Dr, 422- 1907

The Baker Printing Co., Law Case Printers, 251 Market St., Newark, N. J.

New Jersey Court of Errors and Appeals

Between TAYLOR IRON AND STEEL COMPANY, *Complainant, Respondent,* *and* WESLEY G. NICHOLS AND THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY, *Defendants, Appellants.*	*On appeal from Chancery.*

BRIEF FOR RESPONDENT.

This is an appeal from a final decree of the Court of Chancery advised by Vice Chancellor Bergen, made on the nineteenth day of February, nineteen hundred and seven, awarding an injunction restraining the defendant Wesley G. Nichols from divulging or disclosing directly or indirectly, to any person, firm or corporation, the secret methods and processes used by the complainant in the making, moulding, treatment or manufacture of manganese steel taught to or acquired by the said Nichols while in the employment of the complainant, and also restraining the defendant, The American Brake Shoe and Foundry Company, from disclosing or making use of any information relating to the secret methods and processes used by the complainant in the making, moulding, treatment or manufacture of manganese steel that may have been communicated to the said American Brake Shoe and Foundry Company by the said Nichols; and further restraining the said American Brake Shoe and Foundry Company from

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employing, directly or indirectly, in the service of said company, the said Nichols during the term of an agreement between said Nichols and the complainant, dated March 15, 1905, in the bill of complaint set out. (Record, page 975.)

The bill on which this decree was founded was filed by the Taylor Iron and Steel Company, August 17, 1905, for the double purpose of preventing disclosure of its secret methods and processes of manufacture of manganese and other steels by Wesley G. Nichols, an employe, under a written agreement dated March fifteenth, nineteen hundred and five; and to prevent during the term of such agreement the employment of Nichols by the American Brake Shoe and Foundry Company.

The complainant corporation is engaged in the manufacture on an extensive scale, at works at High Bridge in this state, of projectiles, car wheels, castings and other products of iron and steel. The company was organized in 1891 and has used in its works from the beginning, in the making of castings of iron and steel, and especially of manganese and other steels, a certain process known as the Hadfield process, and has also been licensed under certain patents relating to manganese steel and manganese steel castings, issued to Hadfield by the United States Government. Hadfield was in 1891 and still is the proprietor of the famous Hecla Steel Works, of Sheffield, England, and the exclusive right to work under his processes and patents was obtained at large expense by the complainant company under contracts which have been renewed and continued and are still in force, and require the payment of large royalties. (The original and succeeding contracts and licenses are set out

as Exhibits C 8 to C 16 inclusive, Record pages 842 to 901.)

These contracts license the Taylor Company under both "the Hadfield Process" and the Hadfield patents, and in the first and succeeding contracts the dual character of the license is conspicuous. The recital and clauses (1) and (2) of Exhibit C 8, (Record pages 842-4) the original agreement between Hadfield and Howe, Jennings and Taylor, asigned to the Taylor Company, illustrates the distinction in these documents between process and patents. The last agreement of the series, Exhibit C 16, (Record page 887) is dated December 16, 1901, and consolidates all others in effect at its date. By paragraph (1) it licenses the Taylor Company to use at its works in High Bridge, N. J., and at any other place in the United States, "the method of manufacturing and treating steel castings and other steel known as the 'R. A. Hadfield System' *perpetually;* and also the patented inventions relating to manganese steel enumerated, and all improvements thereon for which patents may be taken out in the United States or Canada (including some patents taken out since the date of the original agreement in eighteen hundred and ninety-one) *during the term* of the patents, or any renewal, extension or re-issue thereof, or of any patents taken out for improvements in the United States or Canada. This final agreement was for all purposes whatsoever, thus eliminating exceptions in earlier agreements, but was not to extend to special steels, alloys, crushing or other machines invented, discovered or introduced by Hadfield, and not made by the Taylor Company in August, 1900, at its High Bridge works. Royalties are payable under this agreement to July 1, 1908, and Hadfield covenants that he will not, before June 1, 1908, license any other person, firm or corporation to use either system or

patents in the United States. (Record page 892, paragraph 4). The earlier agreements had contained like exclusive features. The original agreement required secrecy on the part of the licensee until January 1, 1902. The agreement of June 9, 1892 (Exhibit C 11, Record page 863) extended this period of secrecy to December 31, 1903, (Record page 867, paragraph 13), and by the last agreement of December 16, 1901, secrecy was further stipulated until July 1, 1908 (Record page 895, paragraph 8), so that during all times since 1891, the Taylor Company has been under contract obligation to keep the R. A. Hadfield system of making castings strictly secret.

Under these agreements royalties have been paid Hadfield of $220,000. (Record Chrystie, page 58, lines 1 to 10).

After the making of the first agreement in 1891, buildings were constructed at High Bridge, separate from the old forge and machine shop and car wheel foundry. (The complainant company succeeded a former company called The Taylor Iron Works, chartered in 1868, P. L. 1868, 1116.) The new steel works were protected by the erection of a fence all around them and the entrance protected by watchmen to keep out people other than employes, and secrecy of operation has been maintained as far as possible to the present time. (Record, Chrystie, page 32, line 32, to page 33, line 12; Brinton, page 108; Howe, page 189, lines 5 to 22, page 194, lines 10 to 28, page 215, lines 17 to 40, page 216, lines 1 to 20, page 340, line 19 to 342, line 8; Nichols on cross examination, page 418, line 9 to 419, line 28; Snow, page 499, line 15).

After the licenses were negotiated the process was taught to Messrs. Howe, W. J. Taylor and Mr. Chrystie at the Sheffield Works. (Record, Howe, page 189, line 37 to 190, line 5) and Hadfield sent over two men,

one to teach the system and one to work up the product. (Record, Howe page 190, line 26 to 191, line 2). Mallaband came from Sheffield to teach the process. (Record, Brinton, page 166, line 35 to 167, line 15). Brinton went over there in 1898, to be instructed in cast shell making. (Brinton, page 103, line 20 to 104, line 6).

The complainant company was the first in this country to make manganese steel castings commercially. (Record, Chrystie, page 57, line 11; Howe, page 188, line 29; page 239, lines 5 to 36). Although these castings were of higher price (record, Chrystie, page 57, line 20 to 32), a large business has been built up (record, Chrystie, page 57, line 13), and great uniformity in the product for toughness and hardness, resistance to abrasion, tensile strength and other qualities has been developed (record, Chrystie, page 56, line 14, *et seq;* Brinton, page 110, line 8 *et seq;* Howe, page 228, lines 1 to 21; Sherrerd, page 295, line 22). The Taylor manganese castings have become standard in the market for the various purposes for which they are used, as was acknowledged by the sales manager of the defendant, the American Brake Shoe and Foundry Company, and the latter company was desirous of finding an article to compete. (Record, McKee, pages 603-4-5).

That manganese steel is a very valuable product, especially for castings for the wearing parts of crushing and dredging machines, tram wheels, railroad switches and frogs, cast projectiles, &c, is not disputed, (see statement of Mr. Corbin, record page 281), and it is needless to go into the evidence on that line. An amazing illustration of the wearing properties of manganese steel in comparison with other steel will be found in the testimony of Mr. Stewart, road master of the Boston Elevated Railroad System, beginning at

page 279 of the record. A Taylor manganese cast-steel rail, in service four years, six months and twenty-eight days, still in use, showed about one half as much wear in all that time as an ordinary Bessemer rail of the market showed in forty-four days, nickel steel in one hundred days, and a specially made Cambria steel in two hundred and eight days. At a difference in cost between ordinary steel at thirty-eight cents a running foot and Taylor manganese at six dollars and seventy cents per running foot, the latter is proved by experience to be the cheaper.

The defendant, Wesley G. Nichols, was first employed by the Taylor Company, March 16, 1896, and continued in its works until the thirty-first day of July, 1905, when he attempted to sever his relation to the company by a written resignation. There is no dispute that he first came to the company through the recommendation of Mr. Brinton, the superintendent of the steel foundry, and after being taught the Hadfield system of steel making and treatment of castings was made assistant superintendent of the foundry. When he was first employed, and before he was admitted to the works, he was required to sign a pledge of secrecy, a copy of which is set forth in the record, pages 35 and 36, similar in form to a pledge exacted from Mr. Brinton on his employment by the company at an earlier date. (Record, Chrystie page 36, lines 22 to 27; Brinton, page 103, lines 2 to 18; Nichols, page 361, line 39 to page 362, line 8).

At the time of Nichols employment he had no knowledge of making manganese steel or of the Hadfield system. (Brinton, page 102, lines 18 to 33; Nichols, page 406, lines 4 to 23; page 451 to line 23; page 457, line 31). Nichols was taught by Brinton and made fully acquainted with every part of the process and improvements thereon worked out at High Bridge,

and under Brinton and Nichols much advancement was made, all based however, on the original Hadfield system as taught by Mallaband who had come over from England for the purpose. (Brinton, page 108, page 109, page 112, page 161, line 20 to page 167, line 15; Chrystie, page 34, line 17 to page 35, line 4).

March 7, 1905, one Elmer J. Snow, general superintendent of the American Brake Shoe and Foundry Company, came to High Bridge, with a letter of introduction (see copy Ex. C. 2, record page 39), which he presented to Mr. Chrystie, general superintendent of the Taylor Company, and, while not admitted to the foundry, was given leave to go through the machine shop, and while so doing, with the aid of one Estes, sought and obtained an interview with Nichols, who was called from his work in the foundry. This interview lasted but a few minutes, and in its course Nichols was told by Snow that the American Brake Shoe and Foundry Company was having trouble in making manganese steel castings, and Snow then and there offered Nichols, whom he had never seen before, a salary of seven thousand dollars per year to take charge as superintendent of the Brake Shoe Company's steel foundry to make manganese steel, and in addition a block of stock of that company of a market value of ten thousand dollars. Snow requested Nichols to keep this conversation and offer confidential, but Nichols refused to comply with this request, and immediately reported what had been said to him, first to superintendent Brinton and later to Chrystie. After a few days consideration Nichols wrote Snow declining the proposition and announced to Brinton and Chrystie that he was going to stay with the Taylor Company.

We have accounts of the Snow visit and interview from four witnesses; Chrystie and Brinton, who, as to

the interview, tell us what Nichols told them immediately after it happened, and Nichols and Snow himself; and whatever difference there may be in detail, the evidence is not at all conflicting in essentials. (Chrystie, page 37, line 10 to page 42, line 35; Brinton page 114, line 10 to page 115, line 33; Nichols, page 362, line 26 to page 366, line 26; on cross examination, page 434, line 24 to 438, line 10. Snow, page 498, line 34 to page 501, line 40; on cross examination, page 515, line 35 to page 522, line 36).

Brinton, Chrystie and Nichols all agree that Snow was after a manganese steel maker for the American Brake Shoe and Foundry Company. Snow does not acknowledge that he mentioned manganese steel, but his whole tale of a $5000 offer to a man he claims never to have heard of until the day of this fifteen minutes' interview, and whom he accidentally heard of while going through a plant he had obtained admission to under false pretenses, tests credulity. No other conclusion can be drawn than that he went to High Bridge to get Nichols to come to the Brake Shoe Company to make manganese steel castings, in the manufacture of which that company had and was having trouble.

After the Snow visit, Estes was discharged and a correspondence ensued between Mr. Chrystie and Mr. W. W. Snow, who had signed E. J. Snow's letter of introduction, in which Mr. W. W. Snow denied knowledge of the object of E. J. Snow's visit. (See Ex. C. 4, page 45; C. 5, page 46; C. 6, page 47.) Estes subsequently entered the service of the American Brake Shoe & Foundry Co. (E. J. Snow, page 528, line 9 *et seq.*).

After Nichols had declined to listen to Snow's proposition, the Taylor Company advanced his salary and prepared and submitted to him a contract, which he

accepted and signed. This contract is dated March 15, 1905, and is Ex. C. 3. It is printed as part of the bill of complaint, beginning on page 10 of the printed book. By its terms the Taylor Company employed Nichols for a term of five years from March 1, 1905, at a salary of three thousand dollars per year, payable monthly, and an additional sum of fifteen hundred dollars per year under conditions named in the contract. Nichols on his part agreed to devote his entire time, skill, labor and attention during the term of the agreement to the service of the Taylor Company, and to at all times perform such duties as might be assigned to him to the best of his skill and ability, and contracted that he would not at any time, directly or indirectly, during the term of the agreement or afterwards, divulge to any person, firm or corporation, except to the Taylor Company and its officers, any information of any nature then known to him, or thereafter acquired by him during the term of the agreement, relating to or regarding any process of steel making or moulding or treating steel that might have been, was then, or might thereafter during the term of the agreement be used in the works of the Taylor Company, and that he would at all times hold inviolate the treatment, processes and secrets known to or used by him in the works of the Taylor Company. The agreement further provided, if Nichols kept his contract, that the Taylor Company should each year during the term deposit in a named trust company $1,500, or $7,500 in all, to be paid, with interest accumulations, to Nichols at the end of the term. The contract was made terminable by death of Nichols or by failure on his part to observe his contract and provision was made for the forfeiture of the deposit in the latter case, but no such termination of the contract was to release Nichols from his obliga-

tions of secrecy, and neither the termination of the agreement nor any forfeiture of the deposit was to deprive the Taylor Company of any remedy for any violation of the terms of the agreement it might have had during the continuance of the agreement or afterwards.

The negotiation of this contract is described by Chrystie and Brinton, and both say that it was voluntarily made and signed after opportunity for examination, and that after it was executed Nichols expressed his satisfaction with it and his gratitude to the company for its terms. (Record Chrystie, p. 43; on cross ex., page 59, line 37 to page 60, line 31; Brinton, page 112, line 38, to page 114, line 3; on cross ex., page 154, line 26, to 156, line 20; on re-direct, page 156, line 21, to page 161, line 10.)

Nichols himself tells of the making of this contract and endeavored to make it appear that he was coerced or misled into its execution, but he admits that he took the contract after being at first dissatisfied with it, but after re-examination and consultation with Brinton, accepted it and worked under it and drew his pay in accordance therewith until he left High Bridge about August 1, 1905. (Record, Nichols, pages 367 to 370; on cross ex., page 452, line 34, to page 461, line 9; on re-direct, page 474, line 12, to page 475, line 12.) Nichols asserts his good faith and happiness in the acceptance of the contract on pages 460 and 461, and absolutely nullifies the claim set up in the answer of both defendants that the contract was procured to be signed by improper and unfair means.

After the contract of March, 1905, Nichols pursued his work with the company until July 31, 1905, when he sent a written resignation to Mr. Chrystie. (The letter Ex. C. 7 is printed on page 49 of the record.) This resignation was not accepted and interviews fol-

lowed with Nichols by Mr. Chrystie and Mr. White, a director of the Taylor Company, on August third, at which Nichols told them he was going to leave because he had been shadowed by two fellow workmen, and that he would not work with them longer. His attention was directed to the contract of March, 1905, and he said that was the only thing that was bothering him. He said he had shown that contract to Mr. E. J. Snow and Mr. Otis H. Cutler, of the American Brake Shoe and Foundry Company, that they had told him the contract was "no good," and that they were very anxious to have him. At the end of the interview Nichols promised to stay with the Taylor Company, and that he would report at the steel works (from which he had been absent for some weeks on account of illness) the following Monday morning. Nichols left High Bridge the following day, and after conferring with the American Brake Shoe and Foundry Company officers in New York, went to Chicago with E. J. Snow, with a view to entering the Chicago Heights plant of that company. White got in communication (August 7th) with the Brake Shoe Company officers, who said they had been making manganese steel at their Chicago Heights plant; that their superintendent had proved unsatisfactory and they were looking for a man and had in contemplation the employment of Nichols. They admitted knowledge of the contract with the Taylor Company made in March, 1905; said they had submitted it to counsel, and that it was invalid and was not considered by them as an obstacle to Nichols' employment by them. White and Chrystie went to Chicago and White there obtained an interview with Nichols and sought to get him to return but without success. Interviews between White and Chrystie on the one hand and high officers of the Brake Shoe Company were held in Chicago, but

the latter refused to surrender their claim on Nichols. An injunction was then obtained (August 9) against both Nichols and the American Brake Shoe and Foundry Company, restraining the company from employing Nichols, out of the Cook County, Illinois, Circuit Court, which injunction is still in force, and later this bill was filed (August 17) in the Court of Chancery of New Jersey. (Christie, page 48, line 20, to page 55, line 32; White, page 77, line 10, to page 95; Brinton, page 116; Nichols, pages 371 to 377; on cross ex., page 430, line 18, to page 434, line 23, and page 462, line 32, to page 473, line 23; Cutler, page 478, line 10, to page 487, and on cross ex., page 488 to page 490, line 5; E. J. Snow, page 502 to page 507, line 7, and on cross ex., page 524, line 37, to 528, line 7.)

After the injunction was served in Chicago, Nichols remained there until the following June, and was supported there by the American Brake Shoe and Foundry Company, and also in Philadelphia from June on to the time of the hearing in this case. (Nichols page 414, line 34 to page 418, line 8).

In September, 1905, Leonard, another former Taylor Company employe, was at the Chicago Heights plant of the American Brake Shoe and Foundry Company for about four months. He had left High Bridge shortly after Nichols and had been employed after calling at the New York office of the Brake Shoe Company to make an affidavit, and had drawn pay from that time, although he had not gone to Chicago Heights until three weeks later. (Leonard page 767, line 6, *et seq*).

Leonard was employed by the American Company as assistant foreman, and was in frequent communication with Nichols. (Leonard, page 768, line 29, *et seq;* Nichols page 414, line 3, *et seq*). Leonard told France, whose acquaintance he first denied, (Leonard

page 769, line 23 to page 776, line 28), and on the following morning remembered, (Leonard page 786, line 39 to page 795), that Nichols was the superintendent of the foundry of the Brake Shoe Company at Chicago Heights, and was in Chicago, but prevented from visiting the plant by an injunction, and that he, Leonard, was working in his, (Nichols' place and received his orders from him, and that when he, Leonard, was gone, most of the work would have to be taken care of by "phone." (France, pages 801 to 825). A comparison of Leonard's testimony with that of France and the Exhibits C. 31 and C. 32 produced by him is convincing that France is telling the real history of life at Chicago Heights; Vice Chancellor Bergen, who heard both men on the witness stand, characterized Leonard as a witness "as a lamentable failure, and not the slightest reliance can be placed upon any of his statements which are in conflict with other witnesses." (Page 973, line 32).

The efforts of the American Brake Shoe and Foundry Company to make manganese steel castings are fully described by Potter, the former superintendent of the Chicago Heights plant. Potter received a salary of $3000 per year, was an able and energetic superintendent with wide knowledge of steel making in general. By independent experiment and study of pubications he claims to have produced manganese steel castings of good quality from June, 1904, and in commercial quantities. The Tropenas converter is used at Chicago Heights and the mixtures and methods were worked out and installed in practice by Potter. His evidence is given at great length (pages 537 to 599, 725 to 752). He says, as does Prof. Howe and Mr. Brinton, that mere knowledge of the Hadfield patents will not make manganese steel; that manganese steel castings are not made on specified analysis,

as also stated by Mr. Brinton; that he had two or three primary mixtures (Mr. Brinton has six) and that these mixtures were evolved out of his experience and were not so far as he knew in use in any other foundry; that each foundry had its own ways and that he had left behind him when he left Chicago Heights fixed rules of practice evolved out of experience in that foundry. It should perhaps be noted that even Potter, in working out the manganese steel casting problem, traces the pedigree of his final product, through many years of experimentation, back to the Wharton Co. at Philadelphia, and the assistance there of Klein, who claimed to have his information from the Taylor foundry at High Bridge.

He left Chicago Heights in the latter part of June, 1905. He had first proposed to go in February. Both dates are significant with reference to the Nichols negotiations in March and July. Potter confesses to some trouble about returned manganese steel castings and (page 738) admits talking to Dr. Waldo concerning manganese steel castings and telling him that the Brake Shoe Company had secured a man from the Taylor Company but had not been able to use him on account of an injunction. E. J. Snow had told Nichols in March at High Bridge, that the Brake Shoe Company was having trouble in making manganese steel castings and the officers of the company, in August, frankly admitted that they wanted Nichols to take charge of the foundry to make manganese steel castings. McKee, sales manager of the Brake Shoe Company says (page 603, *et seq*) that the Taylor manganese steel had been in the market for some time, and in 1904 and prior thereto the Brake Shoe Company had been seeking for an article that would take the same market; that the Taylor manganese steel was a standard article in the market and had

been so referred to in advertising the Brake Shoe Company product.

Many witnesses were sworn as to the merits of the Taylor product. William Wharton, Jr., & Co., of Philadelphia, one of the largest manufacturers of track work, curves, switches, frogs, etc, in the United States, have used the Taylor manganese castings exclusively since 1894, when they first introduced it for this line of work in substitution for Bessemer steel rails theretofore in general use. (Angerer, pages 136 to 139). There are several other makers, inclusive of the defendant Brake Shoe Company, attempting competition in this country, and manganese steel is also imported, but the Taylor Company was first in the field and supplies a wide market in the United States and Canada, controlling in the wearing parts of dredges ninety-five per cent., and of hard stone crushers, ninety per cent. of the trade, and supplying, to the exclusion of all others, the Wharton Company, the largest makers of street and steam railroad track work in the United States; the product being so thoroughly introduced by the complainant and generally acceptable to and in use by those having need for it, that notwithstanding all other steels offered in competition at less price, some of them in fact or in name "manganese," the complainant has as yet scarcely felt the competition. (Sherrerd, pages 293 to 301; Siedler, pages 346 to 350).

This evidence was easily to be met, if not founded on fact, but no effort to contradict or vary it was made.

Several witnesses were also sworn as to the merits of manganese steel castings made by the Brake Shoe Company, and some comparative tests, based on tensile strength, were submitted to the court. Such tests are absolutely without value in determining the wear-

ing qualities under friction, as some of the classes of iron lowest in tensile strength are those that resist wear the best, and some of the classes of iron highest in tensile strength are those which do not resist wear. (See Prof. Howe's testimony, on page 831, and to the same effect Prof. Langley, who conducted the tests, on cross examination, at pages 705 to 710, and Potter who says the only test of steel for abrasive purposes is the abrasion test and that this was not applied, page 752). It is not disputed that manganese steel castings have been produced by the Brake Shoe Company by methods of its own, aided by the disclosures of the Hadfield patents; but the evidence, as a whole, clearly shows that the Brake Shoe Company has not attained that uniformity of product in toughness and strength in castings of varying sizes and shapes which has been attained at High Bridge.

It is also to be especially noted that at High Bridge great advances and additions have been made since the introduction of the Hadfield process in 1892, and it is true that some of these advances, with reference to the treatment of the castings after moulding, have been disclosed by the Brinton patent of February 20, 1906. This patent was taken out since the bill in this case was filed, and Nichols put under preliminary injunction. Prof. Howe, Professor of Metallurgy at Columbia University, whose distinction in the scientific world is established (see Record pages 185 to 187), with exact knowledge of the methods and processes at High Bridge and wide knowledge of the manufacture and treatment of steel and steel castings the world over, testifies to the great advances over the original process and in its application to conditions not deemed workable under it at the beginning. Superintendent Brinton, also, an experienced steel worker before his employment at High Bridge, tells

of the great improvements on the Hadfield system, worked out by practice and experience. These changes, modifications and improvements (except as disclosed by the Brinton patent as to treatment of castings of February 20, 1906, since this bill was filed) have been kept secret. Nichols was there as an Assistant Superintendent during this period of development, and was fully acquainted with both the original system taught to Brinton by Mallaband of Sheffield, and by Brinton to Nichols, and the after modifications grafted on the original. Nichols' cross examination completely disposed of his attempt to show the High Bridge practice to be disclosed by books and patents, and identical with the Brake Shoe Company's practice at Chicago Heights. He was compelled to admit that there were at High Bridge practices and methods taught to and acquired by him while there, that so far as he knew were not in use elsewhere; that the books did not disclose these processes, and that the works were not open to visitors. (Page 405 line 30 to 411 line 27). And Nichols' present attempt to deny the methods and processes at High Bridge to be secret and to designate them as common practice in steel foundries is to be considered in the light of his admission in writing in the contract of March, 1905, that there were secrets to preserve, an admission made nearly ten years after his first admittance to the Taylor foundry and with full knowledge of its practices.

The evidence establishes in this case the possession by the complainant company of secret processes and methods. The evidence of Supt. Brinton and Dr. Howe, corroborated largely by the cross examination of Nichols himself, clearly shows there are unique and special methods as to which secrecy is maintained so far as practicable, by the use of which uniform hard-

ness and toughness are secured in castings of manganese steel. These are summarized by Dr. Howe, and the impossibility of attaining the results by the mere aid of the published books and patents pointed out. (Page 223, line 6 to 233, line 33). Of course it is not pretended that somewhere else a similar result may not be reached by methods independently worked out and it is quite possible that the methods so worked out may approximate the Taylor practices. It *is* claimed that the problem has been solved by the Taylor Company and Hadfield, and that others should work out the problem for themselves.

These special methods, as to which secrecy has so far as possible been maintained, are as follows:

(1) In the initial mixture.

(2) In the method of melting in cupola.

(3) In the procedure between cupola and converter.

(4) In the method of converting, especially with reference to regulating the temperature and determining the time when the process is completed.

(5) In the pattern making for manganese steel castings.

(6) In the use of chills in the moulds.

(7) In the time of removal of castings from the moulds.

(8) In the heat treatment.

(9) In the manufacture of cast shells.

Some of the steps followed in the heat treatment are the subject of patents—partly expired and partly in force—but as to the other steps the methods used are not disclosed by any patents, and are not discoverable by analysis and are in practice, so far as the High Bridge people know and so far as the evidence in this case discloses, limited to High Bridge.

The evidence of the existence of these trade secrets, although they are not disclosed in detail, is sufficient for any case where the aid of the court is sought against an employe in advance of an accomplished appropriation of the secrets of a defendant infringer.

The court has the following competent and satisfying evidence of the existence of trade secrets—evidence which of itself would abundantly justify a verdict by a jury that the complainant has, as against Nichols, trade secrets—as follows:

1. The purchase by the complainant of a license at large expense to work under a system of steel making introduced from England, known as the Hadfield system.

2. The instruction of men sent specially to England for the purpose, and the installation of the system in the complainant's works by Mallaband sent here from the licensor.

3. The special education by Mallaband of Brinton, and by Brinton of Nichols, after both had been admitted to the complainant's works under pledge of secrecy.

4. The renewal of the license after the original royalty period had expired, and the continuation of the payment of royalties to the present time.

5. The payment of $225,000 in royalties to Hadfield under his system and patents from 1892 to date.

6. The covenants of secrecy in the Hadfield license agreements, original and renewed.

7. The protection of the steel foundry by fence from the rest of the works, and the secrecy with which the manufacture of steel castings by the complainant is conducted.

8. The conceded fact that the complainant was the first successful manufacturer of manganese steel castings in this country.

9. The sustained superiority of the complainant's product of steel castings in competition with other products offered for like uses—due apparently to the uniformity secured by the complainant, by the use of its processes, in hardness and toughness.

10. And above all, the declarations of the contract of Nichols of March, 1905, after he had been with the complainant nearly ten years, found in his agreement to preserve and keep inviolate the secrets of the Taylor Company. That contract has not been impeached, and the existence of secrets, so far as Nichols is concerned, is a confessed fact, and even if the contract be wholly rejected as a basis of relief it stands as a written declaration of Nichols. To it he has added his admissions on the witness stand.

11. The declarations of officers of the defendant Brake Shoe Company that that company had been trying to make manganese steel castings and had failed, and that it wanted *Nichols* to make a success of that deartment of their business; and the methods pursued to get Nichols. Why Nichols, if no secrets in the complainant's processes? Why not Jones or Smith, or any other possessed of the "common knowledge" of the trade?

12. The direct evidence of Brinton and Howe, both skilled in the art of steel making, and with extended knowledge of the practice of the art.

The details of the methods and practices at High Bridge were not disclosed in the hearing. The defendants' counsel endeavored to secure them by cross examination, but on objection in behalf of the complainant, was overruled, and, on like objection, Nich-

ols was not permitted in his own direct examination to disclose these secret methods and practices at High Bridge, and his claim of identity of practice between High Bridge and Chicago Heights was absolutely shattered on cross examination. But even if such were the case, Potter swears that the practice at Chicago Heights was the result of independent experiment and investigation and reduced to rule by him.

Nichols and the officers of the Brake Shoe Company say that he has not disclosed any of the methods or practices at High Bridge, having been put under preliminary injunction before he had opportunity to put the High Bridge ways in operation at Chicago Heights. This being so, the object of the complainant to protect its trade secrets from spoliation by either Nichols, its confidential employe, or by a competitor conspiring with him, has, by the decree below, been accomplished.

This is not a suit by a master against an employe who has already taken the master's trade secrets to another employer, and to enjoin such employe and such second employer from using something already communicated and in possession.

This bill is filed to prevent the communication of trade secrets—accepting now the denials of the defendants and assuming their ignorance is as great as their evidence assures. The theft of the complainant's trade secrets is sought to be arrested before consummation.

Under such conditions the court meets the questions involved on simple and narrow lines, and the necessity for completeness of detail and identity of article, essential where the contest is over something actually appropriated by a defendant, is absent in this case. In most of the cases reported, the absolute necessity for determining the identity of the thing claimed by

complainant to be in the use of defendant, called for proofs of a positive and non-circumstantial character. The *Reichenbach case,* 20 N. Y. Sup., 110, affirmed 29 N. Y. Sup., 1143, is a notable exception, that case being very similar in circumstance to our own. In that case and in this case, the complainant was called upon to establish merely the existence of trade secrets and their knowledge by the defendant employe, and not to affirmatively demonstrate the possession of those secrets by the defendant infringer.

Salomon vs. *Hertz,* in our own state, 13 Stew., 400; was an instance of a bill filed to prevent a threatened injury, and the Chancellor did not withhold his preliminary injunction because the defendants denied the secrets. In the *Grasselli case,* 20 Dick., 756, and the *Can Company case,* 58 At., 290, on appeal 67 At., 339, the defendants were in active manufacture under the secret rights claimed to be infringed. *Salomon* vs. *Hertz* never went to final hearing, but in the present case on final hearing, we have, in support of the answers denying the existence of the secret, almost no evidence. Nichols, under skillful leading on direct examination, claimed he learned nothing at High Bridge not known to him when he went there, or acquired by him from books read after he left there, but under cross examination, even this claim failed, and the case on the part of the defence is without proof in support of the claim in the answers, and Nichols' own evidence as a whole is strongly corroborative of the existence of trade secrets and their use in the High Bridge plant. The most that can be claimed from Langley and Potter's evidence is that good manganese steel castings have been made at places other than High Bridge. Langley's personal experience is limited to fifteen experimental tons of tool steel at Pittsburg in 1892, and two or three days' observation at Chicago

Heights, while Potter demonstrates that the boasted results at that plant were not secured by Taylor methods, but by the use of a Tropenas converter and as a result of experiments designed and conducted by Potter himself. Nothing in this to indicate that the High Bridge methods are not what they are claimed to be by the complainant, and as above shown the complainant's proofs are satisfying.

The proofs offered by the complainant and defendants fully sustain the allegations of the bill of complaint and (without disclosing the details of the processes as was not necessary in a case of this character, and calculated, if required, to turn this protective proceeding into a means of information to the defendant company of what it denies it has as yet received) abundantly show the existence of trade secrets in unique and special practices in steel making and moulding, and in the combination of known methods to secure a uniform result of toughness and hardness in the product, based on the original Hadfield process, brought from Sheffield, England, taught by Mallaband to Brinton and by Brinton to Nichols, and greatly improved and extended at High Bridge.

The vice chancellor properly followed in the trial of this case the method of trial pursued in the *Reichonbach* case, *supra* (a case referred to by Mr. Justice Swayze in this court in *Stone* vs. *Grasselli Co., supra*, and quoted *in extenso* in *Thum* vs. *Tloczynski*, 114 Mich., 149, which last case was here named by Mr. Justice Swayze as a leading case in this country,) the printed book used on the argument of that case having been brought to the vice chancellor's attention by counsel for complainant.

See also *Moxie Nerve Food Co.* vs. *Beach*, 35 Fed., 465, and *Stokes Bros. Mfg. Co.* vs. *Heller*, 56 Fed. Rep., 297.

Mr. Wigmore in his work on Evidence, Vol. 3, Sec. 2212, discusses the subject of evidence in these cases in the following language:

> "In a day of prolific industrial invention and free economic competition, it may be of extraordinary consequence to the master of an industry that his process be kept unknown from his competitors, and that the duty of a witness be not allowed to become by indirection the means of ruining an honest and profitable enterprise. This risk, and the necessity of guarding against it, may extend not merely to the chemical and physical composition of substances employed, and to the mechanical structure of tools and machines, but also to such other facts of a possibly private nature as the names of customers, the subjects and amounts of expense, and the like. Accordingly, there ought to be and there is, in some degree, a recognition of the privilege not to disclose that class of facts, which for lack of a better term, have come to be known as 'trade secrets.'
>
> "Nevertheless, the occasional necessity of recognizing it should not blind us to the danger of such a measure, or entice us into an unqualified sanction for such a demand. In the first place, in an epoch when patent-rights and copy-rights for invention are so easily obtained and so amply secured, there can be only an occasional need for the preservation of an honest trade secret without resort to public registration for its protection. Such instances do occur, but an object of the patent and copyright laws is to render them as rare as possible, and the presumption should be against their propriety. In other words, a person claiming that he needs to keep these things secret at all should be expected to make the exigency particularly plain. In the next place, the occasion for demanding such a privilege arises usually in actions where the party claiming it is one charged with infringing the rights of another by fraudulent competition in business,

and the existence of the fraud can be proved only by investigating the claimant's methods of business; in such cases, it might amount practically to a legal sanction of the fraud if the court conceded to the alleged wrong-doer the privilege of keeping his doings secret from judical investigation. No privilege at all should there be conceded, although as much privacy as possible might be preserved by compelling disclosure no farther than to the judge himself, or to his delegated master or auditor, if (as is usual) the cause is tried by chancery procedure. Finally, even where the claimant of the privilege is not a party charged with fraud, no privilege of secrecy should be recognized if the rights of possibly innocent persons depend essentially or chiefly, for their ascertainment, upon the disclosures in question. In other words, the privilege should be conceded in those cases only where the disclosure of the facts by the particular channel of the witness in question is but a subordinate means of proof, relative to the other evidence available in the case; for without some such limitation the general principle cannot be enforced (*ante,* Sec. 2192) that testimonial duty to the community is paramount to private interests, and that no man is to be denied the enforcement of his rights merely because another possesses the facts without which the right cannot be ascertained and enforced. The simple expedient of restricting the disclosure to the judge or his delegate will usually prevent whatever detriment might otherwise be incurred by forcing a public revelation of the trade-secret.

"1870, *Hatherley, L. C.,* in *Moore* vs. *Craven,* L. R., 7 Ch. App., 94, note; 'The Court does not, when discovery is a matter of indifference to the defendant, weigh in golden scales the questions of materiality or immateriality; but where the nature of the discovery required is such that the giving of it may be prejudicial to the defendant, the Court takes into consider-

ation the special circumstances of the case, and whilst, on the one hand, it takes care that the plaintiff obtains all the discovery which can be of use to him, on the other, it is bound to protect the defendant against undue inquisition into his affairs. The question of materiality must be tested by reference to the case made by the plaintiff's pleadings, and to what will be in issue at the hearing.'

"What the state of the law actually is would be difficult to declare precisely. It is clear that no absolute privilege for trade-secrets is recognized. On the other hand, Courts are apt not to require disclosure except in such cases and to such extent as may appear to be indispensable for the ascertainment of truth. More than this, in definition, can as yet hardly be ventured."

Under the facts of this case as we have thus found them from the printed record, it is confidently contended that the decree of the Court of Chancery should be affirmed.

Since this case was heard in the Court of Chancery, this court has had before it, and decided, the case of *Vulcan Detining Company* vs. *American Can Co.*, 67 At. Rep., 339, in which the Court of Chancery was reversed and an injunction decreed on the merits not discussed in the Chancery opinion. (62 *At. Rep.*, 881).

In the earlier case of *Stone* vs. *Grasselli Chemical Co.*, 20 Dick., 756, this court had laid down the principles applied to this class of cases as follows, (after reviewing the cases):

> "These cases establish the principle that employes of one having a trade secret, who are under an express contract or a contract implied from their confidential relation to their employer, not

> to disclose that secret, will be enjoined from divulging the same to the injury of their employer, whether before or after they have left his employ; and that other persons who induce the employe to disclose the secret, knowing of his contract not to disclose the same, or knowing that his disclosure is in violation of the confidence reposed in him by his employer, will be enjoined from making any use of the information so obtained, although they might have reached the same result independently by their own experiments or efforts. We approve the principles thus established."

The *Stone* case is reaffirmed in the opinion of Mr. Justice Garrison in the *Vulcan Detining Company* case, and relief afforded against former employes of the Vulcan Co. on its authority; and also against the American Can Co. which had, through the aid of a former officer and employe of the Vulcan Company, acquired and was actually using a process to which the title of the latter company was not above suspicion. While the facts in the *Can Company* case differ from the facts in the case now before the court, in that in the former case the secret process had actually been given over to the American Can Co., and in this case the injunction of the Court of Chancery was secured before the knowledge of the trade secrets of the Taylor Co. had passed to the Brake Shoe Company, the language of Mr. Justice Garrison is obviously pertinent to this case. The title of the Taylor Company, partly by assignment and partly by discovery, to the system of steel making it is endeavoring to protect, is not disputed, but in the *Can Company* case, Mr. Justice Garrison, speaking for this court, approved the opinion of Vice Chancellor (now Mr. Justice) Reed, on a demurrer in the same case (58 *At. Rep.*, 290) holding that, conceding that neither party stood in the shoes of the discoverer of the secret pro-

cess, the equity of the bill rested upon principles generally applicable to trusts, and not upon rights peculiar to the discoverer (or owner) of a secret process, and (as interpreted by Mr. Justice Garrison) "placed the equity of the bill upon an alleged breach of confidence respecting a secret process, and not upon any inherent property in such process."

Mr. Justice Garrison further says, (page 343):

> "What I wish to point out is that the real gravamen of the complainant's bill as amplified in the proofs, is not that the defendants are threatening to destroy the value of an absolutely secret process by imparting it to the public, but that the defendants, while keeping the secret of the process to themselves, are making a use of it that is inequitable as to the complainants. In fine, the main and immediate need of the complainant, as shown by the testimony, is to be protected from the inequitable competition to which it has been exposed by a breach of confidence. Incidental to this relief, and resting upon the same equitable jurisdiction, is the restraint of the defendants from publishing the process itself, of which, however, there is no proof of any present threat or intention. Indeed, as long as the present state of affairs exists, such publication would be equally injurious to both parties, and for the same reason; namely, because of the competition to which it would expose the business in which each is at present engaged. I am not suggesting that the complainant is not entitled to an injunction enjoining publication, for I think that it is; but I am now saying that the main ground for relief disclosed by the complainant's case is the existence of inequitable competition arising from a breach of trust, and hence referable to general principles of equity, and not to those special doctrines by which unpatented secrets are protected. In the application of these general principles the secrecy with which a court

of equity deals is not necessarily that absolute secrecy that inheres in discovery, but that qualified secrecy that arises from mutual understanding, and that is required alike by good faith and by good morals. It is proper to say here that the plea that absolution should be granted by courts of equity from the observance of such private obligations whenever the public will thereby be the gainer, cannot for a moment be entertained.

* * *

"The conclusion to which the foregoing considerations lead is that, entirely aside from the technical secrecy of the process or the abstract question of property therein, the complainant is entitled to have its trustee, his associates, and their servants restrained from using against the interests of the complainant the very process with which its trustee was intrusted for its benefit. It is further worthy of note, upon this question of the secrecy of the process, that, apart from the peculiar rights of its discoverer, the secrecy of a process may be viewed in two aspects: First, as having for its object the keeping of the public in ignorance of the nature, source, or composition of a commercial product that is put upon the market; and, second, as having for its object the prevention of competition by rivals in production. The first of these aspects has sole regard to the public as prospective purchasers; the second has reference solely to rivals in probable competition. In the case before us, publication by the complainant's trustee would, of course, violate the obligation of secrecy in each of these respects; but, as regards the second, namely, prospective competition, such trust is equally violated if the trustee himself uses the secret to engage in such competition, even though, as would clearly in that case be to his interest, he sedulously kept the secret to himself, excepting so far as his selfish use of it required the co-operation of associates and servants. To this the trustee might in-

deed answer: 'It is true that I agreed to keep your secret from others; but I did not agree that I would not myself make use of it in competition with you.' But it is not likely that a court of equity would regard such answer as in any wise ingenuous or exculpatory. The present case rests as it seems to me, largely upon the distinction thus indicated. The secrecy maintained by the original purchasers of the process in question was not in order that the public might not know what it was buying, but that the profits of production should not be cut by rivals. It was unquestionably to this end that the process was sedulously guarded by Assmann and his original associates, and by Assmann as a personal trustee of its formula. When, therefore, Assmann severed his connection with the complainant and installed the process in question for the defendant corporation as a competitor in production, it is the same in equity as if, without having severed such prior connection, he had broken faith with his fellows by imparting to a rival the secret which he had promised to preserve. The jurisdiction of equity in such case, whether the breach of trust be actually beneficial to the wrongdoing trustee or only injurious to his *cestuis que trustent*, is too familiar to justify the citation of authorities."

These views are as applicable to the arrest of a contemplated theft as to prevention of enjoyment of an accomplished larceny, as are the further remarks, on page 345, approving and upholding the rule as to notice through agents laid down by this court in *Sooy* vs. *State*, 41 N. J. Law, 394, and applying the rule of implied notice to the case then under consideration.

In the case now before the court the defendant company must submit to the test laid down by this court.

Under the law of this state as declared and established by this court, Nichols is bound as well after as before the termination of his employment against dis-

closing the trade secrets of the Taylor Company, whether his contract to do so was express or implied.

The same rule has been declared by the courts of England, of the United States and many of the states, as sufficiently appears from the citations in the opinion of this court in *Stone* vs. *Grasselli Chemical Co. supra.*

In the present case the contract was express by the agreement of March, 1905. It reads, sec. 2:

> "(2) The said Wesley G. Nichols agrees that he will devote his entire time, skill, labor and attention during the term of this agrement, to the service of the Taylor Iron and Steel Company, and that he will at all times faithfully perform the duties that may be assigned to him by the management of the said Taylor Iron and Steel Company to the best of his skill and ability for the compensation aforesaid, and that he will not at any time, directly or indirectly, during the term of this agreement or afterwards, divulge to any person, firm or corporation, except to the Taylor Iron and Steel Company and its officers, any information of any nature now known to him, or hereafter acquired by him during the term of this agreement, relating to or regarding any process of steel making or moulding or treating steel that may have been, is now, or may be hereafter during the term of this agreement, used in the works of the Taylor Iron and Steel Company, and that he will at all times hold inviolate the treatments, processes and secrets known to or used by him in the works of the said Taylor Iron and Steel Company."

The objection to this contract made in the answers of the defendants that it was unfairly obtained, has as we have already seen, failed of establishment. But even if the proofs did not conclusively dispose of this claim the acceptance by Nichols of its benefits for a period of several months without objection to the com-

plainant, would amount to ratification and preclude him from questioning it.

Dennis vs. *Jones,* 17 Stew. 513.

It was vigorously argued below that this contract was in restraint of trade and therefore void. It is remarkable that in no one of the leading cases quoted in the opinion of this court in *Stone* vs. *Grasselli Company, supra,* is any suggestion made that the rule referred to applies to trade secret covenants, and the views of Mr. Justice Garrison, above quoted, from the *Can Company* case, show how inapplicable the principles governing cases involving restraint of trade are to trade-secret controversies.

The following cases expressly hold that trade-secret contracts are not within the rule appealed to by the defendants to get rid of this Nichols agreement:

Maxim vs. *Nordenfeldt,* (1893) 1 Chy. Div., 630.

Morse Twist Drill, &c., Co. vs. *Morse,* 103 Mass., 73.

Hulse vs. *Bonsack Machine Co.,* 65 Fed., 864.

The second paragraph of this contract, to which this criticism is addressed, is, it is submitted, correctly interpreted by Vice Chancellor Bergen in the opinion below. (Record, pages 961-2.) The whole contract is to be taken together and construed as a whole, and so as to sustain it unless the language absolutely forbids.

See *Trenton Potteries Co.* vs. *Oliphant,* 13 Dick., 507.

The words "now known to him" are to be construed in view of the fact that at the time of the execution of the contract Nichols had been for nine years in the employment of the complainant, during which time he had been steadily instructed in their practices, and the whole scope of the agreement clearly shows that it was this information and nothing more that is referred to as that "now known to him."

Further, as also pointed out by the Vice Chancellor, the covenant under consideration may be considered as two covenants, and the second "and that he will at all times hold inviolate the treatment, processes and secrets known to or used by him in the works of the said Taylor Iron and Steel Company," is not broader than necessary for the complainant's protection, and such a contract as a manufacturer has a right to exact against disclosure of the trade secrets which he commits in confidence to any employe whom he admits into his works.

Further, it has been shown that, under the proofs in this case, it abundantly appears that the complainant has trade secrets of a most valuable kind, but apart from such proofs, Nichols has no standing to deny their existence and cannot be heard to claim that the complainant's processes do not constitute trade-secrets.

They were not only communicated to him as such, but he has himself so treated them by written covenant in his original pledge of 1896, and his contract of March, 1905. In the first he agreed to observe secrecy "whether novel or not," which is only another way of declaring that for the purpose of the covenant they should be regarded as novel or secret. In the contract of March, 1905, nine years after he had entered the complainant's works, he agrees to keep inviolate the "treatment, processes and secrets" of the complainant company. How can a court now listen to his denial? It was well said in *Morrison* vs. *Moat*, 9 Hare, 241, that the processes as to the covenanter may be secret although they are public as to all the rest of the world.

Nichols has received and accepted a contract of service and has been admitted and continued in the Taylor works on the faith of this solemn covenant: that he will not disclose to others the processes of making

steel and of moulding and treating steel in use in those works, communicated to him while in the Taylor employment; and that he will at all times keep inviolate the treatments, processes and secrets known to or used by him in the Taylor works. A reasonable interpretation of this clause does not include those ordinary accomplishments of a steel maker known to Nichols at the time of his first employment, but does include the methods, processes and treatments at the Taylor works, communicated to and practiced by him in those works on the faith of his promise of secrecy, even if not novel, and even if not as individual parts of a system, secrets. It is competent for a master to protect his plant and its product by such contracts with his employes, and they are not in restraint of trade if proper for such protection. The product secured at the Taylor plant by the Taylor methods has been illustrated by the proofs in this case, and dismissing all comparisons as to present productions, the fact is unchallenged that the Taylor people were first in the field, and that the excellency of their product has incited the experiments of their rivals in the trade. Nichols himself has not hesitated to speak with pride of the Taylor castings, and it is evident that great uniformity and excellence of product have been attained. The fact that others by experimentation or direct discovery have been or are now securing equal success does not militate against the Taylor Company's right to protect its product, any more than does the fact that these results have been secured by the use of cupola, converter and moulds, instruments long known to the steel maker. Combination of well-known principles and practices to the attainment of a uniform result has been recognized by the Supreme Court of the United States in the Carnegie Steel case as the basis of patent right, under laws requiring novelty of inven-

tion. (*Carnegie Steel Co.* vs. *Cambria,* 185 U. S., 403.) The reasonable protection of the complainant justified it in exacting such a covenant of Nichols, and he should not be permitted to carry its methods, processes and treatments, which have given it success, if not alone, at least years in advance of its competitors, to those competitors, and the right to such protection against him is not dependent on whether Potter, in Chicago Heights, or Langley, in Pittsburg, or somebody, somewhere else, has used in part some of the Taylor ways and succeeded in making steel castings from molten iron.

No authority is needed beyond that already cited to sustain the propriety of the injunctive relief against the defendant American Brake Shoe and Foundry Company.

The case shows conclusively a design to secretly and fraudulently induce the defendant, Nichols, to leave the employ of the complainant company for the benefit of the defendant, the American Brake Shoe and Foundry Company, in breach of Nichols' known employment under the contract in evidence; and the basic principles of the relief are those so clearly developed in the opinions of this court in the *Stone* and *Can Company* cases. The fact that the original proposition in March was manfully rejected by Nichols does not in any way detract from the defendant company's guilt in the premises. The seed was planted and the subsequent conduct of the officers of the defendant company as disclosed by themselves, frankly shows great eagerness to get Nichols, and a design to keep him regardless of the rights of the complainant. This desire could only be founded on the wish of the defendant company to get at the methods of making and treating steel castings, and the conduct of the defend-

ant company's officers is absolutely inconsistent with the claim now made that Nichols was only an ordinary steel maker possessing no knowledge of value to the defendant company. The exceptional salary originally offered him and later renewed, the support of Nichols since this litigation was begun, the employment of Leonard, all evidence irresistibly the intention of the defendant company to get at the methods and processes of the complainant company. Claiming to be successfully manufacturing manganese steel at the time the original approach was made to Nichols, they were willing to discharge the satisfactory superintendent who had introduced and built up the manufacture of manganese steel castings for them, employed at a salary of $2,500 a year, and substitute a new man, at a salary of $7,000 and a bonus of stock, of whom they knew nothing except that he occupied an important position in the complainant's works. After notice of the complainant's rights and against its protest, the effort to get Nichols was continued, and the whole course of the defendant Brake Shoe Company's conduct evidences overwhelmingly the fraudulent design to secure through Nichols the methods, treatments and secret processes employed by the complainant in its works at High Bridge.

The decree of the Court of Chancery should be affirmed.

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New Jersey Court of Errors and Appeals

Between
TAYLOR IRON AND STEEL COMPANY,
Respondent,
and
WESLEY G. NICHOLS AND THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY,
Appellants.
} *On Appeal.*

ARGUMENT FOR APPELLANTS.

The complainant was incorporated in 1891, to make manganese steel under the Hadfield patents issued in 1884. Hadfield was a famous English maker of steel. Manganese is used in all steel making, and is one of the impurities to be driven off in the process. If there is more than about one per cent in the steel, it becomes brittle, and, if several per cent, the steel was supposed to be worthless. Hadfield discovered that while a small percentage of manganese was harmful to the steel (p. 904, ll. 20 to 30), yet, if the manganese was increased up to 12 or 15%, a product of great strength and hardness, and of great value for some purposes, was produced. The purposes are few, and are chiefly those where great resistance to wear is required, such as stone crushers and the teeth of a dredging machine. Hadfield patented this product, and called it manganese steel; he also described and patented the process of making it, which consists chiefly in adding to the carbon, which is put in to make ordinary steel, a sufficient percentage of ferro-man-

ganese. He procured several later patents for improvements in method, describing the process of manufacture in great detail. One patent for using from two and a half to seven per cent only, of manganese, with little carbon does not appear to have been as useful (908), though something similar was patented and used with success by the defendant company for brake shoes in 1890 (p. 909, l. 20, p. 446, l. 35). Hadfield licensed the Taylor Company to use his patents until their expiration in 1902, and agreed to impart his mode of making, and any future discoveries, and as a part of the contract the Taylor Company agreed to pledge their workmen to secrecy until 1902, when the patents ran out (p. 851, l. 20). The Taylor Company having thus acquired a monopoly, protected by patents, built up a profitable trade. In 1896, they employed the defendant Nichols, who had been foreman in a Bessemer Steel Plant, to act as assistant superintendent to Brinton. Nichols signed a pledge, which was made both to the complainant and to Hadfield. This pledge was carefully limited so as to be fair to the servant and within the law as to restraint of trade. It left the servant wholly free to use all his knowledge and skill after 1902, and free before that time to use it as to all processes, except the processes "covered by the Hadfield patents." (Case, p. 35).

The complainants, however, do not seem to have attached any importance to concealing their processes for it is shown that they allowed their workmen, several hundred in number and changing from time to time, to see all the processes, and did not pledge them. They did not even pledge an officer so important as the foreman of the Moulders, who was employed four times at intervals from 1894 to 1905, and who had every opportunity which Nichols had to see what was done (p. 756). The only matters not thrown open

fully to observation were the component elements of the mixtures to make the steel. The chemist of the company analyzed the ores and other materials, and gave to each lot a number, and directed how many tons should be taken from each lot for a furnace charge. His analyses were never made known to Nichols (p. 379, lines 25 to 40; p. 380, lines 1 to 17); Nichols so testified, and the chemist was not called to dispute him. All that Nichols could observe was open to the knowledge of hundreds of others, and was no secret because it has been observed by Nichols as practised in other works. (Case, p. 402 to 405; p. 407; p. 408, p. 760; p. 761; p. 797). Prof. Langley, of Michigan University, shows also that Hadfield, in Sheffield, makes no concealment of his operations (p. 620, lines 1 to 15). When the patent ran out in 1902, the term of the pledge also ran out, and was not renewed. Nichols continued in the employ of complainant down to March 1905; he was then free from any pledge, and free to take any other employment, and to use all his skill and ability. In March, 1905, the defendant, American Brake Shoe & Foundry Company, needed a superintendent competent to make manganese steel, in place of one about to leave their employ. That company has six foundries in various parts of the country, all of which are iron plants, except one at Chicago Heights, where steel as well as iron is made. The company had recently entered upon the making of manganese steel under a very able and competent superintendent, Mr. Potter, whose testimony shows him to be the most competent of all the expert witnesses called in the case in his knowledge of the art of making manganese steel. Under his direction, the company had overcome the preliminary difficulties of entering on a new line of business, and their manganese trade was growing and profitable. But, Mr.

Potter had resigned for personal and business reasons, namely, to live with his father in New York, and to aid him in business, and a successor was needed. Mr. Snow, an officer of the defendant company, called upon Nichols at High Bridge and offered him the positon, which, after conference with Brinton and other officers of the complainant, he took under consideration, and was on the point of accepting; but, at this stage, the sudden death of his sister, and a financial embarrassment connected with it, upset Nichols, who is an impulsive man, and he abruptly rejected the offer, and, at the same time, applied for a loan from Brinton which was offered him by the Taylor Co. (p. 439, l. 34; to p. 440, l. 20; p. 450); at the same time he was told that the company appreciated highly his refusal to leave their employ, and that his salary would be raised from $2500 to $3000 (p. 452, l. 35); the offer he had refused was $5000, and he had demanded $6000.

The next day, after returning from the home of his sister, he was in haste to leave the office of the company to go to her funeral, and wished to take money with him, but was kept waiting for the check to be loaned him until the last moment, at which time he was presented with the elaborate and complicated contract by which it is now claimed he is bound (p. 10). He was asked to sign this at once, and Mr. Brinton told him that it raised his wages for a term of five years; he signed it without time to examine it, and then received the check and hastened to have it cashed and to catch the train to go to the funeral (p. 454 to 456; p. 459, lines 35 to 40; p. 155). Some weeks later, when he read the contract, he complained to his superior officer, Mr. Brinton, that it was unfair, and was told by Brinton that he had refused to sign a like contract, after taking legal advice; that it was not a valid contract, and Nichols need not worry (p. 370;

p. 155). Soon after, in July, 1905, there came about a disturbance in the social and domestic life of Nichols and his family which made High Bridge intolerable to him as a place of residence; he was also angry with his employer because he had been followed by spies, who were set after him, as he supposed, by the company, although Brinton now says it was by him. Nichols thereupon resigned from the employment of the complainant, and applied to the defendant company for work. Before employing him they took him to Chicago Heights to look over the ground, but, before any bargain had been concluded, the preliminary injunction was served in this litigation. The bill is filed to enforce the contract of March, 1905, and to enjoin Nichols from disclosing or using any knowledge acquired by him at High Bridge, and from entering at all into the employ of the defendant company.

The defense is, *First*: That the complainant has no secret processes known to Nichols and entitled to protection by the court; *Second*: That the contract was unfairly procured from Nichols, and therefore not one to be specifically enforced in equity, and *Third*, that the contract is void because it is an excessive restraint of the right of Nichols to work and use his ability as a steel maker.

Comments on the opinion.

The opinion is remarkable for the number of findings of fact without evidence and against evidence.

First—The court says that Nichols was bound to keep the secrets which he learned outside of the scope of his written pledge, which ended in 1902 (p. 956, lines 30 to 40; p. 957, lines 1 to 6).

There is no evidence whatever of the existence of any such secrets, and the legal proposition that an obligation arose as to secrecy beyond the terms of the

written pledge upon that subject is unsound in point of law. In this state we hold firmly that the writing is the full measure of the obligation. *Naumberg* vs. *Young,* 44 N. J. L. 331, 339; *Van Syckel* vs. *Dalrymple,* 32, N. J. Eq. 233, affirmed on appeal. *Id.* 826. A part of the compensation of a workman is the knowledge which he acquires of the trade, and, in the absence of clear evidence, it is his right to use his skill and knowledge for his own profit.

Solomons v. *United States,* 137 U. S., 342.

Albright v. *Teas,* 10 Stew., 171.

Second—The court finds that the defendant company under the management of Potter, did not satisfy the trade with its product as well as the complainant did, and gives as a reason for this finding that the complainant furnished 95% of the product used (p. 957, l. 25); and further finds that the amount sold by defendant company did not show its ability to satisfy the trade (p. 957, l. 36). There is no competent proof that the complainant was selling 95%. The opinion of the only witness who testified to that effect was manifestly incompetent, and founded on no sufficient information (p. 296); and, if it were true, it would not show any inferiority of the product of the defendant company. The proof shows rapid and satisfactory growth in the sales of defendant up to sixty-five tons per month, which, at the price stated, amounts to much more than $100,000 per year (p. 599, l. 38; p. 607, l. 20). There were only two witnesses who had tried the steel of both companies, and these two pronounced the product as substantially the same in value (p. 533, l. 20; p. 534, l. 10; p. 613; p. 614, lines 1 to 10).

Third—The court says that the evidence does not settle what offer was made to Nichols by the defendant company in March, 1905 (p. 958, l. 27). If anything can be settled by testimony, this was settled by the

undisputed testimony of Snow, who made the offer, and Nichols who received it.

The inference drawn by the court from the fact that Nichols was offered more than the resigning superintendent, Potter, was receiving, are far beyond the legitimate inferences to be drawn in courts of justice, and assume the very thing which complainant has failed to prove, namely, its possession of secret processes, and a desire on the part of the defendant to learn those processes. A sufficient explanation of the price offered to Nichols is that it was important to the defendant company to hold its growing trade of manganese steel, and to offer enough to secure at once a man competent to take Potter's place, no matter what price they had to pay. In these days of rapid growth in steel making, expert founders are in demand at high prices.

Fourth—The court narrows the construction of the contract of July, 1905, far within its terms, in order to sustain it (p. 361, l. 25). But, as the cases hereinafter cited will show, courts do not so aid an employer who has made an unfair contract. It is not the policy of the law that an employer shall hold an excessive restraint over a workman, and then be helped out by modifying the terms of the contract. The policy is that employers must be fair in fixing the terms of such contracts and shall not abuse the position of an employer dealing with a servant.

Fifth—The court argues that because Nichols worked for several months under the contract, he is estopped from disputing its fairness (p. 963, l. 5). But there are no circumstances of estoppel here, and a court of equity will not specifically enforce an unfair contract, unless some clear equity has arisen to require it. What equity was there in favor of complainant in July stronger than in April? The only

material increase to be given to Nichols was conditioned on his remaining five years, and payable at the end.

Sixth—The court argues, to justify the novel rulings whereby evidence bearing on the existence of trade secrets was shut out (p. 965), and then proceeds to find that such secrets must have been possessed by complainant because two of its officers, Mr. Brinton and Prof. Howe, declared that in their opinion it was so (p. 968); but, neither of these witnesses was competent to give an opinion on the subject, because neither knew anything of the methods used by other makers of manganese steel. The court completely ignores here the testimony of Nichols and of others, that the processes used by defendant company were the same as those used by the complainant; but argues further that the complainant must have some secret knowledge, because they have the biggest trade (p. 970). Of course, even if the license under the patent did not explain the trade, such reasoning would still be preposterous. The finding of the existence of secret processes is not sustained by a scrap of competent evidence, and is disproved by the only competent evidence on the subject, namely, by the testimony of Nichols and others who have seen the processes of complainant in full use by the defendant company, and so know that those processes are not secret.

Seventh—The court finds that Leonard, who was employed by the defendant company, was a messenger between Nichols and the company, to teach them how to make steel. This is denied by Leonard, and by Nichols, and also by Potter, who had charge of the manufacture, and is supported by not one scrap of testimony. The indulgence of such suspicions by the court, without evidence, indicates a glaring pre-judgment which prevented a fair consideration of the tes-

timony. The attempt to discredit Leonard, who is an honest mechanic, although somewhat dull, is amazing, and there is nothing to warrant it. One reading Leonard's testimony fairly will be surprised at the statement that "as a witness he was a lamentable failure." The hostility of the court to this witness seemed on the trial to arise solely out of the fact that he could not remember a detective called France by that name, although, after a time, he recalled the man (p. 769, ll. 23 to 40; p. 771, ll. 2 to 8; p. 773, ll. 10 to 13; p. 788, ll. 32 to 40; p. 789, ll. 24 to 40; p. 794, ll. 1 to 4; p. 794, ll. 35 to 40; p. 795, ll. 13 to 20). Leonard was employed for about two months by the defendant company in Chicago, partly, no doubt, to be able to have him at hand as a witness in March when it was supposed the case would be tried, and also to get the benefit of his skill in handling manganese steel. He went from Newark to Chicago, and remained there about two months, and, while there, made scores of saloon acquaintances. It was not strange that he should not remember the name of a bar-room companion, whose surname may never have been repeated twice in his presence. It appears that the complainant employed a detective agency, who sent a man named France to watch Leonard and Nichols. He met Nichols but once in a saloon with Leonard, and the detective was there drunk, and betrayed himself to Nichols (p. 829, l. 30), who told him that he suspected him to be a detective. France says that he only pretended to be drunk, but admits that he got into a difficulty and was struck by a policeman (case, p. 823). This detective says that he met Leonard many times in the saloon, with others.

Leonard's testimony is entitled to full credit, and certainly no court can afford to find facts supported by no evidence at all against the sworn evidence of several witnesses; and, yet, that is precisely what the

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Vice-Chancellor does when he finds that Nichols gave instructions to the defendant company.

There was not the slightest impropriety on the part of the defendant company in hiring Leonard, nor in Leonard keeping up relations with his old friend Nichols who was waiting in Chicago in enforced idleness for the trial of this cause.

That the defendant company should loan Nichols money enough to live upon was natural and commendable, and the adverse criticism of it by the court is further evidence of a singular bias.

I.

IN MARCH, 1905, NICHOLS WAS FREE TO CHANGE EMPLOYMENT.

When the pledge made in 1896 (p. 35), ran out in 1902, it was not renewed. Nichols was employed at will, and was at full liberty to use all that he knew of the business and its processes in any other foundry.

In the absence of a contract, the servant owns all his knowledge and discoveries made while in his master's service.

Solomons vs. *U. S.*, 137 U. S. 342.

Albright vs. *Treas.*, 10 Stew., 171.

This state of affairs continued until March 1905. In that month, Nichols was offered Five Thousand Dollars per year to become superintendent of one of the foundries owned by the American Brake Shoe & Foundry Company. He was free to accept that offer, and to use all his skill and knowledge, and on this point there is no dispute. He made known the offer to the superintendent and other officers of complainant, and evidently no one then thought that he was not at full liberty to accept it. The complainants told him that they would not stand in his light and that

they would not meet the offer, and he took it under consideration (p. 365, ll. 30 to 366, l. 20).

As Nichols had a perfect right to receive and accept the offer, so the Brake Shoe Company had a perfect right to make it. To deny their right to make it, would be to deny his right to change his employment. It would be absurd to say that he could change at will, but no one could offer him employment.

It is lawful to offer employment to one who is free to accept it; it would be a disgrace to our civilization if it were otherwise.

Campbell vs. *Cooper,* 34 N. H., 49.

Sykes vs. *Dixon,* 9 Ad. & El., 693.

Harsh criticism has been made of Mr. Snow, the agent of the Brake Shoe Company, because he had been admitted to one of the departments of the complainant, by courtesy, at the time when he first obtained an interview with Nichols. This a criticism on manners rather than on legal rights, and I do not know that lawyers or judges are called upon to decide questions of manners, or that they have any special qualifications to decide them. The fact that Snow was in the finishing room when he asked to see Nichols is of no significance. He could have seen him at his house, or have asked for him at the entrance to the foundry. Men do not cut themselves off from communication by taking employment in a foundry. Even a domestic servant cannot be excluded from access of persons desiring to employ him. It is absurd to say that a foreman of a foundry cannot be called out and spoken to on any subject.

If it were shown that Snow could not have met Nichols except by the permission of the General Manager, it might be said that he had taken a discourteous advantage of the permission; but, as no difficulty ex-

isted in his meeting Nichols, without permission to enter the finishing room, the fact that he had such permission is of no importance.

Since the agents and counsel of complainant see fit to indulge in harsh language on this subject, I will retort with my own decided conviction that one of the most contemptible things in business is the disposition, such as this complainant has so clearly shown, to stand in the way of employees and block their opportunities of bettering their condition. It is not the rule of American employers to do this; but, on the contrary, most employers are liberal minded and promote the interests of their workmen, and aid them to get on in the world. The notion that a master has a property right in his servant and can control even his conversation with strangers, or his opportunities for other employment, is a relic of the days when servants were slaves.

If I should go to the tenant at will of another and invite him to move into my house and pay me rent, no court would question my legal right to do so. An employer's right to retain the body of his servant is no more sacred than a landlord's right to the body of his tenant. Nothing is more important in our American life than the opportunity which we give to men to advance, and I profoundly despise the spirit which would deny to any employee the full and lawful measure of his opportunities.

Snow and Nichols had the full legal right to meet in the foundry. If they had then and there closed the contract, it would have been a legal contract. Such a contract made at the foundry would have been as valid as if made at the house of Nichols, and to present this negotiation as a ground of legal action is preposterous. It was a proper and lawful negotiation on both sides, and it ended in the refusal of Nichols to

change his employment at that time. There is nothing in it which bears in the slightest degree upon the rights of the parties in the present litigation.

II.

THE COMPLAINANTS HAVE FAILED TO PROVE THAT THEY HAVE ANY VALUABLE SECRET PROCESSES.

Until the patent ran out in 1902, no one except the Taylor Company could make maganese steel in this country by any method, because the product itself was patented as well as the process. As soon as that patent ran out, it was proper for others to undertake the manufacture, and it was inevitable that they should do so. There is no public policy to maintain the monopoly of the Taylor Company; the public policy is all the other way.

The Taylor Company, however, seek to maintain an advantage in the trade by setting up the claim to manufacture a superior product by means of secret processes outside of those described in the patent. Perhaps they really believed that some of their methods were secret, but they do not know whether they were or not, because, according to the testimony, they made no efforts to find out what methods were used by their competitors. They make bold assertions that they alone know how to make manganese steel, no doubt, for purposes of advertising. Such claims are common, but are recognized in all trades as advertising devices, and no one has more decidedly ridiculed such claims in the steel trade than the principal expert witness of complainant, Prof. Howe in his work on Metallurgy.

The courts ought not to be credulous as to such claims, and they do not regard with favor attempts to prolong the advantages of a patent.

The patent law is a contract between the state and the inventor, whereby the state gives the inventor the exclusive use of his invention, in consideration that he will fully disclose it, so that at the end of his term the whole community may have the benefit of it. The inventor must give sufficient description of it to enable one skilled in the art to successfully make the product or work the process.

Lawthen v. *Hamilton,* 124 U. S. 1.

It is therefore suspicious when the patentee pretends to have cheated the public and to have withheld information essential to success.

In *Kendall* v. *Windsor,* 21 How. 322, Daniel, *J.,* said:

"The inventor who designedly withholds his invention from the public comes not within the policy of the Act of Congress; with very bad grace could he appeal for favor to that society which if he had not injured he certainly had not intended to benefit."

Prof. Langley of Michigan University, a metallurgist of the highest rank, declares that the successful making of manganese steel under Hadfield's patents does not involve any secret processes, and that the few changes from the methods used in ordidnary steel making are obvious and well known. (pp. 616 to 622).

The evidence of complainant utterly fails to show that they have any valuable trade secrets. At best, it shows that they claim that they have, and that they do not know whether they have or not. On the other hand, defendants have shown that the complainants have no secrets, unless in their mixtures, as to which there is no dispute that Nichols had no knowledge. (379, l. 25 to p. 380, l. 18; p. 392, l. 34; p. 394, l. 19; p. 395; p. 405, l. 20.)

The defendants have shown in detail how manganese steel is successfully made by them under the expired patent. Eye witnesses to all the processes practised in the Taylor foundry, including Nichols, have proved these methods to be the same as those practised, most of them in Bessemer foundries, and the few additional details used for manganese steel in the foundry of the Brake Shoe Company. (p. 392; 394 to 399; 757, 760 to 762.)

After defendants proved in detail their processes at Chicago Heights, the complainant did not prove or even allege that they had any process not known to the defendant company.

Their only witnesses on this branch of the case are their superintendent, Brinton, their expert, Dr. Howe. Brinton does not claim to know anything about the practices in other foundries. Dr. Howe is a stockholder and officer of the complainant. On his direct examination he made some pretence of knowledge of the business of steel casting in general and of the practice of the complainant, and undertook to enumerate generally each process of the manufacture as something secret. But on cross-examination this proof of secrecy is shown to be utterly worthless because this witness has no knowledge of the practice in other manganese steel works than his own, and practically none of his own, for during the nine years while Nichols was in charge of the actual work of casting, he met him only once. (p. 241, l. 16; p. 405, l. 25.) His testimony about secrecy practiced in the work during Nichols' time cannot possibly be founded on knowledge or observation.

For Dr. Howe's avowal of absolute ignorance of the methods of making manganese steel by the Bessemer method except at High Bridge, (See case p. 320,

ll. 30 to 40; p. 321, ll. 1 to 7; p. 322, ll. 1 to 30.) In this connection, we may refer to a characteristic bit of acting by counsel for complainant:

Nichols had testified that he found in use at Chicago Heights the same methods that he had known at High Bridge. Counsel asked Mr. Nichols:—

> "Q You did not know that those things that were taught to you there, though unknown to you before, were actually known to others at the same time, do you?
>
> A. No, I am not in a position to say that others ~~know~~ knew those very same things that may exist there." (P. 474.)

Thereupon, counsel triumphantly declared that the whole defense was gone. On reading the question and answer together it is plain that what Mr. Nichols says is, that he did not *then* know that others ~~know~~ knew of the process; that is to say, he did not, when at High Bridge, know it.

This in nowise modifies his testimony that he now knows, from what he saw at Chicago Heights, that others did use the same process.

Complainants ask the court to enjoin not the disclosure of valuable secrets, for they have failed to show that they have any, but to prevent Nichols from practising the known methods, on the sole ground that he has agreed not to do so.

We submit that in order to obtain the aid of this court something more than an agreement of secrecy is essential.

The ground of the jurisdiction to prevent the disclosure of a trade secret is irreparable injury.

In 5 *Pom. Eq.*, sec. 268, the law is stated as follows:

> "The protection of an injunction is, of course,
> "extended only to that which is really the plain-
> "tiff's secret, and not to knowledge or informa-
> "tion which is accessible to all the world."

Cites *Reuter Co.* vs. *Byron,* 43 L. J. Chan. 661, opinion of Jessel, *M. R.,* and *Williams* vs. *Williams,* 3 Mer. 157, where Lord Eldon dissolved an injunction to restrain the disclosure of a medical compound because defendant's affidavit set up that it was no secret at all.

There can be no irreparable injury from the prac-

In *U. S.* vs. *Addyston Pipe & Steel Co.,* 85 F. R., 281, Taft, *J.,* said, that to enforce a covenant by a servant not to compete with his master, it must be shown that the restraint was reasonably necessary "to "protection from danger of loss to the employer's busi- "ness caused by unjust use on the part of the employee "of confidential knowledge acquired in such business."

under the Hadfield patent are adequate is shown by the fact that such steel of high quality has been successfully made in large quantities by the Brake Shoe Company for several years, and they have built up a growing and satisfactory trade of sixty-five tons per month, being much more than $100,000.00 per year (p. 599, l. 38; p. 607, l. 20). The elaborate tests made indicate that their product is superior to that of such samples of the Taylor steel as they could buy. It is not, however, material to know which makes the best steel on the average. The fact is that the Brake Shoe Company do make steel above the average of Hadfield's own standard (p. 635, ll. 1 to 15), and that the only customers called who had used both the Taylor steel and that of the Brake Shoe Company find them substantially the same in value (p. 533, l. 20, to p. 534, l. 10; p. 613; p. 614, ll. 1 to 10).

Dr. Howe criticises the tensile tests, but they bring out the characteristics of manganese steel, and the crushing tests which he does not question evinces the superiority of the Brake Shoe steel (p. 831, ll. 18 to 30).

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There can be no irreparable injury from the practice by Nichols of his art in the manner described in the Hadfield patents, and practiced by other makers. If there is injury to complainants in depriving them of the advertising pretense that they control secret processes which are essential to a good product, that is not such a grievance as the court will redress. It will not aid the complainant to maintain a sham.

That the known methods of making manganese steel under the Hadfield patent are adequate is shown by the fact that such steel of high quality has been successfully made in large quantities by the Brake Shoe Company for several years, and they have built up a growing and satisfactory trade of sixty-five tons per month, being much more than $100,000.00 per year (p. 599, l. 38; p. 607, l. 20). The elaborate tests made indicate that their product is superior to that of such samples of the Taylor steel as they could buy. It is not, however, material to know which makes the best steel on the average. The fact is that the Brake Shoe Company do make steel above the average of Hadfield's own standard (p. 635, ll. 1 to 15), and that the only customers called who had used both the Taylor steel and that of the Brake Shoe Company find them substantially the same in value (p. 533, l. 20, to p. 534, l. 10; p. 613; p. 614, ll. 1 to 10).

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The differences which arise between samples are evidently largely due to the selection of materials. As stated by Mr. Brinton, good materials make the best steel, but, of course, they cost more.

An examination of the patents in evidence shows how little room is left for secret processes. Hadfield says in his first patent, No. 303150 (p. 906, l. 8), "I need not describe the processes of preparing iron and steel for receiving the addition of manganese, as such processes are well known."

He also says that he prefers to use rich ferro manganese, containing about 80% of manganese, which "is first carefully melted in a reverberating or other suitable furnace before adding it to the molten steel" (p. 905, l. 32, to p. 906, l. 8). This is either poured into the steel, or the steel is poured into it (p. 906, ll. 15 to 20). This completes the process of manufacture, after which the steel may be poured into moulds.

The complainants seek to make a mystery out of the process of melting iron and blowing it in a converter, and out of the process of melting in a crucible furnace, and out of the order in which the iron and so-called physic are put into the ladle.

All these matters are referred to in the patent, and certainly are not secrets.

Patent 585161 describes the process of weighing the steel and manganese separately after they have been melted and pouring them together in the ladle in known proportions, with a view to give greater certainty and uniformity to the product (p. 910).

This also is shown to be the practice at High Bridge and at Chicago Heights.

Patent 572,891 refers to a method already well known of toughening or softening manganese steel by heating and plunging it into cold water, and notes the liability to crack internally, and describes the rem-

edy, slow heating at first, increasing very rapidly from 1200° to 1700° F., and then quenching. He refers to castings of from 2 to 4 inches as thick castings (p. 911).

This also is shown to be complainant's practice, except that higher temperatures are now sometimes used in the art, as stated by Potter, to wit, 1900° F., and this accords with a later Hadfield patent, No. 731,450, which gives degrees as averaging from 940° to 1125° C., and then quenching (p. 913). These degrees C are equal to 1724° to 2057° F.

There remains now nothing further than the very simple device of taking the castings from the mould to the furnace while hot, to avoid cracks in cooling. This is fully described in the Brinton patent No. 812,-811. In this patent Brinton says that the high temperature to which castings should be raised before quenching is "now well known in the art" (p. 914; p. 915).

This covers the whole process except the moulding. The two moulders who have been employed at High Bridge and elsewhere, say that the practice there is that usual in moulding iron and steel, and no one disputes them or suggests any variance, except Dr. Howe, who is shown to have no personal knowledge of the practice during the time that Nichols was at High Bridge, and avows his ignorance of the methods of making manganese steel in other foundries, and does not describe any peculiar methods at High Bridge (p. 757, ll. 18 to 40; p. 758, ll. 1 to 8; p. 797, ll. 30 to 40; p. 798, ll. 1 to 10).

The claim that there are any peculiar or secret processes in use by complainant and known to Nichols, utterly fails.

We submit that this failure leaves complainant without any proof of irreparable injury, and with no claim to the aid of the Court of Chancery.

In addition to 5 *Pom. Eq., sec.* 268, *see also Stone* vs. *Grasselli Chemical Co.,* 20 Dick., 756, 760, where after an express contract for secrecy was proved, the court made the right to an injunction depend on proof by complainant that there was a specific secret process and not mere skill in manipulation; and to show this the details were fully disclosed. In nearly all of the cases where the disclosure of trade secrets has been enjoined, the existence of the secret has been admitted, and the contest has arisen merely over the right of the defendant to use it.

III.

THE COURT IMPROPERLY EXCLUDED EVIDENCE OF THE PROCESSES IN USE BY THE COMPLAINANT.

The bill alleges that complainant makes manganese steel under secret processes used only in this country by the complainant (p. 1, l. 35), and that the manganese steel can be made only by the aid of persons taught its processes by complainant (p. 17, l. 20).

The answer denies this, and denies that the processes of complainant are secret (p. 27). The issue was thus distinctly framed, and, as above shown, it was essential to complainant to show that it had such secret processes of value requiring protection.

The court permitted the witnesses for complainant to describe their processes in part, and to declare that some methods not fully described were secret and valuable, and refused to permit the defendants on cross-examination to bring out the details as to any processes, and also refused to permit the defendant to show what the processes were and thus to show

that they were well known and in use by other steel makers. On this lack of proof, the court nevertheless found that the complainant did have valuable secret processes, basing this finding on the mere opinion of two witnesses, Mr. Brinton, and Dr. Howe (p. 968, l. 11), who could not know whether their processes were used by other makers. After they were called, the methods used by the defendant company were disclosed in the fullest detail, and it was shown that by these methods the defendant made manganese steel of high quality.

Prof. Langley, who is high authority after thorough comparative tests declared the steel of the defendant better than the Hadfield standards, and better than the samples which he obtained of the complainant's steel (p. 635, l. 1 to 15; p. 630; p. 631).

Nichols declared that the defendant company used under Potter's direction all the processes used at High Bridge, and that he had learned at High Bridge no processes not used by the defendant company at Chicago Heights in making of manganese steel (p. 392, p. 394 to p. 399). Neither Brinton nor Dr. Howe ventured to dispute this, or to testify, after the methods used by the defendant company were disclosed, that there were any methods in use at High Bridge and known to Nichols which had not been described by Potter and successfully used by him in the making of manganese steel.

The only ground other than the opinion of Brinton and Dr. Howe stated by the court in support of the finding was that the complainant has practically a monopoly, and, therefore, must have secrets (p. 979, l. 20). But surely the case must be desperate when the existence of trade secrets, and their knowledge by Nichols, is inferred on such a preposterous ground.

That a monopoly did exist until 1902 is true, because manganese steel was a patented product. Since that date, substantial competition has sprung up, and the notion of the court that the complainant has still a substantial monopoly is founded on the mere opinion of its selling agent, improperly admitted and based on no competent knowledge of the production by other makers (p. 296).

The court seems to think there is something immoral on the part of the defendant company in attempting to make manganese steel at all.

A statement of the proof admitted and of that rejected will show how gross was the error of the court in permitting the counsel for complainant to determine what disclosures should be made either by his witnesses or by Nichols.

The superintendent of complainant, Mr. Brinton, described the mode of making manganese steel. He said that the pig iron and other materials were selected by chemical analysis, and melted in the cupola, and then turned into the converter, where air is blown through it on the familiar Bessemer process. What is called "physic" is separately prepared. The blown metal and the "physic" are mixed in a ladle and the mixture poured from the ladle into the moulds. In the moulds it becomes a steel casting, and is taken to the tempering furnace, and, when heated, is thrown into water, and then turned over for trimming (pp. 196, 197).

Brinton says that all of this process is a secret (p. 108, l. 1 to 10), but what he means is that the complainant professed to do it secretly, for it is the ordinary Bessemer process, except that a high instead of a low percentage of manganese is put in, pursuant to the Hadfield patent. The process is very fully

described in the patent, where it is declared to be well known (p. 906).

In answer to the court, Brinton says that the secret processes are first used "in the unique method of controlling the heat changes during the processes of conversion" (p. 117, ll. 30 to 40). He first says that these heats are not described in the patents (p. 117, l. 40), but corrects this right after by saying that he is not familiar enough with the patents to say, but that the secret is in knowing what temperature to use as between 100° and 1200° named in the patent (p. 118, ll. 1 to 5). He must mean his own patent (p. 915).

On cross examination, Brinton described the same thing as being the Bessemer process practised by himself and Nichols together at Chester, in 1895 (p. 120). He was asked in what respects, if any, he changed the process at Chester, and names combination of materials, the unique method of controlling temperatures, and preparing special physics for special steel (p. 123, l. 15). The first and last of these were controlled by the chemist and not known to Nichols.

He says that the question of temperature first arises in the converter, and that this is also one of the problems in the ordinary Bessemer process (p. 126, l. 23). He then said that the physic and the steel go into the ladle, but not in the same manner as that practised by him at Chester.

He said that he knew of only one method of increasing the heat in the converter at Chester, and that was charging the iron with silicon, and that he reduced heat by putting in pig iron and steel, and that this was the method also used at the Taylor Works (p. 145, l. 36; p. 146, ll. 6 to 20).

The percentage of manganese in the steel is 12, and of carbon 1¼. They are put into the steel in the ladle in the form of ferro-manganese, containing 80% manganese, and 3½ to 4% carbon (p. 148; p. 149, l. 1).

The witness was then asked whether the manganese or the steel was first put into the ladle, and was permitted to refuse to answer this question because it was entering into the methods which might be secret (p. 149, ll. 2 to 20). In his patent, Hadfield says that either may be put in first (p. 906, l. 16). The steel is then poured from the ladle into the moulds. The casting is taken sometimes while still hot to the furnace; if allowed to cool in the mould, there is some risk of cracking (p. 151, l. 16).

Mr. Brinton was then asked whether the casting was taken out of the mould as soon as it could be handled, and, on a declaration by counsel that the degree of heat was a secret, the court refused to require the question to be answered (p. 151, l. 30). The witness, however, said that he did not call it a secret, and that he had patented the method of removing the casting as soon as possible from the mould, in order to prevent cracking (p. 152, ll. 1 to 11). The casting is then heated to a bright red color (p. 152, l. 21), and is plunged into a cold bath (p. 152, ll. 36 to 40). Then the witness said that he had told practically the whole process, except simply "care and skill in operating the different processes" (p. 153, ll. 16 to 22).

It is well settled that mere care and skill do not amount to a trade secret.

The whole testimony of Brinton amounts to an abandonment of the claim of any secret, unless in the combination of materials by the chemist, which was never made known to Nichols. On a later cross-examination about the tempering treatment, Brinton admits that the heating is carried to about 1800°, as

called for in Hadfield's patent and says the complainant does that and more, and the "more" refers to special care of some castings, and, so far as he can determine, it is a secret, whereupon the court ruled that he need not disclose it (p. 171; p. 172, ll. 1 to 20).

Next he says that the rate of heating is a secret (p. 174, ll. 1 to 5); but Hadfield shows, and it is well known, that the first heating should progress slowly, to avoid cracking; but the later heating should advance more rapidly (p. 912, ll. 20 to 35).

Next Brinton says that the use of wash metal to put into the converter to reduce excessive heat was not known to him except at High Bridge. The court refused to require him to answer whether it was used at High Bridge (p. 175, l. 20).

We believe that the use of wash metal to reduce high heats in the converter is the supposed secret as to temperature of the converter. But, it is no secret, because Potter showed that he found such material useful and used it at Chicago Heights as a result of his own experiments (p. 550, ll. 30 to 40). It is better than the scrap steel and pig iron often used, because it is purer, having been so treated as to eliminate phosphorus and sulphur.

Dr. Howe is an officer of the complainant. He had practically no knowledge of the work going on in the foundry while Nichols was at High Bridge, and does not know what methods other makers of manganese steel are using. He made broad and vague claims of mysterious processes in every stage of the making.

On cross examination, he was asked whether the physic was melted in a retort, and the court ruled that he need not answer the question (p. 262, l. 16; p. 267, ll. 1 to 10). Thereupon, he was compelled to admit that the melting of the physic for a mixture was no

trade secret, and that the Taylor Company practised it (p. 268, ll. 1 to 6). Hadfield describes it in his patent (p. 906, l. 3).

Next Dr. Howe says that he knows of no practice of adding ferro-silicon to the contents in the converter, in order to induce heat, except at High Bridge; but, the inquiry whether he knew of such a practice at High Bridge was excluded (p. 274, 275).

Such practice exists elsewhere, and, therefore, cannot be secret.

Now we take up the defence:

It was, of course, the plan of defendant to ascertain on cross-examination what processes were claimed to be secret, and then show that they were not secret, but were in common use.

The complainant having been protected from full disclosure on cross-examination by the ruling of the court, we undertook to prove by Nichols, first, what was the practice at High Bridge, and next that it embraced no trade secrets, because the same practice, so far as made known to Nichols, was well known and used by others; but, the court refused to permit Nichols disclosing anything which he had first learned at High Bridge, whether a trade secret or not, because he had signed a contract in March, 1905, not to disclose anything, whether secret or not, he had learned there.

Defendant argued in vain that no legal ground for such exclusion existed, even if we admitted the validity of the contract, and that as we denied the validity, the court could not prejudge that issue in order to make a ground of exclusion.

We then resorted to this expedient: Nichols had stood by and watched for several days in August, 1905, the process of making manganese steel at

Chicago Heights, under the direction of Mr. Potter; he described the process used there, and Potter did the same. Nichols testified that the methods used there were in all material details the same as those used by the Taylor Company, (pp. 396 to 399). Leonard, who had worked at both foundries said the same, and proved a similar practice at the works of Atha, in Newark, (pp. 760, 761). Having thus shown that there were no secret processes known to Nichols at High Bridge, and that the processes which he knew there were known to others, we renewed our attempt to prove in detail the processes, and the offer was excluded. A curious and illogical distinction was drawn by the court between the processes learned by Nichols before he went to High Bridge and those learned by him after he left High Bridge. He might tell what was done at High Bridge, provided he had ever seen it practiced elsewhere before 1896, but he must not tell it if he had seen it practiced elsewhere in or after 1905.

The contract forbade him to disclose anything that was practiced at High Bridge, whether he had seen it practiced elsewhere or not, either before or after his term there (p. 11, ll. 1 to 9). The court tried to turn the contract into something very different from its terms.

The difficulty of presenting a defense under such novel and whimsical rulings may be seen from the record (p. 383, l. 36; p. 384, ll. 29 to 35; p. 392, ll. 1 to 40; p. 395, ll. 1 to 40; p. 398, l. 35 to p. 399, l. 5; p. 401, ll. 22 to 37).

We submit that the exclusion of evidence on the grounds stated was contrary both to authority and sound principle. It was based on the assumption that complainant had valuable secret processes known to Nichols which was the very issue. Evidence relevant to the issue must be admit-

ted, and the grounds of privilege are few and well known, and among them it has never been considered that the promise of a party not to tell could relieve him from the duty and privilege to tell what was relevant to the issue in a court of justice.

A doctor is not permitted to conceal what his patient tells him, and a promise to conceal for a consideration would not change the rule.; There is no public policy in the protection of trade secrets requiring a change in the rules of evidence.

A party coming into court to protect a trade secret risks its disclosure, where its existence as a secret is put at issue, except so far as the court can aid him by taking the testimony in secret.

In the Eastman case, 20 N. Y. Supp., 110, the existence of the secrets was not denied, nor was the knowledge of them by defendants.

The subject of privilege as to secrets is discussed in *Wigmore on Evidence,* sections 2192 and 2212. Cases are cited where the court has protected a secret from disclosure before it was apparent that such disclosure would be necessary for the proper trial of the case. Nearly every case cited is one of interrogatories before trial, with regard to which the Court of Chancery has a wide discretion.

In *Renard* vs. *Levenstein,* 10 Law Times Rep. (N. S.) p. 94, the defendant was required to answer as to his secret processes, the court undertaking to protect his secret from improper disclosure.

ant.

The case of *Badische &c. Co.* vs. *Levinstein,* 24 Chanc. Div., 156, is instructive. That suit was for the infringement of a patent, and the defendant answered that he was acting under a secret process, and the court ruled that defendant need not disclose his process until the validity of the patent should be

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If the processes of complainant are in common use, then they are not secret, and are not entitled to protection. There must be irreparable injury to warrant the intervention of equity in these cases. There is no way to ascertain whether they are in common use, unless they are stated.

The cases cited in the opinion by no means warrant the rulings against competent evidence.

In the case of *Moxie Nerve Food Co.* vs. *Beach*, 35 Fed., 466, the disclosure was denied because not cross-examination.

In *Stokes* vs. *Heller*, 56 Fed., 297, which was a patent suit, the court merely refused to order an inspection of the defendant's factory by the complainant.

The case of *Badische &c. Co.* vs. *Levinstein*, 24 Chanc. Div., 156, is instructive. That suit was for the infringement of a patent, and the defendant answered that he was acting under a secret process, and the court ruled that defendant need not disclose his process until the validity of the patent should be

firstly determined, because if the patent should be held invalid, it was not material that the process should be disclosed. The patent was held valid, and the court then gave to the defendant his option whether to defend or not by disclosing his secret process. It was quite evident that unless he did disclose, the decree would run against him, and he elected to disclose it *in camera*. The court then found that the defendant's processes deserved great praise, but were embraced within the patent, and enjoined their use.

In *Mellor* vs. *Thompson*, 31 Chanc. Div., 55, a client sought to enjoin his solicitor from disclosing a privileged communication. The court ordered the case heard *in camera*. It did not occur to that court that it could enjoin the communication as privileged without knowing what it was.

IV.

THE CONTRACT OF COMPLAINANT WITH NICHOLS IS INVALID BECAUSE IN RESTRAINT OF TRADE.

This contract contains a provision that Nichols "shall not at any time during the term of this agreement, *or afterwards*, divulge to any person any information of any nature now known to him relating to or regarding any process of steel making, or moulding or treating steel, that may have been, is now, or may be hereafter, during the term of this agreement, *used in* the works of the Taylor Iron and Steel Company, and that he will *at all times* hold inviolate the treatments, processes and secrets known to or used by him in the works of the Taylor Iron and Steel Company."

This is in striking contrast with the terms of the Hadfield pledge made by Nichols in 1896 (case, p. 8).

It will be seen that this contract purports to restrain Nichols from carrying on his trade for his whole

lifetime. His only profession is that of a steel founder, and it was that trade which he had learned before he went to High Bridge, and which he carried on while there. The restraint is not merely against disclosing secrets or even what he learned at High Bridge, but against disclosing processes which he learned anywhere, whether secret or not, if it had been or ever should be used at High Bridge to his knowledge. Under this, he could never after the end of his five years' term, charge a cupola, or blow steel in a Bessemer converter, or mould a casting, or use any of the ordinary and well-known methods, merely because they had been used at High Bridge. At the end of five years he would be at the mercy of complainant, for no one else could employ him in his trade. He could not use any of these methods without divulging them, and it would be no defense to a charge of breach of the contract to show that he had withheld information that the method had been used at High Bridge. If he uses a method once used at High Bridge, he thereby divulges it though he conceals the fact that it was used there.

It is clear beyond all controversy that such a contract is not only an excessive but a general restraint, and therefore invalid. It is invalid because unlimited in point of time; invalid because not limited as to the territory where the restriction shall apply, and invalid because excessively limited as to the kind of work which he may be prevented from doing.

The general doctrine is stated by Bradley, *J.*, in *Oregon Steam Nav. Co.*, 20 Wall, 64, as follows:

> "There are two principal grounds on which the doctrine is founded that a contract in restraint of trade is void as against public policy. One is, the injury to the public by being deprived of the restricted party's industry. The other is the in-

jury to the party himself by being precluded from pursuing his occupation, and thus being prevented from supporting himself and his family. It is evident that both these evils occur when the contract is general; not to pursue one's trade at all, or not to pursue it in the entire realm or country; the country suffers the loss in both cases; and the party is deprived of his occupation, or is obliged to expatriate himself in order to follow it. A contract that is open to such grave objection is clearly against public policy."

Judge Bradley goes on to point out that where a business is sold, it is competent to provide that the seller shall not establish competition within a reasonable distance.

In *Alger* vs. *Thacher,* 19 Pick., 51, an iron founder sold his business and agreed never to be concerned in the business of founding iron. This was held void, because unrestricted in time or place. Morton, *J.,* said that such contracts diminish the means of procuring a livelihood, and expose the person contracting to imposition and oppression; that it deprived the public of the services of men in the capacities in which they might be most useful; that it discouraged industry and enterprise; diminished the products of skill; prevented competition; enhanced prices, and exposed the public to all the evils of monopoly. "And this especially is applicable to wealthy companies who have the means, unless restrained by law, to exclude rivalry, monopolize business, and engross the market."

These principles are fully accepted elsewhere.

In *Ward* vs. *Byrne,* 5 M. & W., 548, the covenant sued on was not to be employed in the business of a coal merchant for nine months. This was held void, because unlimited in point of territory.

This case was discussed in *Nordenfeldt* vs. *Maxim etc. Co.,* 1894, App. Cas. 568, where Lord McNaughten said of *Ward* vs. *Byrne*:

> "In that case an unlimited restraint was imposed on a coal merchant's clerk; when once he left his master's employment, he was not, for nine months, to earn his daily bread anywhere, as a coal merchant or a coal merchant's clerk, or in any capacity connected with the business of a coal merchant,—an absurd and unreasonable stipulation if ever there was one."

In the Nordenfeldt case, a restraint as to specific goods for a limited term of years was sustained in part, but that was a case where the restraint accompanied a sale of the business and good will, and that fact was one of the grounds of the decision. The court distinguished a case where the contract related to services only. It was also a case where the only customers were foreign governments, and a general restraint was necessary to protect the established trade with them.

In the same case there was a general covenant of restraint which was held void.

In New Jersey it has been long settled that a restraint unlimited in territory is void, even though limited in time.

See *Brewer* vs. *Marshall*, 4 C. E. Gr. 439, 547, and cases cited.

Trenton Potteries Co. vs. *Oliphant*, 13 Dick., 514.

In the last cited case in chancery, 11 Dick., 680, 715, Grey, *V. C.*, quotes from *Brewer* vs. *Marshall*, and says:

> "It will be noticed that this opinion recognized "the force of the old rule to make void any cove- "nant or restraint excluding from a business with- "out limit of space."

There was a partial reversal of this Trenton case, whereby the limitation which governed many states was enforced as to the territory of New Jersey alone, but denied outside, which was on the ground that the

covenant was several as to each state, but the doctrine that a restraint unlimited in space was void, was not shaken.

In addition to the fatal defect that the limitation here is unlimited in space and time, there is the further defect that it is not limited as to the subject matter of the employment. It places it within the power of the employer to cut off the employee from any employment because the employer can set Nichols at any work he chooses, and the mere fact that he has done any work in the foundry of complainant forbids him ever to divulge it elsewhere.

Where the restraint is limited, the inquiry arises whether it is broader than is necessary for the fair protection of the party seeking the restriction. It must also not be so large as to interfere with the public necessity that workmen shall use their skill: and, if excessive, it is oppressive and void.

24 *Ency.* 850, 851, *and cases cited in Note* 1.

In *Albright* vs. *Teas,* 10 Stew., 171, 173, Van Fleet, *V. C.,* said that on the theory of complainant "the de-"fendant has restrained himself generally and abso-"lutely, without limitation as to time or place, from "exercising his talents and skill in making gig saddles "and coach pads. According to the uniform course of "decision, such a contract is void."

In *Mandeville* vs. *Harman,* 15 Stew., 185, a physician in Newark who sold his practice, agreed "not to engage in practice in Newark at any time thereafter." He resumed practice, and Van Fleet, *V. C.,* refused to enjoin him, saying:

> "Whatever restraint is larger than the neces-"sary protection of the party can be of no benefit "to either. It can only be oppressive."

He distinguished the case of the sale of a business where the restraint might continue in a limited terri-

tory while the business was carried on there, but treated such a contract as to personal services with great disfavor. He said on p. 194:

> "It is one of the rights of every citizen of this "state to use his skill and labor not only to get "food, raiment and shelter, but to acquire prop- "erty, and I think it may be regarded as very "certain that the courts will never deprive any "one of this right, or ever abridge it, except in "obedience to the sternest demands of justice." * * * * * "No one can fail to see that if "this covenant is valid and enforcible in equity, "then it is competent for every merchant and "trader when he employs a clerk or shop-girl to "require them, although the compensation he "agrees to pay is no greater than which is cus- "tomarily paid for such service, to enter into a "covenant that on quitting his service they will "not, at any time afterwards, accept like employ- "ment for any other merchant or trader in the "same town or city, and that if such covenants are "made and broken it will be the duty of this "court to enforce them, though the consequence "may be that a citizen will thereby be deprived "of his only means of supporting himself and his "family."

This case was approved in Trenton Potteries case, where the contract sustained in part did not relate to personal service alone, but accompanied the sale of a business.

Applying these principles to the present case, we find that the services to be rendered by Nichols are undefined. He is to do the duties "to be assigned him by the management." The duties he had done were those of steel founder, and the contract disables him for life from continuing that business. The duties he may perform, are any that he may be assigned to do. The contract further disables him for life from doing

anything he may learn under the new assignment, however needless the restraint.

It is apparent that all these restraints cannot possibly be necessary for the protection of any legitimate interest of complainant.

What was necessary to be protected? Not to protect the good will against his competition as a manufacturer, for he never had any customers or business of his own. Certainly not against the use of the ordinary Bessemer or other known processes. It could not be necessary to protect complainant against the doing by Nichols of work which others are accustomed to do in hundreds of foundries. The only lawful restraint would have been his disclosure of specific trade secrets. But, complainant has not made any such contract, but has generally forbidden Nichols ever to divulge elsewhere anything ever done at High Bridge, no matter where else he learned it, or in how many places elsewhere it may be practiced.

We submit that it is not competent for the court to frame out of this a specific and limited covenant and enforce that. The court must deal with the contract as made. Vice-Chancellor Van Fleet treated the whole contract as void, in the Mandeville case; he did not try to make a new contract which should apply only to a limited term, but condemned the whole, because excessive.

Besides, the complainant has failed to prove that there is anything in its processes which it is of value to it to protect. Nichols declares that he knows of no special or secret processes, that those used at Chicago Heights are the same, and the complainant proves none. There is no ground for the court to stand upon in framing a new restraint, for the reason that the court cannot find any right of complainant which requires restraint for its protection.

The admission made by Mr. White at the outset of the litigation is fully supported by the proof, that Nichols had no special knowledge or trade secrets. There is no evidence which warrants a finding that any interest of complainant will be prejudiced by the working of Nichols at his trade for any person who will give him employment.

As the case stands, it is apparent that the Brake Shoe Company can and will fill all the orders for manganese steel which they can obtain, whether Nichols works for them or not. That the effort to restrain Nichols was not for fear of his disclosure of secrets was admitted by Mr. White, speaking for the company, and his denials of his statements are so guarded and qualified as to be practically an admission. (Case p. 778; p. 95.)

The restriction is excessive because it restricts Nichols not only from engaging in the work he had theretofore performed, but in any other service which complainant might thereafter put upon him.

In *Mallan* vs. *May,* 11 M. & W., 688, there were two covenants, by one employed as a dentist for four years. One was that he would not practice in London, and this was sustained. The other was, that he would not practice in any town in England where the plaintiff might have been practicing during the term of service. The court said:

> "This goes much beyond what the protection of any interest of plaintiff's could reasonably require. It puts into their hands the power to prevent the defendant from practicing anywhere. It is an unreasonable restriction."

The restriction must be limited to special business, and cannot be extended indefinitely to all sorts of competition.

In the famous case of *Maxim* vs. *Nordenfeldt* (1893), 1 Ch., 630, 633, the covenant was on a sale of a large business of guns and explosives, and the seller agreed not to engage for twenty-five years in such business "or in any business competing or liable to compete with that, for the time being, carried on by the vendee." The covenant as to the business of guns and explosives was held separable, and was sustained on appeal, their customers being foreign nations, while that as to other competing business was held to be excessive and void, both in the Chancery Division and on appeal.

In *Ehrman* vs. *Bartholomew* (1898), 1 Ch., 671, 674, where the restraint extended to business of any kind, Romer, *J.*, said:

> "Cases where negative stipulations in contracts of service are enforced by the court ought not to be extended, and are to be regarded as anomalies which it would be very dangerous to extend. To enforce such a general negative stipulation as I find here, would be, in my opinion, a dangerous extension, for here the stipulation extends to business of any kind, while the negative stipulations enforced in the prior cases were confined to special services."

The court cannot help out these excessive restrictions by limiting them to the foundry business, and to secret methods learned by Nichols at High Bridge and not elsewhere. The contract restricts him from divulging any method used or to be used there in any business or class of work, and no matter where learned and must stand or fall as made.

Thus, in *Baker* vs. *Hedgecock*, 39 Ch. Div., 520, the court held that an agreement not to carry on any business whatever was void no matter how narrow the limits of time and space during which the restraint was to operate, and refused to construe it as restricted to the particular business in question.

In *Perls* vs. *Saalfeld* (1892), 2 Ch., 149, 152, C. A., the contract was one of employment as clerk, and the complainant agreed for a limited term of years not to set up in business within fifteen miles of the London Exchange, unless the master should be satisfied that it was not a competing business. This was held to be excessive, and the judges said that they had no power to construe it so as to restrict a competitive business only, in which case it would have been valid.

In *Althen* vs. *Vreeland,* 36 Atl. 479, the defendant sold a bakery business in Newark, and agreed not to engage in a like business within 1000 miles of Newark, Emery, *V. C.* held this restraint to be excessive and void, complainant urged that it was good within the state, but the vice chancellor said: "If enforced at all it must be enforced according to its terms," He also made the point against it, that being unrestricted in time, it extended to the whole life of defendant.

V.

THE CONTRACT WAS PROCURED UNFAIRLY BY COMPLAINANT, AND IS OPPRESSIVE AND UNJUST.

The admitted fact is that the contract was carefully prepared in advance by complainant without a word of discussion with Nichols as to its terms. It was presented to him while in the employ of complainant, and in a dependent position, and after he had refused the offer of the Brake Shoe Company. It was presented at a time when, as complainant's officers knew, Nichols was depressed by a heavy bereavement, and was in urgent need of an immediate loan of money, and at a time when he had no chance to study it before he signed. Under these circumstances the company was bound to see that the contract was fair, and also that Nichols fully understood its terms. In both particulars, the breach of duty was gross, and deprives the

complainant of all claim to the aid of a court of equity to enforce the contract.

The law is stated by Pomeroy as follows:

> "If the contract itself is unfair, one-sided, un-
> "just, unconscionable, or affected by any other
> "inequitable feature; or, if its enforcement would
> "be oppressive or hard on defendant, or prevent
> "his enjoyment of his own rights, or work any in-
> "justice; or if the plaintiff had obtained it by
> "sharp practices, by taking an undue advantage
> "of his position, specific performance will be re-
> "fused."
>
> *Pom. Eq.* sec. 1405, Note.

The complainant ought, before drawing up any contract at all, to have negotiated with Nichols and settled the details. It is undisputed that in this case, the complainant prepared the contract in advance, secretly with the aid of counsel, being a contract of considerable length, containing terms requiring careful reading, and disguising great severity towards Nichols; that it was presented to the employe by his immediate superior, who had his full confidence; that Nichols was an uneducated man, who began as a laborer in a foundry in his teens, and continued as a working man ever since; that he was an impulsive man, likely to act hastily; that at the time it was presented he was in haste to catch a train to go to his sister's funeral, and was soliciting a loan of money to take with him; that he had no time to even read the contract, much less to master its provisions; that the only information previously given to him about it was that it raised his salary for a term of five years. That he at once sought advice from his superior officer, Brinton, who, instead of giving him advice to take his time and consult counsel, positively assured him that he was safe in signing at once (p. 154, l. 25; p. 156, l. 20; p. 364, l. 10, to p. 369, l. 40).

What single fact is there to show any care to perform the duty incumbent upon the employer? The only knowledge previously communicated to Nichols was that it raised his wages (p. 366, l. 40, to p. 367, l. 20; p. 160, ll. 10 to 20). The matter of making loan, which he urgently needed for his sister's family, was made practically contingent upon his signing the contract, and the loan was held back until he had signed, and then he had to run to the bank and train (p. 368, l. 36, to p. 369, l. 20). The least that ought to have been done was to give him a copy of the contract and tell him to take time to study it before signing. He cannot equitably be placed in a worse position than if that had been done.

When we turn to the contract itself, we find in it such terms that it is impossible to believe that Nichols would have signed it, if he had understood them. No lawyer would permit a client to sign such an unfair document. As soon as he had read the contract, he protested to Brinton, and was assured by Brinton that it would not hold water (p. 370, l. 21). Brinton practically admits this (p. 155, l. 40, to p. 155, l. 20).

It deprives Nichols for all time of any opportunity to practice his trade, either for himself or for another employer. It does not specify the kind of services, but leaves the employer free to set him at the most distasteful occupation. It does not specify the place of employment; in every detail the contract is drawn in the interest of the employer, and Nichols is placed at the mercy of the complainant. Complainant's officers could at will make the position of Nichols intolerable, and, in fact, that did happen. He deserved better treatment at their hands; he had just refused an offer, which he was free to accept, of $5,000.00 per year from a company more substantial than the Taylor Company. The complainant thereupon drew a contract,

giving him $3,000.00 per year for five years, with a contingent increase of $1,500.00, and coupled it with terms making it impossible for Nichols to obtain employment from any other employer at any time during his life, either to do any kind of work which he had previously done or any which he might thereafter do for employment. When it is considered that Nichols

In *Kimberly* vs. *Jennings,* 6 Sim., 340, 349, the defendant was employed for a term of six years, subject to loss of salary during any disability to work, and agreed that during that period he would not engage in business, or work for anyone else. Being set at distasteful work he broke the contract during the term and set up a rival business, and the bill was filed to enjoin him, the complainant offering to perform on his part. Upon demurrer the complainant's counsel said (p. 349), that the injunction might at all events be granted in a limited form, that is, to restrain the defendant from availing himself of the secrets of his employer's business; because by disclosing their secrets irreparable injury would be done to them. The court said:

> "Nothing could be more harsh towards a young "man dealing with great traders, than that he "should be allowed to enter into an agreement "which placed him so entirely in their power; "and although the events have precluded the "plaintiffs from availing themselves of this harsh "stipulation, I must look at the agreement as it "was originally concocted to see whether on the "whole it was such as the court should counte-"nance."

the unfairness of the contract, to accept employment, then the Brake Shoe Company was free to give him employment.

giving him $3,000.00 per year for five years, with a contingent increase of $1,500.00, and coupled it with terms making it impossible for Nichols to obtain employment from any other employer at any time during his life, either to do any kind of work which he had previously done or any which he might thereafter do for employment. When it is considered that Nichols could in a day obtain a salary of $5,000.00, with prospects of advancement, and that complainant knew it, I pronounce this transaction to be one of the meanest on record of the kind in the reports. It is an attempt to completely control a workman and to deprive him for all life of any chance to better his condition, either by changing his employer or by entering into business on his own account.

In *Crane* vs. *DeCamp,* 6 C. E. Gr., 414, 418, the court said:

> "There is no rule in equity more clearly estab-
> "lished than that upon an application for the spe-
> "cific performance of a contract the court must be
> "satisfied that the claim is fair, reasonable and
> "just, and the contract equal in all its parts. If
> "these points are not established by the complain-
> "ant, he will be left to his remedy at law. In
> "judging of the fairness, the court should look not
> "merely at the admitted terms of the agreement
> "itself, but at the relations of the parties, and all
> "the surrounding circumstances."

The contract thus being invalid and not binding upon Nichols, is clearly not binding upon the Brake Shoe Company, and if Nichols was free, by reason of the unfairness of the contract, to accept employment, then the Brake Shoe Company was free to give him employment.

VI.

NICHOLS CANNOT BE ENJOINED BECAUSE THE CONTRACT DOES NOT EXPRESSLY PROVIDE THAT HE SHALL NOT TAKE ANOTHER EMPLOYMENT.

An injunction is a negative specific performance of the contract and the first instance when such a remedy was recognized was in the case of *Lumley* vs. *Wagner,* 1 D. G. M. & G., 604. There the defendant agreed "not to use her talents at any other theatre" during her engagement with Lumley. The chancellor granted his injunction distinguishing other cases, on the ground that there was a negative covenant in express terms.

In some later cases it was said that a negative covenant might be implied where the party agreed, for instance, to give his whole time to his employer. But, this whole subject was carefully considered in the Court of Appeal in *Whitwood Chem. Co.,* vs. *Hardman,* 2 Ch. Div. (1891), p. 416. There, the manager of a chemical works contracted to give his whole time to the business of the company but entered into the employ of a rival, whereupon an injunction was granted on the theory that there was an implied covenant not to work for any one else. This was reversed. Lindley, *J.*. said that to grant the injunction would be, in effect, a decree for specific performance of a contract for personal service; that in the leading case of *Lumley* vs. *Wagner,* where an actor was enjoined from acting for a rival manager, there was a negative clause, to wit, that the actor would not enter the employ of a rival; and he further said that the decision in *Lumley* vs. *Wagner* was an anomaly which it would be dangerous to extend. "I think the

> "court will generally do much more harm by at-
> "tempting to decree specific performance in cases

"of personal services than by leaving them alone; "and, whether it is attempted to enforce these "contracts directly, by decree of specific per- "formance, or indirectly by an injunction, ap- "pears to me to be immaterial."

In the same case, Kay, *J.*, said, (p. 423), that if the court could interfere by injunction, he did not see any contract of hiring and service in which it ought not also to interfere. "We must tread with very great "caution such a path as that which this applica- "tion invites us to pursue."

This case was approved and followed in *Ehrman* vs. *Bartholomew*, 1 Ch. Div. (1898), p. 671.

VII.

THE INJUNCTION SHOULD BE DENIED BECAUSE THE SERVICES WERE NOT PURELY INTELLECTUAL, PECULIAR AND INDIVIDUAL, BUT SUCH AS COULD BE PERFORMED BY OTHERS.

Dr. Howe says that the Taylor Company have not been interrupted in business from the lack of services of Nichols (p. 248, ll. 29 to 37). There is no evidence, whatever in the case to show that his work could not be adequately performed by others, who were in the employ of the Taylor Company.

The evidence of Potter and of Prof. Langley, as well as of Nichols, makes it clear that the making of manganese and other steels is a well known art, in which skill is attained by shop practice.

In *Rogers Co.* vs. *Rogers*, 58 Conn., 356, an injunction was denied because held not to be appropriate, where the services are not purely intellectual, peculiar and individual in their character.

In *Universal Talking Machine Co.*, vs. *English*, 69, N. Y.. Supp., 813, an employee of a maker of talking machines agreed to work for a term of years, and

to conceal his discoveries from all others. He broke his contract and entered into other employment, and an injunction to prevent him working for another was denied because it was not shown by complainant that the contract service could not be performed by others. The injunction from using discoveries was denied because it was not shown that he had made any.

So also in *Johnston Company* vs. *Hunt,* 66 Hun., 504, affirmed 142, N. Y., 621, it was held that services to a rival would not be enjoined where the duties of the first employer were such as could be performed by others.

In *Kessler* vs. *Chappele,* 73 N. Y. App. Div., 477, the defendant agreed to enter the employ of Kessler, and that he would not assist any other person in dealing in certain wines. He broke the contract by entering the employ of a rival, but the injunction was denied on the ground that the services contemplated by the contract were not special, unique or extraordinary.

In the case of *Chain Belt Co.* vs. *Van Spreckelsen,* 117 Wis., 106; 94 N. W., 78, the contract was made by a mechanical engineer to work for four years for the company making chain belts, in charge of its patterns and models, and to keep inviolate the records, models, etc., solely for the use of the company. The bill charged that the employee knew valuable secrets of the business, and that he had broken his contract and had entered the employ of a rival as superintendent and mechanical engineer. He answered that he had been foreman of a single department of complainant's large business denied that he had any peculiar knowledge, except such as other persons in the employ of complainant had, or that he knew any secrets; alleged that before entering complainant's employ he learned his business under a former employer,

and that his assistant, still employed by complainant, possessed all knowledge that defendant had of complainant's work. The Court denied the injunction, because it did not appear that defendant had any secrets of complainant's business, or any peculiar skill not possessed by others, and approved Rogers Co. vs. Rogers, above cited.

In *Sternberg* vs. *O'Brien,* 3 Dick, 370, Vice Chancellor Van Fleet refused an injunction against the collector for a clothing house in Newark, because it did not appear that the defendant had any position requiring special competence or knowledge of business secrets, and because no irreparable injury was shown.

It is clear that on such a contract as the present, Nichols could have no relief from a court of equity in case of breach by complainant.

It is shown that the relief sought is not mutual, and that of itself is ordinarily fatal to the remedy by specific performance.

See *Rice* vs. *D'Arville,* 162 Mass., 559, 561, where the court regarded the doctrine of Lumley vs. Wagner as one to be carefully limited.

See also *Davis* vs. *Foreman,* 3 Ch. Div. (1894) p. 654.

We contend, therefore, that even if the agreement with Nichols was a valid one, the complainant could not have an injunction; first, because by the contract he does not expressly covenant that he will not enter the employ of another during the term; second, because the services contracted for are not intellectual, peculiar and individual; third, because the work is not of such a character that it cannot be performed by any one else put in his place, so that the injury is not shown to be irreparable.

VIII.

NO GROUND IS SHOWN FOR AN INJUNCTION AGAINST THE BRAKE SHOE COMPANY.

If the complainant has no claim to an injunction against Nichols, it has none against the other defendant. The evidence shows that the negotiations in March were conducted at a time when Nichols was free to negotiate, and were within the legal rights of both parties, as we have shown in Point I. That negotiation was at an end. The court cannot justly hold that the legal rights of the Brake Shoe Company to contract in July shall be impaired because it is supposed that one of their officers showed bad manners in March. The right to negotiate in July depends solely on the question whether the contract of complainant with Nichols is enforcible. It is not questioned that the breach between Nichols and the complainant arose solely from personal grievances of Nichols with which the Brake Shoe Company had no concern. No ground appears for an injunction against that company which would not apply with equal force to any other steel founder to whom Nichols might now apply for employment.

It is also established that the Brake Shoe Company never made any contract with Nichols, and that his position as to them has been, and is, that of an applicant for employment, and their position is merely that of any other steel founder needing an experienced foreman.

The sole ground, therefore, on which to deny the right to hire Nichols is that he is under a contract with complainant. The Brake Shoe Company knew of that contract, and were advised by counsel that it was excessive in its restraint and did not bind Nichols.

We have undertaken to show that this advice was sound, and, such being the case, the Brake Shoe Company cannot be restrained from employing him, and an injunction against the Brake Shoe Company would be a partial enforcement against Nichols of a contract which equity cannot enforce at all.

IX.

THE COMPLAINANT SHOULD BE LEFT TO HIS LEGAL REMEDY.

The whole case against the Brake Shoe Company rests on the charge of unlawful enticing a servant. We have shown that there was no unlawful enticing, because the servant was not bound. On the first negotiation, the employment was at will; and, on the second, it was under a contract invalid and not enforcible because of excessive restraint. But, if there is any grievance in this regard, the remedy at law against the company is adequate and complete, and, therefore, no injunction should be allowed.

Chain Belt Co. vs. *Von Spreckelsen,* 94 N. W. 78, 82; 117 Wis. 106.

As against Nichols the contract provides for a forfeiture of $1,500.00 per year, and this is an additional ground for denying relief in equity.

This case differs from most in the books, in the fact that it is brought while the term of service is pending. If an injunction is granted to enforce the contract against Nichols, it must be based on the readiness of complainant to carry it out in favor of Nichols. No such readiness has been shown in the evidence. How can the court protect the rights of Nichols under it? It is one of the features of the unfairness of the contract that it does not specify either the place of employment or the nature of the services. If the court

should attempt to put terms upon the enforcement against Nichols of the contract, it could only provide that complainant should assign Nichols to such employment as it might choose. It is foreign to the spirit of equity to enforce any contract which gives either party a range of discretion so extravagant. As the Court of Equity would not enforce such a contract in favor of Nichols, so they cannot enforce a contract at all where the enforcement necessarily includes provisions on his behalf for employment on such terms.

In the case of *Met. Co.* vs. *Ewing,* 42 F. R., 198, Wallace, *J.,* said of a contract for personal services which the court was asked to enforce by injunction against breach:

> "It must be one in which the plaintiff comes into court with clean hands, and which is not so oppressive as to render it unjust to the defendants to enforce it. It must be one the terms of which are certain, and in respect to which the minds of the parties have distinctly met, so that there can be no misunderstanding of their rights and obligations."

And Pomeroy says:

> "The contract and situation of the parties must be such that the remedy of specific performance will not be harsh or oppressive."
>
> *Pom. Eq. Jur., sec.* 1405.

X.

THE DECREE DOES NOT CONFORM TO THE CONTRACT.

The restraint as to Nichols is as follows:

"That an injunction do issue restraining the defendant Nichols from divulging or disclosing, directly or indirectly, to any person, the *se-*"*cret* methods and processes used by the complain-"ant in the making, moulding, treatment or manu-"facture of *manganese* steel, *taught to or acquired* "by the said Wesley G. Nichols while in the employ-"ment of the said complainant" (p. 976, l. 28). The italics indicate the principal points of the court's reformation of the contract.

The part of the contract of Nichols which the court is asked to enforce reads as follows:

"That he will not at any time, directly or indirectly, "during the term of this agreement or afterwards, "divulge to any person, firm or corporation, except to "the Taylor Iron & Steel Company, and its officers, "any information of any nature, now known to him "or hereafter acquired by him, during the term of "this agreement, relating to or regarding any process "of steel making, or moulding or treating steel, that "may have been, is now, or may be hereafter, during "the term of this agreement, used in the works of the "Taylor Iron & Steel Company, and that he will at "all times hold inviolate the treatments, processes and "secrets known to or used by him in the works of the "said Taylor Iron & Steel Company." (Case, p. 10, l. 38).

The decree is not an enforcement of the contract. Manifestly, such an enforcement would be a glaring case of an excessive restraint. The decree enforces a very different contract, which the Vice Chancellor has framed and thinks would be lawful. We think that

even such a contract as is enforced by the decree would be an excessive restraint; but, whether it is or not is not material, because if the contract itself is excessive, that is enough to forbid a decree to enforce it, since the court cannot help out complainant by reforming an excessive covenant into a reasonable one. "If enforced at all, it must be enforced according to its terms." *Althen* vs. *Vreeland,* 36 Atl. (N. J.), 479. See also *Kimberly* vs. *Jennings,* 6 Sim., 340, 349 and Point IV of this brief, pp. 37 and 38. The chief changes of the contract by the decree as to Nichols are as follows:

(1) The contract specifies that the information forbidden to be divulged is of any process used in the Taylor Works, whether secret or not.

The decree specifies that the information which Nichols is forbidden to divulge, is that only concerning secret methods and processes used by complainant.

(2) The contract prohibition extends to all steel products of the works, including common steel.

The decree applies to manganese steel only.

(3) The contract prohibition extends for the life of Nichols to all processes used in the Taylor Works, whether learned by Nichols at those Works or elsewhere.

The decree is limited to processes acquired by Nichols while in the employ of the complainant.

The decree, as to the defendant company, forbids them from disclosing or using any information of secret processes used by the complainant in making manganese steel that may have been communicated to defendant by Nichols (p. 976, l. 37).

There is no proof that Nichols ever communicated any secret processes or any processes at all to the defendant company. All the proof on the subject is

to the contrary. This decree against the defendant company is, therefore, without warrant . In the language of a New York Judge: "Suspicion no matter how well founded it may be, does not rise to the dignity of legal proof upon which alone courts may base decrees."

The decree further restrains the defendant company from employing in its service in any capacity whatever the said Nichols, during the term of his employment by the contract dated March 15th, 1905; that is to say, for a term of five years from that date.

The proof shows that the defendant company has seven iron foundries in the United States, widely separated, from New York to Georgia, at only one of which do they make steel, namely, at Chicago Heights (p. 475, l. 20 to 40; p. 476, l. 1 to 10). Yet, they are forbidden to employ Nichols anywhere in any capacity.

Evidently, there is no occasion for making the restraint extend beyond the Chicago factory, even if there were any cause for a restraint against the defendant company at all.

As to the substance of the restraint in general, covering as it does a vague number of undefined processes, supposed to be secret but never described, we think the decree as against Nichols is subject to the criticism found in *Swift* vs. *United States*, 196 U. S., 396, where Holmes, *J.*, said: "We are bound by the "first principles of justice not to sanction a decree so "vague as to put the whole conduct of defendant's "business at the peril of a summons for contempt."

So much as to the terms of the decree, now consider its omissions.

The contract in question is not one where nothing remained to be done on the part of the complainant, such as a case where the complainant has paid for the business of defendant and the defendant has agreed not to start in opposition, and that covenant alone remains to be enforced.

Here the covenant to work for five years and never to divulge any processes, was coupled with a reciprocal covenant to give employment.

In such case, the complainant has the choice to claim damages for breach, or to claim performance under the terms of the contract, in which case he must offer to perform on his part. The complainant, in the bill, does not offer to continue to employ Nichols, and the decree does not impose on the complainant any terms that such employment shall be offered.

Specific performance requires full performance on both sides, otherwise it becomes a mere penalty and outside of the function of a Court of Equity.

When the complainant has not fully performed and asks to enforce a negative covenant, if relief is given at all, it should be by a conditional decree.

6 Pomeroy Eq. sec. 775.

In *Stocker* vs. *Wedderburn,* 3 Kay & J. 407, Wood, *V. C.,* said that where an injunction has been granted to enforce a negative contract "the whole benefit of "the injunction is conditional upon the plaintiff per- "forming his part of the agreement, and the moment "he fails to do any of the acts which he has engaged "to do, and which were the consideration for the "negative covenant, the injunction would be dis- "solved."

In conclusion he says (p. 407):

> "It appears to me that this is one entire agree-
> "ment and I cannot decree specific performance
> "of part of it so as to give to the plaintiff all the
> "benefits for which he has stipulated, while the
> "other terms of the agreement are of such a
> "nature that the court is unable to decree specific
> "performance of them."

In the case of *McCaull* vs. *Braham,* 16 Fed., 37, an injunction was granted against the defendant (Lillian Russell) to prevent her violating her agreement to sing for plaintiff, and not for any other person. She was enjoined from singing for others, but on condition that the plaintiff should give bond to pay her for her services if she should give notice of her readiness to sing and should perform her duties under the contract.

An injunction to protect trade secrets must be limited to the specific secrets proved. *Harvey* vs. *Nat. Drug Co.,* 77 N. Y. Suppl., 674.

The harshness of the contract and decree are unprecedented in equity. To appreciate it, let us see how it would look in the criminal law. Suppose a statute should be enacted that any workman pledged to secrecy, who should break a contract of employment for a term of years, should for his whole life be forbidden to work at his trade for any person except his employer, and then only at the employer's option; such a statute would be universally execrated for its cruelty and injustice. The secrecy feature would not relieve it. If, as held here in chancery, the employer need not prove the use of any secret of value, every tyrannical employer could insert the secrecy clause in his contract with perfect security since he need not prove it, and since the servant upon the trial would be prevented from giving evidence to disprove it.

Such a statute would establish a system of slavery for every workman who could be inveigled or surprised into singing such a pledge. A contract which deprives a skilled workman of his only chance of advancement, under a pretense of protecting a secret process, but really to punish one employee and so intimidate others who might desire to improve their condition, is abhorrent alike to public policy, to humanity, and to equity.

CHARLES L. CORBIN,
Counsel for Appellants.

November Term, 1907.

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Bill of Complaint.

FILED AUGUST 17, 1905.

To his Honor WILLIAM J. MAGIE, Chancellor of the State of New Jersey,

Humbly complaining, shows unto your Honor your orator, TAYLOR IRON AND STEEL COMPANY, a corporation organized and existing under the laws of the State of New Jersey:

ONE: That your orator is a corporation of the State of New Jersey, having been organized in the year Eighteen hundred and Ninety-one, with an authorized capital of One Million Dollars, of which Nine Hundred Thousand Dollars has been issued; that your orator is now and has been since its incorporation engaged in the manufacture of car wheels, projectiles, castings and other products of iron and steel, and is now and has been since its incorporation conducting an extensive foundry, machine shop and plant at High Bridge, in the County of Hunterdon in this State, in which it employs from six hundred to eight hundred men, and of which the annual output is very large; that one of the branches of your orator's said business is the making of castings of iron and steel, and especially of manganese and other steels under a process known as the Hadfield Process, based in part on patents and in part on secret processes used only in this country by your orator, introduced in this country by your orator at large expense, in accordance with contracts still effective with Robert A. Hadfield, proprietor of the famous Hecla Steel Works of Sheffield, England, and since

greatly extended and improved by your orator; that in addition to the Hadfield patents and process your orator uses in said foundry many other methods and treatments peculiar to your orator, and unknown to other makers of castings of iron and steel, and of a character tending to make the castings from your orator's said foundry of a superior type; that your orator's castings both of manganese and other steel and of iron have acquired a reputation in the trade peculiar to themselves, and are sought after often at higher selling prices than castings for like uses not produced under the processes and treatments used by your orator; that your orator has built up a large business in castings throughout the United States and Canada, amounting to hundreds of thousands of dollars annually; that the men employed in your orator's foundry must be taught especially the methods, processes and treatments used by your orator, and have long been employed under contracts binding them not to disclose to others the methods and processes necessarily communicated to their knowledge in the course of such employment; that the Superintendent and Assistant Superintendent of said foundry have been many years in their respective positions and have become especially skillful in the use and application of the methods, processes and treatments used in making castings of steel and iron in your orator's said foundry, and have acquired in the course of their confidential employment a wide knowledge of the business there conducted, possible only after many years of instruction and experiment; that the processes, methods and treatments used in your orator's said foundry under the direction of said Superintendent and Assistant are valuable property rights of your orator entrusted by your orator to its said employees in the course of con-

fidential employment under agreement that the knowledge thereof and of your orator's business acquired by them should not be imparted to others.

Two: That on or about the sixteenth day of March, in the year Eighteen Hundred and ninety-six, your orator employed one Wesley C. Nichols at a salary of sixty-five dollars per month in its said foundry, with the express understanding and agreement that he would not make known to any person, except the officials of your orator, any information which he might receive at your orator's said works, or any knowledge which he might obtain, and that he would not adopt or use, except on behalf of your orator, all or any part of any process or system or mixture, or combination of mixtures in use at said works, whether novel or not; that shortly before the employment of the said Wesley G. Nichols by your orator, your orator had employed as Superintendent of its said foundry, under like confidential arrangement, one Walter Brinton, and on the recommendation of the said Brinton the said Nichols was employed by your orator as Assistant Superintendent of said foundry, said Nichols having formerly worked with the said Brinton for another employer; that the said Wesley G. Nichols from the time of his first employment continued with your orator as Assistant Superintendent of the Steel Foundry; that his salary was advanced on May 18, 1896, to seventy dollars per month; June 16, 1896, to seventy-five dollars per month; on April 1, 1898, to eighty-three dollars and thirty-three cents per month; on November 11, 1898, to one hundred dollars per month; on August 31, 1899, to one hundred and eight dollars and thirty-three cents per month; on January 1, 1901, to one hundred and sixty-six dollars and sixty-six cents per month; on

August 1, 1902, to one hundred and eighty-three dollars and thirty-three cents per month; on May 1, 1904, to two hundred and eight dollars and thirty-three cents per month, at which rate it continued until the first day of March, 1905; that during all the years of said Wesley G. Nichols' employment by your orator, his employment was always upon the express understanding and agreement that he should not impart to any person whatsoever, except the officials of your orator, any information which he might receive in your orator's works, or any knowledge which he might there obtain, and that he would not adopt or use except in behalf of your orator all or any part of the processes, systems, mixtures or treatments in use by your orator's said works, whether novel or not; and relying on such express understanding and agreement your orator not only permitted the said Wesley G. Nichols to become acquainted with the processes, systems, methods and treatments in use in your orator's said foundry in the casting of iron and steel, but caused the said Wesley G. Nichols to be instructed and taught such processes, systems, mixtures and methods, and under such employment in the position occupied by the said Wesley G. Nichols it became and was his duty to, and he did acquire from instruction and experience especial skill in the use of the methods, treatments, mixtures and processes used by your orator in its said foundry, and in teaching and superintending others in the use thereof; that all the men employed in said foundry, from the Superintendent down, are and have always been employed by your orator upon the express contract and understanding that no information obtained in the course of such employment shall be imparted to others or used except in the course of employment by your orator; that in the course of such confidential employment

by your orator for so many years an Assistant Superintendent, the said Wesley G. Nichols acquired a great deal of information concerning your orator's business affairs in addition to the special skill and knowledge communicated to and acquired by him in the work of the foundry, and became and was a trusted, valuable and skillful employee, and it will require many years to instruct and acquaint another to a like degree of skill, value and usefulness in your orator's works and business.

THREE: That on the seventh day of March, nineteen hundred and five, one Elmer G. Snow, General Superintendent of the American Brake Shoe & Foundry Company, a corporation organized and existing under the laws of the State of New Jersey, called at the office of your orator in High Bridge, in company with Clarence Estes, a pattern maker employed by your orator; that the said Estes introduced the said E. J. Snow to Percival Chrystie, your orator's Superintendent, stating that Mr. Snow was his cousin and was visiting him at High Bridge; that Mr. Snow presented a letter of which the following is a true copy:

"HILLBURN, Rockland Co., N. Y.

Messrs. TAYLOR IRON WORKS,

GENTLEMEN:

The bearer of this note, Mr. E. J. Snow, is my son-in-law, and desires to visit in your works while visiting Mr. Estes. Any courtesy you may show him will be greatly appreciated by

Yours sincerely,
(signed) WM. W. SNOW.

P. S.—Your General Manager may remember me as the party who assisted in establish-

ing your car wheel foundry many years ago, and furnishing the foreman, also moulders and melter, together with patterns and flasks from Ramapo."

That the said Wm. W. Snow was Chairman of the Executive Committee of the Board of Directors of the said American Brake Shoe & Foundry Company, and was known to your orator's Superintendent as a friend of many years' standing, of the late William J. Taylor, one of your orator's directors, by whom your orator's Superintendent had some years before been introduced to the said Wm. W. Snow; that your orator's said Superintendent expressed his regret to the said E. J. Snow that he could not wholly comply with the request of the said Wm. W. Snow in the matter of visiting the works of your orator, as the rules of your orator and its contract arrangements with Mr. Hadfield would not permit access to the foundry, but that if he desired to go through the machine shop your orator's Superintendent would be glad to have him do so; that the said E. J. Snow said that he was sorry that he could not be permitted to enter the foundry, but that he would be glad to go through the machine shop, and your orator's Superintendent thereupon instructed the said Estes to show the said E. J. Snow around, and gave him a pass to the watchman to admit him to the machine shop, without which it would have been impossible for the said E. J. Snow to obtain access; that the said E. J. Snow, accompanied by the said Estes, went to said machine shop, and when there the said Estes sent a message into the foundry by some means not known to your orator, requesting the said Nichols to come out and see him; said Nichols came out and had a conference with the said Snow and Estes, in the course of which the said Snow

told the said Nichols that the American Brake Shoe & Foundry Company had been endeavoring to make manganese steel, had not succeeded, and wanted Nichols to take charge as Superintendent of their steel foundry to make manganese steel, and offered the said Nichols employment with the American Brake Shoe & Foundry Company for a term of years at seven thousand dollars per year, and, in addition a block of the stock of the said American Brake Shoe & Foundry Company at the market value of ten thousand dollars at the end of the term of employment; that the said Nichols informed the said Snow that he could not leave the employment of your orator, and did not wish to do so; that the said Snow requested him to think the matter over and asked him to keep the proposition confidential; that the said Nichols told the said Snow that he would not keep it confidential, but would report it to your orator; that subsequently the said Nichols did report such conversation first, to the Superintendent of the foundry, Walter Brinton, and later to your orator's General Superintendent, the said Chrystie, first informing the said Brinton and later the said Chrystie that after thinking the proposition over he had concluded to decline and stay with your orator, notwithstanding the better financial terms offered by the said American Brake Shoe & Foundry Company; that he felt that good faith with your orator required him to stay.

FOUR: That your orator was indignant at the way in which the courtesies extended to the said E. J. Snow on the strength of the letter of introduction brought from the said Wm. W. Snow had been abused, and through its General Superintendent addressed a letter to the said Wm. W. Snow, of which the following is a true copy:

Bill of Complaint.

"MARCH 10, 1905.

Mr. W. W. SNOW,
Hillburn, Rockland Co., N. Y.

DEAR SIR:

Your letter introducing your son-in-law, Mr. E. J. Snow, was handed to me by him on Tuesday last.

It is not our custom to admit any one to our works, but owing to your letter we made an exception in this particular case.

I have always heard my uncle, the late W. J. Taylor, speak of you in the highest terms, and you may recollect that about three years ago I took dinner with you and Mr. Taylor in a restaurant on Cortlandt Street, New York City. So when I gave Mr. Snow permission to visit part of our works I assumed that I was dealing with a man of honor; and great was my surprise to learn that he, with the assistance of our Mr. Estes, had visited us for the purpose of hiring one of our foremen, and also to gain what information he could as to our methods of steel making. This may coincide with your idea of honor, but when a man under the guise of friendship tries to inflict an injury, it strike me as a pretty low down trick.

Possibly you may not have known of the object of Mr. E. J. Snow's visit, and for that reason I address this letter to you.

Yours very truly,
(signed) PERCIVAL CHRYSTIE,
Supt.

Dictated P. C."

To this letter, under date of March 17, 1905, acknowledgment was first made that Mr. Wm. W.

Snow was absent in California, and promising an explanation on his return; that on May 9, 1905, the following letter, of which the following is a true copy, was received from the said Wm. W. Snow:

"RAMAPO IRON WORKS,
Hillburn, Rockland Co., N. Y.

MR. PERCIVAL CHRYSTIE:

DEAR SIR:—I find yours of March 10th on my return from California. *The last clause* of your letter covers the whole situation, therefore I can add nothing more.

Sincerely yours,
(signed) WM. W. SNOW."

That when your orator's said Superintendent learned of the purpose of the visit made by the said E. J. Snow to your orator's said works, he at once inquired of the said Estes whether he, the said Estes, had known of the purpose of the said E. J. Snow's visit that the said Estes admitted his knowledge of the reason of Mr. E. J. Snow's coming, and his connivance in bringing the said E. J. Snow to an interview with the said Nichols, and thereupon the said Superintendent discharged the said Estes from the employment of your orator; that subsequently the said Estes was employed by the said American Brake Shoe & Foundry Company, and is now, as your orator is informed and believes, in their employment.

FIVE: That your orator greatly appreciated the action of the said Wesley C. Nichols in declining of his own motion the proposition of the said American Brake Shoe & Foundry Company, and in recognition thereof at once determined to advance the salary of the said Wesley G. Nichols, and caused to

be prepared and submitted to the said Wesley G. Nichols a contract, which was subsequently executed, the said Wesley G. Nichols expressing his entire satisfaction therewith, and his appreciation of the financial arrangement therein contained; that such contract was in words and language following:

AGREEMENT made this fifteenth day of March, nineteen hundred and five, Between TAYLOR IRON AND STEEL COMPANY, a corporation of the State of New Jersey, and WESLEY G. NICHOLS, of High Bridge, in the County of Hunterdon and State of New Jersey, WITNESSETH as follows:

(1.) That said Taylor Iron and Steel Company hereby agrees to and does hire and employ the said Wesley G. Nichols for the term of five years from the first day of March, nineteen hundred and five, and hereby agrees to pay him the yearly salary of three thousand dollars per year, payable monthly, and if the conditions hereinafter stated shall be kept and performed on the part of the said Wesley G. Nichols, an additional sum of fifteen hundred dollars in each year payable in the manner hereinafter provided:

(2.) The said Wesley G. Nichols agrees that he will devote his entire time, skill, labor and attention during the term of this agreement to the service of the Taylor Iron and Steel Company, and that he will at all times faithfully perform the duties that may be assigned to him by the management of the said Taylor Iron and Steel Company to the best of his skill and ability for the compensation aforesaid, and that he will not at any time directly or indirectly, during the term of this agreement or afterwards, divulge to any person, firm or corporation, except to the Taylor Iron and Steel

Company and its officers, any information of any nature now known to him, or hereafter acquired by him during the term of this agreement, relating to or regarding any process of steel making or moulding or treating steel that may have been, is now, or may be hereafter during the term of this agreement, used in the works of the Taylor Iron and Steel Company, and that will at all times hold inviolate the treatments, processes and secrets known to or used by him in the works of the said Taylor Iron and Steel Company.

(3.) So long as the said Wesley G. Nichols shall faithfully keep and perform the terms of this agreement, the said Taylor Iron and Steel Company shall at the end of each year during the continuance of this agreement, deposit with the Trust Company of New Jersey, of Hoboken, New Jersey, in trust for the said Wesley G. Nichols, the sum of Fifteen hundred dollars, the sums so deposited, Seven thousand five hundred dollars in all, with any interest accumulations allowed by said Trust Company, to be paid to the said Wesley G. Nichols at the expiration of the said period of five years. Should the said Wesley G. Nichols die within the said period of five years and while in the employment of the said Taylor Iron and Steel Company, under this agreement, the said Taylor Iron and Steel Company shall deposit with said Trust Company the proportionate amount of Fifteen hundred dollars for the year in which such death shall occur, and the whole amount so deposited shall be paid by said Trust Company to the Executors or administrators of the said Wesley G. Nichols.

(4.) This agreement shall be terminated by the death of the said Wesley G. Nichols, or by the

failure of the said Wesley to faithfully observe and keep the terms and conditions of this agreement by him to be kept and performed; and if this agreement shall be terminated for any other cause than the death of the said Wesley G. Nichols, then the sums deposited with the said Trust Company of New Jersey, of Hoboken, New Jersey, in accordance with the terms of this agreement, prior to such termination shall be paid by the said Trust Company to the said Taylor Iron and Steel Company, and the said Wesley G. Nichols shall have no right or interest therein, and no such termination of this agreement shall release the said Wesley G. Nichols from his agreement not to divulge to any person, firm or corporation, except to the Taylor Iron and Steel Company or its officers, any information of any nature now known to him, or hereafter acquired by him during the term of this agreement, relating to or regarding any process of steel making or moulding or treating steel that may have been, is now, or may be hereafter, during the term of this agreement used in the works of the Taylor Iron and Steel Company, and to hold at all times inviolate the treatments, processes and secrets known to him or used by him in the works of the said Taylor Iron and Steel Company; and no termination of this agreement, or any forfeiture hereby provided, shall deprive the Taylor Iron and Steel Company of any remedy it might have had during the continuance of this agreement, or at any other time, for any violation of any of the terms and conditions of this agreement.

IN WITNESS WHEREOF, the Taylor Iron and Steel Company has caused this agreement to be signed by its President, and its corporate seal to be hereto affixed, attested by its Secretary, and the said Wes-

ley G. Nichols has hereto set his hand and seal, the day and year first aforesaid.

(signed) TAYLOR IRON AND STEEL COMPANY,
LEWIS H. TAYLOR,
President.

Attest:

T. F. BUDLONG,
Secretary.

(signed) WESLEY G. NICHOLS.

Witness as to Wesley G. Nichols,
WALTER BRINTON.

SIX: That under said contract the said Wesley G. Nichols continued to serve your orator, acting as theretofore as Assistant Superintendent of the Steel Foundry until the thirty-first day of July in the present year; that on that date the said Wesley G. Nichols addressed a letter to your orator's Superintendent, of which the following is a true copy:

"HIGH BRIDGE, N. J.,
July 31, 1905.

Mr. PERCIVAL CHRYSTIE,
Supt. Taylor Iron and Steel Co.,
High Bridge, N. J.

Dear Sir:

I hereby tender you my resignation, to take effect this day, July 31, 1905. I feel this to be my honest duty. I no longer could work in perfect harmony.

If you will kindly mail me a state of my account for the month of July, whatever difference may exist I will liquidate.

Thanking the company and yourself very much for past kindnesses to me, I am,

Very truly yours,
(Signed) WESLEY G. NICHOLS."

That your orator has not accepted such resignation or in any way acquiesced in the attempt of said Wesley G. Nichols to terminate the contract under which he is employed by your orator; that your orator's said Superintendent had no authority to accept such resignation, and so orally informed the said Wesley G. Nichols.

SEVEN: That the said Wesley G. Nichols is a married man, and resides in the Borough of High Bridge, where the works of your orator are located, occupying with his wife and family a house in said borough; that he left his home on Friday, the fourth day of August, and went at once to Chicago, in accordance with arrangements made by him with the American Brake Shoe and Foundry Company, that of the said arrangements made by American Brake Shoe and Foundry Company with him, and the terms thereof, your orator has no knowledge, but your orator alleges and charges the truth to be that a contract for a term of years has been made by the said American Brake Shoe and Foundry Company with the said Nichols, under which he is to be employed in the works of said American Brake Shoe and Foundry Company in the making of manganese steel castings; and after the receipt of the said letter of resignation your orator's said Superintendent sought an interview with the said Nichols, but did not succeed in seeing him until the evening of the second of August last; that on that evening your orator's said Superintendent, together with Howard E. White, one of your orator's directors, called without appointment at the house of the said Nichols and found him at home, and there had a long talk with him, urging upon him that he was under contract to the Taylor Iron and Steel Company for a term of years, which contract he was not at liberty to break at his

pleasure, and that the company would not willingly permit him to leave; that said Nichols then informed the said Chrystie and White that he had made a tentative argeement with the American Brake Shoe and Foundry Company; that he had, before making such arrangement, shown his contract with the Taylor Iron and Steel Company to Otis G. Cutler, President of the American Brake Shoe and Foundry Company, and to Mr. E. J. Snow; that he had been advised that it was not binding on him, but that the contract was the only thing that worried him; that he was told that the said Superintendent had no authority to accept his resignation in any event, and that his resignation would not be accepted, and after a lengthy interview finally stated that he would remain with your orator, as required by his contract; that, notwithstanding such promise, said Nichols left his home in High Bridge on the following day for New York, and after, as your orator is informed and believes, there holding further conference with the President and Superintendent of the American Brake Shoe and Foundry Company, went on to Chicago on Saturday with said Elmer J. Snow, General Superintendent of that Company, and at its expense, to take up his employment in the steel foundry of the American Brake Shoe and Foundry Company in that city, and your orator learning that he was in that city, in the employment of the said American Brake Shoe and Foundry Company, contrary to the terms of his contract with your orator, at once began an action in the Courts of the State of Illinois, and on the ninth day of August procured a temporary injunction enjoining said Wesley G. Nichols from serving the said American Brake Shoe and Foundry Company contrary to his contract with your orator.

EIGHT: That the said Howard E. White, one of your orator's directors, was informed by the said Otis G. Cutler, President of the American Brake Shoe and Foundry Company, on the seventh day of August at the office of the said company in the City of New York, that the American Brake Shoe and Foundry Company had tentatively employed said Nichols; that he, the said President, and Mr. Snow, the General Superintendent, had seen the contract of the said Nichols and would employ him notwithstanding that contract if he proved satisfactory; that said Nichols had stated that he, Nichols, had been advised that the said contract was not binding; that Joseph D. Gallagher, Vice-President of the said American Brake Shoe and Foundry Company, informed the said Howard E. White, one of your orator's directors, on the tenth day of August last, at the office of the said Foundry Company, in that city, that the American Brake Shoe and Foundry Company intended to employ Nichols and proposed to keep him unless prevented by legal proceedings; that the American Brake Shoe and Foundry Company had knowledge of the contract between the said Nichols and your orator, and that that contract did not prevent the employment of said Nichols by the said Foundry Company, as that company had been advised by its general counsel that the contract was not binding; that Edward H. Fallows, general counsel of the said American Brake Shoe and Foundry Company, informed the said Howard E. White, one of your orator's directors, in the City of New York, on the eleventh day of August, nineteen hundred and five, that he had so advised, and that Nichols had been or was to be employed by the American Brake Shoe and Foundry Company because of his knowledge of making manganese steel, and to superintend the foundry of the American Brake Shoe and Foundry Company for mak-

ing manganese steel, which it was not now able to make in a satisfactory way.

NINE: That the said American Brake Shoe and Foundry Company, with full knowledge of the said contract between your orator and the said Nichols, has induced the said Wesley G. Nichols to leave the employment of your in defiance of his said contract, has conspired with him to accomplish a breach of that contract in defiance of the rights of your orator thereunder, and to your orator's immeasurable and irreparable damage; that the said American Brake Shoe and Foundry Company is engaged in the manufacture of brake shoes and general castings, and if able to manufacture manganese steel according to the methods and processes in use in your orator's said works would become a competitor of your orator in a product now made only by your orator, and capable only of being made by anybody else with the aid of persons taught by your orator who have acquired information and knowledge as to the methods, processes and treatments of your orator while in your orator's employ under contracts of a confidential character; that wishing to make castings especially of manganese steel of a character equal to the castings produced in the foundry of your orator, and to compete with your orator in the sale thereof, and knowing that only by taking from your orator some of its trusted employees can the methods, processes and treatments of your orator be ascertained, the said American Brake Shoe and Foundry Company has, by underhanded means, and by trick and device induced and conspired with the said Wesley G. Nichols to desert the foundry of your orator in defiance of his contract relations, and to employ for the benefit of the American Brake Shoe and Foundry Company the knowledge, information and skill

he has acquired in the course of his employment by your orator; that the damages resulting to your orator from such action by the American Brake Shoe and Foundry Company are incapable of measurement, irreparable in character, and as to them your orator is without adequate remedy at law.

TEN: That the said Wesley G. Nichols is bound by the terms of his contract to devote his entire time, skill, labor and attention for a term of five years from the first day of March, nineteen hundred and five, in the service of your orator, and to at all times faithfully perform the duties assigned to him by the management of your orator to the best of his skill and ability for the compensation provided by such contract; that he has thereby expressly agreed that he would not at any time directly or indirectly during the term of said agreement or afterwards divulge to any person, firm or corporation except to your orator any information of any nature known to him at the date thereof or acquired by him during the term of said contract, relating to or regarding any process of steel making, or moulding or treating steel, that might have been, was then, or might be thereafter during the term of said agreement used in the works of your orator, and that he would at all times hold inviolate the treatments, processes and secrets known to or used by him in the works of your orator; that there has been no breach of said agreement on the part of your orator, and your orator has thus far faithfully observed and kept the terms and conditions of said agreement, and stands ready and hereby tenders itself ready to continue to perform said agreement on its part; that said agreement is still in full force and effect and binding on the said Wesley G. Nichols; but even if said contract had been terminated said Wesley G. Nichols would continue to be bound by

his agreement therein contained not to divulge to any person, firm or corporation except to your orator any information of any nature, relating to or regarding any process of steel making or moulding, or treating steel used in the works of your orator; that the said Wesley G. Nichols is a peculiarly skilled and trained employee of your orator, possessing acquaintance not only with the methods, processses and treatments in use in your orator's said foundry, and one skilled in the use thereof, and instructing and directing others in the use thereof, but has in other lines of your orator's business confidential information obtained in your orator's employment which made him at the date of the contract between your orator and said Nichols, on the fifteenth day of March, nineteen hundred and five, hereinabove referred to, a peculiarly skillful, valuable and useful employee, the loss of whose services secured to your orator for the term of the said contract will inflict damage on your orator far beyond that occasioned by the loss of an ordinary employee; that the damage so inflicted is incapable of measurement in dollars and cents, and if it were the said Wesley G. Nichols is without financial responsibility and wholly insolvent and unable to meet any judgment which might be recovered against him by your orator for breach of his contract; that no remedy at law is adequate to protect your orator against the consequence of a breach of said contract.

In tender consideration whereof, and for as much as your orator is without adequate remedy in the premises at and by the strict rules of the common law, and can only obtain relief in this Honorable Court, where matters of this nature are properly cognizable and relievable:

To the end therefore that the said Wesley G. Nichols and the said American Brake Shoe and

Foundry Company may, but without oath, answer or answers under oath being hereby waived, to the best and utmost of their respective knowledge, rememberance, information and belief, full, true and perfect answer make to all and singular the matters aforesaid, and that as fully and particularly as if the same were here repeated, and they and each of them distinctly interrogated thereto, and that the said Wesley G. Nichols may be enjoined from divulging directly or indirectly during the term of his said agreement or afterwards, to any person, firm or corporation other than your orator and its officers any information of any nature now known to him or hereafter acquired by him during the term of said agreement, relating to or regarding any process of steel making, or moulding, or treating steel, that may have been, is now, or may be hereafter during the term of said agreement used in the works of your orator, and from divulging treatments, processes and secrets known to or used by him in the works of your orator, and from devoting during the term of said agreement any part of his time, skill, labor and attention to the service of any person, firm or corporation other than your orator, and particularly from devoting any part of his time, skill, labor and attention during the term of said agreement to the service of said American Brake Shoe and Foundry Company and that the said American Brake Shoe and Foundry Company may be enjoined from continuing in its employment, or from hereafter employing during the term of said agreement, the said Wesley G. Nichols, and from using or applying directly or indirectly any information of any nature already communicated to or acquired by it, or hereafter communicated to or acquired by it directly or indirectly, by, through or from the said Wesley G. Nichols, relating to or regarding any proces of steel making or

moulding, or treating steel that may have been, is now, or may be hereafter during the term of the agreement between the said Wesley G. Nichols and your orator used in the works of your orator; and from using the treatments, processes and secrets belonging to your orator, and that your orator may have such further or other relief in the premises as the nature of the case may require, and as shall be agreeable to equity and good conscience.

May it please your Honor, the premises considered, to grant unto your orator not only the State's writ of injunction issuing out of injunction issuing out of and under the seal of this Honorable Court, to be directed to the said Wesley G. Nichols, restraining him from divulging directly or indirectly during the term of the said agreement or afterwards, to any person, firm or corporation other than your orator and its officers any information of any nature now known to him or hereafter acquired by him during the term of said agreement relating to or regarding any process of steel making, or moulding, or treating steel that may have been, is now, or may hereafter during the term of said agreement used in the works of your orator, and from disclosing treatments, processes and secrets known to or used by him in the works of your orator, and from devoting during the term of said agreement any part of his time, skill, labor and attention to the service of any person, firm or corporation other than your orator, and particularly from devoting any part of his time, skill, labor, attention during the term of said agreement to the service of said American Brake Shoe and Foundry Company, and restraining the American Brake Shoe and Foundry Company, its officers, agents, attorneys, servants and employees from continuing in its employment or from hereafter employing during the term of said agreement, the said Wesley

G. Nichols and from using or applying directly or indirectly any information of any nature already communicated to or acquired by it, or hereafter communicated to or acquired by it directly or indirectly by, through or from the said Wesley G. Nichols, relating to or regarding any process of steel making or moulding, or treating steel that may have been, is now, or may be hereafter during the term of the agreement between the said Wesley G. Nichols and your orator, used in the works of your orator; and from using the treatments, processes and secrets belonging to your, but also the State's writ or writs of subpœna issuing out of and under the seal of this Honorable Court, to be directed to the said Wesley G. Nichols and the American Brake Shoe and Foundry Company, commanding them and each of them by a certain day and under a certain penalty therein to be expressed, to be and appear before your Honor in this Honorable Court, then and there to answer all and singular the said premises, and to stand to, abide by, and perform such order and decree therein as to your Honor shall seem meet, and as shall be agreeable to equity and good conscience.

And your orator, as in duty bound, will ever pray, etc.

PITNEY & HARDIN,
Solicitors of Complt.
JOHN R. HARDIN,
Of Counsel.

Answer of defendant American Brake Shoe and Foundry Company.

(Filed December 13, 1905.)

The answer of the defendant The American Brake Shoe and Foundry Company to the bill of complaint of the Taylor Iron and Steel Company.

This defendant answering says, that it is informed, and believes it to be true, that the complainant was organized as in the Bill set forth, and that it carries on the business of making castings of iron and steel under the Hadfield process, but denies that the complainant carries on such business under any secret processes or that it possesses and uses methods and treatments peculiar to the complainant and unknown to other makers of steel castings; and it denies that the castings of complainant are superior to those of other manufacturers of similar products, and denies that the employees of complainant are taught specially the methods and processes of complainant; and denies that they have long been employed under contracts not to disclose the methods and processes communicated to them in their employment; and denies that the superintendent or assistant superintendent of the foundry have acquired any peculiar skill or knowledge beyond what is possessed by similar skilled workmen in like employments; and denies that the processes, methods and treatments used in complainant's foundry are valuable property-rights of the complainant, or are entrusted to its employees in the course of confidential employment, or under any agreement that the same shall not be imparted to others.

Answer of Defendant American Brake Shoe & Foundry Company.

This defendant is informed and believes that Wesley G. Nichols was employed by complainant in March, eighteen hundred and ninety-six, under a contract for a term of six years, but denies that such employment was under any understanding that he would not make known any knowledge which he might obtain at the works, or that he would not adopt or use elsewhere any process, system or mixture in use at the works.

And this defendant is informed, and believes it to be true, that after the expiration of said contract the said Nichols continued in the employ of the complainant from month to month, and that he was paid wages, as set forth in the Bill; but denies that any of said employments were upon the agreement that he should not impart any information or knowledge which he might obtain in complainant's works, or that he would not adopt or use, except for complainant, any of the processes or treatments in use in the works; and this defendant denies that all the men employed in the factory were employed by the complainant on the understanding that no information obtained in the course of their employment should be imparted to others.

And this defendant denies that Wesley G. Nichols acquired information concerning the business affairs of the complainant in addition to the special skill and knowledge acquired by him in the work of the foundry.

This defendant is informed and believes that Elmer G. Snow, its general superintendent, in March, nineteen hundred and five, visited the factory of the complainant; and is informed that he was denied the privilege of visiting the works of complainant, except its machine shop; and is informed that he had an interview with the defendant, Nichols; but this defendant is informed that it is not true that the said Snow offered said Nichols employ-

ment with this defendant for a term of years at seven thousand dollars per year and a block of stock of the said Foundry Company; and this defendant says that a negotiation was had, in a proper and lawful manner, between the said Snow and said Nichols with a view to his employment as superintendent by this defendant, which negotiation resulted in the decision on the part of said Nichols not to enter into the employ of this defendant.

This defendant is informed and believes that a contract, dated March fifteenth, nineteen hundred and five, was executed by the Taylor Iron and Steel Company, and signed by Wesley G. Nichols (a copy of which is contained in the Bill); and this defendant is informed and believes that the same was procured to be signed on the part of the said Nichols improperly and unfairly, and that the said Nichols is not bound by said contract, under the circumstances attending its execution.

This defendant believes it to be true that the said Nichols resigned his position with the complainant and refused to continue in their employ, for reasons connected with his personal relations with employees of the complainant, and with which this defendant has no concern. And this defendant is informed that the complainant denied the right of the said Nichols to leave the employ of the complainant, and admits that one of the directors of the complainant so informed the officers of this defendant, and that a temporary injunction was obtained in the Courts of the State of Illinois in a suit brought by complainant against Wesley G. Nichols and against this defendant, wherein the said Nichols was enjoined from serving this defendant.

This defendant denies that its president, on the seventh day of August, nineteen hundred and five, or at any other time, informed any of the direct-

ors or officers of the complainant that the Company had tentatively employed the said Nichols, or that it intended to employ him, or that it had been advised by its counsel that the contract of said Nichols was not binding, or that it proposed to employ the said Nichols because of his knowledge of making manganese steel, or that this defendant was not able to make manganese steel in a satisfactory way.

And this defendant denies that it has induced the said Nichols to leave the employ of complainant, or that it conspired with him to break that contract, or that it has attempted to employ the said Nichols with a view to obtain any of the methods or processes or treatments of the complainant, or that it has, by trick or device or otherwise, induced or conspired with the said Nichols to desert the complainant's foundry, or to employ, for defendant's benefit, any knowledge or skill or information acquired by him in the course of his employment by complainant.

All which matters this defendant is ready to maintain and prove, and prays to be hence dismissed, with costs.

COLLINS & CORBIN,
Solicitors for The American Brake Shoe and Foundry Co.

Answer of defendant Wesley G. Nichols.

(Filed April 18, 1906.)

The answer of Wesley G. Nichols, one of the defendants, to the bill of the above-named complainant.

This defendant is informed and believes it to be true that the complainant was organized as in the Bill set forth, and that it carries on the business of making castings of iron and steel, but denies that it carries on such business under any secret process, or that it possesses and uses methods and treatments peculiar to complainant and unknown to other makers of steel castings, and he denies that the castings of complainant are superior to those of other makers of similar products, and that the employees of complainant are taught special methods and processes, and that they have long been employed under contracts not to disclose the methods and processes communicated to them in their employment, and denies that the superintendent and assistant superintendent of the foundry have acquired any peculiar skill or knowledge beyond that of similar skilled workmen in like employment, and denies that the processes and treatments used in complainant's foundry are valuable property rights of complainant, or are entrusted to its employees in the course of confidential employment, or under any agreement that the same shall not be imparted to others.

He admits that he was employed as assistant superinendent by complainant in March, 1896, and continued in such employment down to March, 1905, but denies that such employment was under any agreement that he would not make known any knowledge that he might obtain in such employ-

ment, or that he would adopt or use elsewhere any process, system or mixture in use at the works, and denies that any special or secret processes of complainant were made known to him, or that he did acquire there from complainant any instruction or special skill in the use of methods or processes; and he denies that he acquired confidential information concerning the business affairs of complainant.

He is informed that Elmer G. Snow, the superintendent of the defendant company, visited the factory of complainant in March, 1905, and was denied the privilege of visiting the foundry or any part of the works except the machine shop. He admits that he conversed with said Snow with reference to entering the employ of the defendant company as he might lawfully and properly do, and he says that the negotiation terminated soon after on his decision not to enter into the employ of the defendant company.

He admits that a contract, dated March 15, 1905, with the complainant, was signed by him, a copy of which is annexed to the Bill, but says that said contract was prepared by complainant without consulting him, and after he had refused to enter the employmenut of the defendant company, and at such a time and under such circumstances that he was in no position to properly protect his rights, that he acted, in signing the same, without proper advice and without understanding the terms and effect of the document, and that unfair advantage was taken of him in the preparation of the paper, and in procuring his signature thereto; that the terms of said contract are unfair and unreasonable, as will appear by an inspection of said contract; and he says that the complainant is not entitled to the aid of a court of equity in the enforcement of said contract.

Answer of Defendant Wesley G. Nichols.

He admits that he resigned his employment in writing on July 31st 1905, having discontinued work several days before, and has not since worked for the complainant in any capacity; but he denies that he left the employment of complainant by persuasion of the defendant company, and says that he left such employ because of offensive interference of employees of the company in his personal and family affairs; and he says that the complainant, prior to the commencement of this suit, employed his personal enemies to spy upon him, and circulated scandals about him, and stirred up mischief in his family, and made the village of High Bridge, where the business of the company is carried on, intolerable as a place of residence for himself and for his family.

He admits that on the fourth day of August, 1905, he went to Chicago, but he denies that he went there under any contract with the defendant company, and states the fact to be that he went there and visited a steel plant of said defendant company with a view to negotiate with the company for employment after he should have ascertained the nature of the required services; and he says that he has not, at any time, made any contract for employment, or other contract with said defendant company; and he denies that he has contemplated or desires to disclose or use any peculiar methods of complainant, or any trade secrets, or that he knows any such methods or secrets.

He says that prior to 1896 he was employed for about ten years in the making of steel, and acquired a knowledge of the business, working for a part of the time with Mr. Brinton, mentioned in complainant's Bill; that at the time of his employment by complainant, along with said Brinton, the complainant was not succeeding in the making of steel, and that this defendant, together with said

Brinton, made steel for complainant successfully by introducing the ordinary and well-known method, which they had learned and practiced before entering the employ of complainant, and this defendant learned nothing of value, then or later, from complainant, and did not practice or learn of any methods, except those in common use, and often practiced and published.

All which matters this defendant is ready to maintain and prove, and prays to be hence dismissed, with costs.

COLLINS & CORBIN,
Solicitors for and of Counsel
with said Defendant.

In Chancery of New Jersey.

Between—
TAYLOR IRON & STEEL COMPANY,
Complainant,

and

WESLEY G. NICHOLS *et al.*,
Defendants.

Transcript of Stenographer's notes of evidence, taken in the above-entitled cause, before his Honor, JAMES J. BERGEN, Vice-Chancellor, at the Chancery Chambers, Newark, N. J., November 8th, 1906, at 10 A. M.

APPEARANCES:

Messrs. PITNEY & HARDIN (Mr. Hardin) and Mr. R. V. LINDABURY, for the Complainant.

Messrs. COLLINS & CORBIN (Mr. C. L. Corbin), and Mr. EDWARD H. FALLOWES and Mr. JOHN B. GOODE, of the New York Bar, for the Defendants.

PERCIVAL CHRYSTIE, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. Highbridge, N. J.

Q. What is your occupation? A. I am Vice-President of the Taylor Iron and Steel Co.

Q. What is the business of the Taylor Iron and Steel Co.? A. Manufacturing steel castings, iron castings of various kinds, but particularly manganese steel castings.

Q. And where are the works of the Taylor Steel and Iron Co.? A. At Highbridge, N. J.

Q. How long have you been connected with the Taylor Steel and Iron Co.? A. Since 1887.

Q. You mean you have been connected with the Taylor Steel and Iron Co. since the year 1887? A. The Taylor Iron Works it was originally, and then it became the Taylor Iron and Steel Co.

Q. Do you recall when it was the Taylor Iron and Steel Co. was organized, the present company? A. In 1891 or 1892—1891 I think.

Q. Were you connected with the company in 1905? A. Yes, sir.

Q. What position did you have at that time with the company? A. Superintendent.

Q. Are you also a director of the Taylor Steel and Iron Co.? A. Yes.

Q. And were you in 1905? A. Yes; part of the time.

Q. Do you recall the organization of the Taylor Steel and Iron Co., the present company, the time of the organization? A. I think it was in 1891.

Q. What, if anything, was introduced at that time into the Taylor Steel and Iron Co.? A. The Hadfield system of making steel castings.

Q. What arrangements were made at the works for the use and production of that system—were any new buildings constructed? A. New buildings were constructed for the machinery, and new machinery for the grinding of the castings and for the manufacture of them.

Q. And were those buildings separate from the others, or were they protected in any way? A.

Yes, sir; they were separated from the original old forge and machinery, and also the car-wheel foundry, and the new steel works was protected by the erection of a fence all around it, and the entrance to the steel works were protected by watchmen.

Q. What was the purpose of all this protection? A. To keep the people away except those who were employed there.

Q. To keep them away from where? A. To keep them away from the works.

Q. Is that continued to the present time? A. That is continued to the present time.

Q. You spoke about the introduction of the Hadfield system—where did that come from? A. From Sheffield, England.

Q. Well, did it come out of a sugar factory or where? A. No, sir; Mr. Hadfield had a large steel plant there, and he had been very successful in the manufacture of steel castings and projectiles.

Q. Do you know Wesley G. Nichols? A. I do.

Q. How long have you known him? A. Since 1896.

Q. Where did you first meet him? A. At Highbridge, N. J.

Q. Under what circumstances? A. He was brought there as an employee of the works.

Q. On whose recommendation, do you recall? A. On the recommendation of Mr. Walter Brinton.

Q. Who was Mr. Brinton? A. He was an employee of the works at that time.

Q. In what capacity was Mr. Brinton employed? A. As an assistant at first.

Q. Mr. Brinton I am speaking of? A. When he first came to Highbridge he was engaged as assistant to the Superintendent of the steel foundry.

Q. And later what did he become? A. Superintendent of the steel works.

Q. Is he so still? A. Yes.

Q. And was such superintendent in 1905? A. Yes.

Q. In what capacity was Mr. Nichols first employed? A. As foreman in what we termed the Fettling shop, where the castings are cleaned and prepared for shipment and machining.

Q. And later? A. He finally became assistant superintendent of the steel works.

Q. What in general were the duties of the assistant superintendent? A. Well——

Q. Was he assistant superintendent in the early part of 1905? A. Yes.

Q. How long after he came there did he become the assistant superintendent? A. I don't think I can give you an exact answer to that—it was several years, I think.

Q. Now, then, can you tell us what the duties of the assistant superintendent were in a general way? A. The duties of the assistant superintendent, were to carry out all orders given in by his superior officer, to assist in the making of steel and the preparation of the moulds, the treating of the steel and the shipping of the steel.

Q. And were the duties of the assistant superintendent of the steel department exercised in the steel plant, or where? A. In the entire steel plant.

Q. And was his position or work within or without this enclosure you have spoken of? A. Within.

Q. To what extent is the assistant superintendent acquainted with the methods of treating and making steel and steel castings, and so on? A. He is fully acquainted.

Q. With every branch of the work? A. Yes; with every branch of the work.

Q. Was Mr. Nichols so acquainted? A. Yes.

Q. How did he become so acquainted with the

work? A. He was taught by his superior officer, Mr. Brinton.

Q. How many years was his education going on? A. From 1896 up to the time he left Highbridge.

Q. Do you know whether or not when he was first employed, he was employed under circumstances pledging him to secrecy as to his work? A. I do.

Q. Have you brought with you a paper signed by him at that time? A. I have.

Q. Is this the paper (handing witness paper)? A. That is the paper.

Q. Do you know the handwriting in which that paper is written? A. Yes.

Q. And you know Mr. Nichols' handwriting? A. Yes.

Q. It is signed by Wesley G. Nichols? A. Yes, sir; it is signed by Wesley G. Nichols.

MR. HARDIN—I offer that paper in evidence, it reads as follows:

"TAYLOR IRON & STEEL COMPANY,
HIGH BRIDGE, NEW JERSEY,
March 16/96.

"TO THE TAYLOR IRON AND STEEL CO.,
AND R. A. HADFIELD,

In consideration of the said Taylor Iron & Steel Co. allowing me to inspect its steel works on the R. A. Hadfield system at High Bridge, N. J., giving me information in relation to the R. A. Hadfield system I promise and give my word of honor, that I will not before January 1st, 1902, make known to any person whomsoever except the officials of the said Taylor Iron & Steel Co. any information, which I shall receive at the said works, nor any information or knowledge which I may obtain from

said inspection, nor will I adopt or use except on behalf of the said company all or any part of any process or system or any mixture or combination of mixtures in use at the said works whether what I shall see or be informed or learn may be novel or not. And that if I shall act contrary to my promise then and in each case I will pay to each of you the sum of $2500 as liquidated damages and not by way of penalty.

Provided always that notwithstanding anything herein contained I shall be at liberty to do any work which does not relate to steel castings of any kind of Manganese steel or other steel covered by the said R. A. Hadfield patents.

WESLEY G. NICHOLS

Witness

J. M. SHERRERD."

Marked Exhibit C 1.

Q. When was this paper signed with reference to the time Mr. Nichols was allowed to go into the steel foundry? A. The time he was first employed?

Q. Before his admission to the works or afterwards? A. It was before.

Q. Do you know what the original term of Mr. Nichols employment was? A. What the original term?

Q. Yes; the original time when he first came with the company, how long was he employed originally? A. I think it was indefinitely, but I had nothing to do with his employment, I don't know. I cannot answer that question.

Q. Did he continue with the company until January 1st, 1902? A. Yes, sir.

Q. Continuously from March, 1896? A. He did.

Q. And after that time? A. Yes; he did.

Q. Under what terms after January 1st, 1902? A. The terms, as I understand it, of the agreement, although at that time I had nothing to do with it——

Q. Do you know whether Mr. Brinton, the superintendent of the steel works, was originally the assistant superintendent who came about the time Mr. Nichols did, was under like arrangement as to the confidential character of his work? A. Yes; he was.

Q. Do you know Mr. E. J. Snow? A. I have met him.

Q. Where did you first meet him? A. At my office at High Bridge, N. J.

Q. When? A. I think it was March 7th, 1905.

Q. And under what circumstances? A. He came there asking for permission to go through our works, he was accompanied by Mr. Estie, his cousin, and I gave him permission to go through the machine shop.

Q. Did he identify himself in any way to you? A. Yes; he brought a letter of introduction from Mr. W. W. Snow.

Q. Who was Mr. W. W. Snow? A. W. W. Snow was an old friend of my uncle, W. J. Taylor, and was connected I think with the Ramapo Iron Works, a man I had heard of ever since I was a little boy.

Q. You mean originally connected with the Ramapo Iron Works? A. Originally connected with the Ramapo Iron Works.

Q. What was his connection at the time, or in March, 1905, with what concern was he identified then? A. I don't know what concern he was identified then with.

Q. Do you know now? A. With the American Brake Shoe and Foundry Co.

Q. Is this the letter Mr. E. J. Snow handed to you (handing witness a paper)? A. Yes, sir; it is.

Q. At the time you mention in March, 1905? A. It is; yes, sir.

MR. HARDIN—I offer this letter in evidence.

Marked Exhibit C 2, and reads as follows:

MR. CORBIN—I object to the offer as immaterial—I don't see how anything that Mr. W. W. Snow can say would bind these parties—it is only a letter of introduction.

COURT—I understand he is connected with the defendant company.

MR. CORBIN—There is no evidence of it yet.

COURT—If, as a result of that letter, his company succeeded in getting a man into the works of complainant, as they charge, and to undertake to seduce one of their servants away from their employ, I should think it would be important. If he did not represent that company, that would be an entirely different thing.

(*Mr. Hardin.*)

Q. You knew the position that Mr. W. W. Snow occupied with the American Brake Shoe and Foundry Co., did you not? A. I know it now, I did not know it at that time, if I had known it at the time Mr. E. J. Snow would not have gone through the works at all.

Q. What was the relation of Mr. W. W. Snow with the American Brake Shoe and Foundry Co.? A. He was chairman of the executive committee.

COURT—I will admit the letter.

Exhibit C 2 reads as follows:

"HILLBURN, ROCKLAND CO., NEW YORK.

(Received High Bridge, N. J.
March 7-1905. Ref'd to.)

"Messrs. TAYLOR IRON WORKS,

GENTLEMEN:

The bearer of this note Mr. E. J. Snow is my son-in-law, and desirous of visiting your works while visiting Mr. Estes. Any courtesy you may show him will be greatly appreciated by

Yours Sincerely
(Signed) WM. W. SNOW.

P. S.—Your Genl Manager may remember me as the party who assisted in establishing your car wheel foundry many years ago, and furnishing the Foreman also moulders and melter together with Patterns and flasks from Ramapo."

(*Mr. Hardin.*)

Q. Had you met W. W. Snow before that time? A. I had.

Q. When and where? A. I met him a few years ago in New York with my uncle, and we all dined together.

Q. What uncle? A. Mr. Wm. J. Taylor.

Q. Who was Wm. J. Taylor with reference to the Taylor Iron and Steel Co.? A. He was a director, and he was the founder of the Taylor Iron & Steel Co.

(*M. Lindabury.*)

Q. The founder of the works? A. Yes, sir.

(*Mr. Hardin.*)

Q. What happened after you got that letter with reference to E. J. Snow? A. I gave Mr. Snow and Mr. Estes a pass to admit them through the gates—they went through the gates.

Q. Did you explain anything to them about the general admission to the works? A. I told Mr. Snow that Iwas sorry we could not allow him to go through the foundry, we had a very strict rule against that, but I would allow him to go through the machine shops where the casting were being machined and shipped.

Q. Did you give him any reason? A. Yes; I told him we had a secret process there, and he expressed great regret that he could not go through.

Q. Did he take your card for the rest of the works? A. He took the card for the steel works, the works inside the inclosure.

Q. Did you see Mr. Snow again that day? A. I did not.

Q. Who went with him when he went out of the works? A. Mr. Clarence Estes, his cousin, and our pattern maker.

Q. Do you know whether or not E. J. Snow saw Mr. Nichols that day when visiting your works? A. I know that he did see Mr. Nichols that day.

Q. From whom did you know that? A. Mr. Walter Brinton, and also from Mr. Nichols himself.

Q. When did Mr. Nichols tell you that Mr. Snow had seen him on that day, how shortly after? A. A day or two afterwards.

Q. What did Mr. Nichols tell you at that time, as to the conversation between E. J. Snow and himself? A. He said Mr. Snow had offered him a salary of $7,000 a year, and a bonus in stock of the American Brake Shoe and Foundry Co. of $10,000, to be given him at the end of a term of employment.

Q. Did he tell you what the term was to be? A. I think he stated three years.

Q. For what, what was the work? What did he want to employ him for? A. To teach them how to make Manganese steel.

Q. Where? A. At their works in Chicago Heights.

Q. What works? A. The works of the American Brake Shoe and Foundry Co.

Q. Did Mr. Nichols tell you how he came to have this talk with Mr. Snow? A. Yes.

Q. Tell us about that? A. He said that Mr. Estes had sent a man into the foundry to him, and he went out to see Mr. Estes and his friend, and Mr. Estes went to one side, and Mr. Snow made him this offer.

Q. What did Mr. Snow say to him, what did Mr. Nichols say Mr. Snow said to him? A. That they wanted someone——

Q. Who? A. The American Brake Shoe and Foundry Co. wanted someone, indeed a man to teach them to make Manganese steel, they had experimented, and had bare results, and they had heard of him, and he, Mr. Snow, had come to High Bridge for the purpose of making Mr. Nichols an offer, hoping to induce him to join them in Chicago.

(*Mr. Lindabury.*)

Q. Did he say Mr. Snow had mentioned this position with the American Brake Shoe and Foundry Co.? A. He said, as I recall it, that Mr. Snow was one of the higher officers of the American Brake Shoe and Foundry Co.

(*Mr. Hardin.*)

Q. Did he say anything further to you? A. He said it was a very tempting offer——

Q. That was what Mr. Nichols said; did Mr. Nichols tell you that Mr. Snow said anything further to him, made any suggestions about the compensation? A. Yes; Mr. Snow requested Mr. Nichols to keep the matter absolutely confidential, which Mr. Nichols said he informed Mr. Snow he would not do.

Q. Did Mr. Nichols tell you what he had decided, with reference to this proposition, he told you about the conversation, but did he tell you about the determination as to whether he would stay with you, or whether he would go away? A. At that time he did not say, except to say that he did not see how he could leave honorably.

(*Mr. Lindabury.*)

Q. You stated to us a little while ago, that Mr. Nichols said, "This was a tempting offer," and then you stopped? A. Oh, yes—Mr. Nichols said that the offer was very tempting, but that he did not feel he could honorably leave the Taylor Iron and Steel Co., and I advised him to think it over; I did not hold out any inducements.

(*Mr. Hardin.*)

Q. Did he finally tell you what he was going to do? A. Yes.

Q. What did he tell you? A. He told Mr. Brinton before he told me——

Q. What did he tell you is what I want? A. He told me he was going to stay with us.

Q. When was this, how shortly after this Mr. Snow's visit? A. That was the day he signed a contract with us.

(*Mr. Lindabury.*)

Q. About how long after the first conversation, a day or a week or how long? A. Just a few days.

(*Mr. Hardin.*)

Q. After that, did you take up the matter of the contract with him? A. Mr. Brinton had taken up the matter of the contract with him. Mr. Brinton presented him with the undersigned contract.

Q. Is this the contract to which you refer (handing witness paper)? A. It is.

Q. Was that contract prepared under your direction? A. Yes.

Q. Did you have conversations with Mr. Nichols about it? No; not previous to his signing it; it was presented to him by Mr. Walter Brinton.

Q. And you had your conversation with Mr. Brinton? A. Yes.

MR. HARDIN—This contract has already been read in the bill this morning, and I offer the original in evidence.

Marked Exhibit C 3.

Q. Did you have any talk with Mr. Nichols about this contract, after or at the time he signed it? A. After he signed it, he seemed to be very happy, and he remarked to me that he was the happiest man in New Jersey.

Q. Did he give any reason for his happiness? A. Yes; he felt that he had done an honorable thing, and he said he believed that it was his duty to remain with us, and he had come to a decision to do so without any persuasion on the part of any one connected with the company, and he felt that the company had treated him very handsomely in making this contract with him.

Q. Did this contract result in an increase of compensation for Mr. Nichols? A. Yes.

Q. Are you able to tell us the compensation he received at the time this contract was made? A. Yes; I am able to tell you what it was.

Q. Yes; what was it? A. $2,500 a year.

Q. During the time that Mr. Nichols had been with the company, his compensation had been from time to time increased? A. Oh, frequently.

Q. How long had it been $2,500, about? A. I think a year approximately.

Q. After you heard from Mr. Nichols that Mr. E. J. Snow came from the American Brake Shoe and Foundry Co., what did you do with reference to the letter you received from Mr. William W. Snow? A. I wrote him a letter expressing my indignation at what he had done.

Q. Have you got that original letter, Mr. Corbin?

MR. CORBIN—I have not.

MR. HARDIN—I have not given you any notice to produce it, so I will ask you if you have any objection to the production and use of a copy.

MR. CORBIN—It seems to me that it is incompetent; it is just a private correspondence between this gentleman and Mr. Snow, and has nothing whatever to with this case, and I think it is entirely incompetent.

MR. HARDIN—Have you any objection to the use of a copy, instead of the production of the original?

MR. CORBIN—No.

(*Mr. Hardin.*)

Q. Is that a copy of the letter you wrote to Mr. W. W. Snow (handing witness paper)? A. It is.

MR. HARDIN—I offer that copy of letter in evidence.

MR. CORBIN—I object to the offer as immaterial and incompetent and for the reasons already given, it being a private correspondence between these two gentlemen.

COURT—I will admit the letter.

Letter marked in evidence Exhibit C 4, and reads as follows:

"MARCH 10, 1905.

"MR. W. W. SNOW,
Hillburn, Rockland Co., N. Y.

DEAR SIR—

Your letter introducing your son-in-law, Mr. E. J. Snow, was handed to me by him on Tuesday last.

It is not our custom to admit any one to our works, but, owing to your letter, we made an exception in this particular case.

I have always heard my uncle, the late W. J. Taylor, speak of you in the highest terms, and you may recollect that about three years ago I took dinner with you and Mr. Taylor in a restaurant on Cortlandt Street, New York City. So when I gave Mr. Snow permission to visit part of our works, I assumed that I was dealing with a man of honor; and great was my surprise to learn that he, with the assistance of our Mr. Estes, had visited us for the purpose of hiring one of our foremen and also to give what information he could as to our methods of steel making. This may coincide with your idea of honor; but when a man under the guise of friendship tries to inflict an injury, it strikes me as a pretty low down trick.

Possibly you may not have known of the object of Mr. E. J. Snow's visit, and for that reason I address this letter to you.

Yours very truly,

(Signed) PERCIVAL CHRYSTIE,

Dictated P. C. Supt."

Q. Did you receive a reply to that letter? A. Yes, sir; I did.

Q. Is that the reply (handing witness paper)? A. Yes, sir; it is from Fred W. Snow.

MR. HARDIN—I offer that letter in evidence.

Marked Exhibit C. 5 and reads as follows:

"RAMAPO IRON WORKS,

HILLBURN, Rockland Co.,
N. Y., Mch. 17, 1905.

Dictated by F. W. S.

"MR. PERCIVAL CHRYSTIE, Supt.,
Taylor Iron & Steel Co.,
High Bridge, N. J.

DEAR SIR:

Your valued favor of the 10th inst. to W. W. Snow is received, and in his absence I can give you no information, as I am not acquainted with any of the circumstances referred to. Mr. W. W. Snow is in California and will not return for several weeks. When he does return, I believe there will be no difficulty in his explaining the matter to your entire satisfaction.

Yours very truly,

(Signed) FRED W. SNOW."

Q. Did you receive a direct reply from William W. Snow later? A. I did.

Q. Is that it (handing witness paper)? A. Yes.

MR. HARDIN—I offer that letter in evidence.

Marked Exhibit C 6, and reads as follows:

"RAMAPO IRON WORKS,

HILLBURN, Rockland Co., N. Y.

(Received High Bridge, N. J.,
May 9-1905. Ref'd to.)

"MR. PERCIVAL CHRYSTIE,
MY DEAR SIR:—

I find yours of March 10th on my return from California. The *last clause* of your letter covers the whole situation; therefore I can add nothing more.

Sincerely yours,
(Signed) WM. W. SNOW."

Q. After the disclosure by Mr. Nichols to you of this conversation with E. J. Snow, did you say anything to Mr. Estes about the matter? A. I did; I sent for Mr. Estes——

MR. CORBIN—I object to this as immaterial.

COURT—He can tell what he did but I shall overrule the conversation.

(*Mr. Hardin.*)

Q. What did you do as to Mr. Estes?

MR. CORBIN—I object to this as immaterial.

Question allowed.

A. I discharged him.

(*Mr. Hardin.*)

Q. Do you know where he is now? A. No.

Q. Do you know where he was after he left your employ?

MR. CORBIN—I object to that.

Objection sustained.

(*Mr. Hardin.*)

Q. Didn't you know, as a matter of fact, that he was employed by the American Brake Shoe and Foundry Co.?

MR. CORBIN—I object to the question—and as a fact it is not true.

Objection sustained.

(*Mr. Hardin.*)

Q. How long did Mr. Nichols continue with the Taylor Iron & Steel Co. after the execution of this contract of March, 1905? A. Until August, 1905.

Q. And was employed as heretofore, by your company after the time of this contract until the time of his leaving, in accordance with the contract? A. Yes.

Q. And when did you first learn that he intended to leave? A. On July 31st, 1905.

Q. How did you learn it? A. By receiving a letter from him, in which he handed in his resignation.

Q. Is that the letter you received (handing witness paper)? A. It is.

MR. HARDIN—I offer this letter in evidence.

Marked Exhibit C 7, and reads as follows:

"HIGH BRIDGE, New Jersey,
July 31st, 1905.

"MR. PERCIVAL CHRYSTIE,
Supt. Taylor Iron & Steel Co.,
High Bridge, N. J.

"DEAR SIR:—

I hereby tender you my resignation to take effect this day—July 31st, '05. I feel this to to be my honest duty, I no longer could work in perfect harmony.

If you will kindly mail me a statement of my account for month of July, whatever difference may exist I will liquidate.

Thanking the Company and yourself very much for past kindness to me—I am

Very Truly Yours,
(Signed) W. G. NICHOLS."

Q. Did you accept that resignation in any way? A. I did not.

Q. Did you see Mr. Nichols after that? A. I did.

Q. How soon after? A. On the evening of August 3d.

Q. Where? A. At his house.

Q. Did you communicate with him in the meantime at all? A. I had sent word to him that I would like him to come and see me, but he refused.

Q. Where did the interview that you have referred to take place? A. In the house occupied by Mr. Nichols.

Q. In whose presence? A. Mr. Howard E. White, Mr. Nichols and myself, that is all.

Q. How long did the conversation last? A. Oh, an hour or so.

Q. Now tell us that conversation? A. I asked Mr. Nichols what he intended to do. He said he

intended to go away. We discussed the matter, and before we left in the evening, he said he did not feel right about going, and he would not go. His principal grievance was that evening, that he had been shadowed by two men connected with the steel works, in an offensive manner, and he stated that he simply could not work with those men any longer.

Q. Is that all that was said? A. Mr. White, who was a director of the company, told Mr. Nichols that the contract he had with the company was a valid contract, and that he could not break it. Mr. Nichols was not threatened by either Mr. White or myself in the conversation, all evening, it was all taken in very good part on both sides.

Q. What, if anything, did Mr. Nichols say, about the Nichols contract with the Taylor Iron & Steel Co. himself? A. He had no objection to the contract at all, it was simply—well, his only grievance was, that he was shadowed by these two foremen from this steel works.

Q. Did he say anything to you, as to whether he had shown the contract to any one or not? A. He stated that he had shown it to Mr. Cutler, the president of the American Brake Shoe and Foundry Co.

Q. And anybody else? A. I am not clear about it.

Q. Did he say that he had shown it to E. J. Snow or not? A. Oh, yes, sir; he had shown it to Mr. E. J. Snow.

Q. Did he say anything about what these gentlemen had told him? A. He said they had told him, that the contract was no good, and he also said, that they were very anxious to have him.

Q. Did he say anything about for what purpose they wanted him on that occasion? A. On that particular occasion?

Q. Yes. A. No.

(*Mr. Lindabury.*)

Q. Was that the whole expression?

(*Mr. Hardin.*)

Q. Was that all that was said? A. There was very little said about any reason for leaving, other than that he had been shadowed by two fellow employees at the steel works, and it was very distasteful to him that he should be so shadowed.

Q. Who called his attention to the contract? A. That evening?

Q. Yes. A. Mr. White.

Q. And when his attention was directed to the contract, what did he say? A. He said that was the only thing that was bothering him.

Q. What was the only thing that was bothering him? A. The contract was the only thing that was bothering him in connection with his leaving.

Q. And was that the time that he said he had showed the contract to Mr. Snow? A. Yes.

Q. And they said that the contract was no good—that is what they had told him? A. Yes.

Q. Before you parted that night, what did Mr. Nichols say as to going or staying? A. He promised that he would stay and that he would report at the steel works the following Monday morning.

Q. Did he so report? A. He did not.

Q. When next did you see him? A. This morning.

Q. Was anything said in that conversation with reference to Mr. Nichols communicating with the American Brake Shoe and Foundry Co., as to his determination to stay with you, that is this night of this conference you have spoken of? A. I do not recall any.

Q. He did not say that he was going to write to them or would write to them, did he? A. I do not

recall—he promised faithfully and absolutely, however, that he was going to stay with us, and that he would report to the steel works the following Monday morning.

Q. Do you know Mr. Cutler, the president of the American Brake Shoe and Foundry Co.? A. I have met him.

Q. Do you know Mr. Gallagher? A. I have met him.

Q. And Mr. E. J. Snow? A. I have met him.

Q. Other than at the works at High Bridge, have you met him, Mr. E. J. Snow? A. No, sir, I have only seen him that once, I think.

Q. Where did you meet this other gentleman? A. At the office of the American Brake Shoe and Foundry Co. in Chicago.

Q. When? A. In August, 1905.

Q. What was the occasion of your visit there? A. It was a visit for the purpose of seeing whether some mutual agreeable arrangement could not be made between the Taylor Steel and Iron Co. and the American Brake Shoe and Foundry Co. in regard to Mr. Nichols.

Q. Who was present at that interview? A. Mr. Cutler, Mr. Gallagher, Mr. Fallows, Mr. Howard E. White, and the Chicago counsel of the American Brake Shoe and Foundry Co., I do not recall his name, and myself.

Q. What, if anything, was said at that conversation by those gentlemen connected with the American Brake Shoe and Foundry Co. concerning Mr. Nichols' employment by that company? A. They gave Mr. White and me to understand that they wanted him, and——

Mr. Corbin—I object to the understanding. I think we ought to have the statements made by the particular parties.

COURT—Yes, that is a pretty general statement, "They gave us to understand." What we want is what they said.

(*Mr. Hardin.*)

Q. What was said by these gentlemen? A. There was a discussion as to whether the matter of their retaining Mr. Nichols should be submitted to arbitration——

Q. Never mind that—I mean what was said with reference to the employment of Mr. Nichols by that company? A. They stated——

Q. Was it Mr. Cutler, Mr. Gallagher, Mr. Fallows or this other Chicago gentleman, that said it? A. It was Mr. Gallagher. Mr. Gallagher stated that Mr. Nichols was not in their employ at that time.

Q. Did he say anything else about it? A. He said they expected to take Mr. Nichols and that they were going to put "A seidlitz powder on that injunction and dissolve it," that is the way he expressed it, I remember that very well.

Q. On what injunction? A. On the injunction standing against the American Brake Shoe and Foundry Co. and Mr. Nichols in Chicago.

Q. When was that got? A. Early in August.

Q. Who got it—tell us about it? A. Mr. Howard E. White.

Q. Who was the complainant—at whose suit was the injunction obtained? A. The Taylor Iron and Steel Co. against Wesley G. Nichols and the American Brake Shoe and Foundry Co.

Q. What court was it brought in? A. In Chicago.

Q. What court? A. I don't know, sir.

Q. An Illinois court? A. Yes, sir, I presume so.

Q. Well, what else did Mr. Gallagher say about

this contract? A. He said this contract was not binding.

Q. Not binding on who? A. On Mr. Nichols.

Q. Did he give any authority for that? A. His own opinion.

Q. Was there anything else he said? A. I do not recall.

Q. Did he say anything about what the American Brake Shoe and Foundry Co. intended to do about Mr. Nichols? A. No.

(*Mr. Lindabury.*)

Q. Why, yes, they said "We are going to put a seidlitz powder on the injunction and dissolve it, and then take Mr. Nichols," didn't they? A. Oh, yes, I have already stated that, but in addition to that——

(*Mr. Hardin.*)

Q. Now, going back to the interview at High Bridge—was there anything said by Mr. Nichols that night with reference to his employment by the American Brake Shoe and Foundry Co.? A. Yes.

Q. Tell us about that? A. He said they wanted him and that he had been up there, to their office, and that he could go with them at any time.

Q. Did he say anything about contract? A. As I recall it, nothing about a contract that night.

Q. Well, any time, to you? A. Previously—I testified a while ago that they had offered him $7,000 a year.

Q. I know, that was in March, 1905? A. Yes, that was in March, 1905.

Q. Now, I mean in July—at the time of the talk of his leaving? A. No, I don't recall that there was anything said about a contract or an expected contract? A. No, sir, except that I was given to under-

stand that he could have a contract with them at any time.

Q. I know, but he did not say anything to you? A. No, not directly.

Q. Now, when you were in Chicago, what was the date you fixed for that? A. Early in August.

Q. At that time where was Mr. Nichols? A. In Chicago, so far as I know.

Q. Was there anything said at that conversation with the American Brake Shoe and Foundry Co. about Mr. Nichols? A. They said he was in Chicago.

Q. Who said so? A. Mr. Gallagher, and it was generally admitted in the talk all around.

Q. Was anything said about what he was in Chicago for? A. They stated——

Q. Who were "they"? A. In this general talk, sometimes Mr. Gallagher and sometimes Mr. Cutler, and sometimes Mr. Fallows, it was a general discussion.

Q. Tell us what you were going to say, and then if you can recall, who said it—tell us that? A. They said that Mr. Nichols was not in their employ at that time, and would not be until after the injunction was dissolved.

Q. Did they say that he was in Chicago, did they give any reason for that? A. No, sir, except that they expected to employ him after the injunction was dissolved.

Q. They did say something about it then? A. Yes, they said that.

Q. What class of castings are made by the Taylor Iron and Steel Co. that may now be distinguished between stock castings and special orders? A. What class of castings are——

Q. Do you make special castings or class castings? A. We make special castings.

Q. For what purpose? A. Stone and ore crush-

ing, contract work for both electric railways and steam railroads, with projectiles for the army and navy, gun shields, and various castings, as called for by our customers, for any purpose whatever.

Q. Car wheels and other castings? A. Yes, sir, we make car wheels, that is steel car wheels, but not in the steel works.

Q. Do you make tram car wheels? A. Yes, sir, tram car wheels, and car wheels of various descriptions and wheels used under cars, used on sugar plantations in the Philippines, Porto Rico, Mexico and other places.

Q. What are the specialties of the Taylor Iron and Steel Co.? A. Manganese steel.

Q. How long have they been making Manganese steel? A. Since ~~1902.~~ 1892.

Q. Are you able to tell us what are the peculiar physical qualities of the Manganese steel produced by your company? A. Hardness and toughness combined.

Q. And have you had opportunity to compare the castings made in your works with the castings made in other works? A. We have.

Q. In what way? A. We have had a great many samples of castings made by other people that we have put through physical and chemical tests.

Q. Have you been present at some of these physical tests? A. I have.

Q. And have there been many of such tests? A. Yes, sir, quite a number at various times during the last ten years.

Q. What is there distinctive of your castings, as compared with the others, if aything? A. Regularity.

Q. What do you mean by that, regularity in what, regularity in what physical property? A. Regularity so far as the analysis goes, and so far as the toughness and hardness goes—in other

words, we can make a small intricate casting, and a big heavy plain casting, and have them both equally good.

Q. And under what system are these castings made? A. Under the Hadfield system of Sheffield, England.

Q. When was that acquired? A. In 1891 and 1892.

Q. At the date of the organization of the Taylor Iron & Steel Co.? A. Yes, sir.

Q. Do you know who first made Manganese steel castings in this country, commercially? A. The Taylor Iron & Steel Co.

Q. Is that a large business now, the making of Manganese steel castings, as conducted by you? A. Yes, sir, amounting to hundreds of thousands of dollars a year.

Q. Are you acquainted with the sales made and the market price of your castings, as sold? A. Yes.

Q. Are you able to tell us how that price compares with the price of castings made by other concerns in competition in the market?

MR. CORBIN—I object to the question as immaterial and as calling for the conclusion of the witness—let us have the facts.

Question allowed.

A. We get considerably higher.

(*Mr. Hardin.*)

Q. Substantially higher? A. Yes.

Q. Do you know whether your company has been paying anything for the use of this Hadfield system? A. Has been paying royalty?

Q. Yes? A. Yes, sir, they have.

Q. Can you give us an idea of the amount that has been paid to these people—you say you began to manufacture in 1891 or 1892—can you give us an idea of the amount paid in royalties during that time to this English company? A. About $220,000.

Q. Are royalties being paid now for the use of this system to that company? A. Yes, they are, every month.

Cross-examination by Mr. Corbin.

Q. I call your attention to your conversation with Mr. Nichols at his house in August, 1905—I understood you to say that Mr. Nichols said he had been told by Mr. Cutler that the contract was not valid, is that your recollection of that conversation? A. That is the contract with us, the Taylor Iron & Steel Co.?

Q. Yes? A. Yes.

Q. Did he not tell you that an attorney had advised him that it was not valid, instead of Mr. Cutler, had so advised him? A. He mentioned Mr. Cutler's name.

Q. Didn't he tell you that an attorney had so advised him? A. I do not recall that.

Q. When you made an affidavit in this cause, the matters were more fresh in your memory then than they are now, were they not? A. Yes.

Q. You did not at that time say that he said Mr. Cutler had so advised, did you?

MR. LINDABURY—I object to the question.

(*Mr. Corbin.*)

Q. If that had been your recollection at that time you would have so stated, would you not, that he said that Mr. Cutler had so advised him, you would have so stated then? A. I might have done so, yes.

Q. You knew that Mr. Cutler was the president of the American Brake Shoe and Foundry Co., didn't you? A. Yes.

Q. Did you not at that time state in your affidavit that "Mr. Nichols stated that he had consulted an attorney about the contract, and he was advised that it was not binding," didn't you state that? A. If that is in the affidavit, I did.

Q. It does appear in the affidavit—if you so stated it in the affidavit, then it was right? A. Yes.

Q. That is correct, is it not? A. Yes.

Q. Your memory was fresher then than it is now? A. Undoubtedly.

Q. In that conversation did Mr. Nichols state who the men were who had shadowed him? A. He did.

Q. Who were they? A. Evans E. Winsell and Bardell O'Rourke.

Q. Were those men under your orders? A. In regard to this case of Mr. Nichols?

Q. Were they men in your employ, or in the employ of your company? A. Yes.

Q. And under your orders? A. Yes.

Q. And what they have done had been done under your orders? A. Absolutely not.

Q. Under whose orders? A. I don't know that they were done under anybody's orders.

Q. Did they remain in your employ? A. Those two men?

Q. Yes? A. Yes.

Q. Did you get affidavits from them in this cause? A. Not that I recall.

Q. And they are still in your employ? A. They are still in our employ.

Q. Who prepared the contract of March, 1905—you said it was done under your direction—to whom did you give those directions? A. The contract with Mr. Nichols?

Q. Yes? A. Why, it was prepared by Mr. John R. Hardin.

Q. Mr. Hardin? A. Yes.

Q. Did you go to Newark about it? A. Yes.

Q. And you gave him the directions what to put in it? A. I simply outlined what I thought would be a fair contract.

Q. And it was prepared and you took it back with you? A. I either took it back with me or it was sent to me.

Q. Why didn't you consult with Mr. Nichols before having the contract prepared, about the terms of it? A. I didn't think it was necessary, I thought Mr. Nichols could submit a counter proposition, after receiving the contract, if he was not satisfied.

Q. You did not have any counter proposition? A. I say Mr. Nichols could submit a counter proposition.

Q. You did not get any counter proposition? A. No, we did not get any counter proposition at all.

Q. And you gave it to Mr. Brinton and it was returned to you signed? A. No, sir.

Q. What did take place then? A. Mr. Nichols and Mr. Brinton came over to my office, and Mr. Nichols signed it in my office.

Q. It was produced there, and he signed it? A. No, sir, he had it with him.

Q. Where did you sign it? A. I had given it to Mr. Brinton.

Q. And they came back and signed it? A. Yes.

Q. You were present you say at an interview at Chicago, where Mr. White and yourself were present in behalf of the complainant company? A. Yes.

Q. Did Mr. White speak for your company in that conversation principally? A. Yes.

Q. What is his connection with the company? A. What is, or was?

Q. What was at that time his connection with the company? A. He was a director.

Q. What is his business? A. He is a lawyer.

Q. Was he counsel for the company? A. Well, as director, it was his duty—it was the duty of all the directors to look after such things—Mr. Hardin was the counsel of the company.

Q. Where was Mr. White's office? A. Where is Mr. White's office?

Q. Where was it? A. In New York.

Q. Did you have an office there? A. We have a sales office in New York.

Q. Is Mr. White still connected with the company? A. No.

Q. When did he cease to be a director of the company? A. I cannot give you the exact date.

Q. At this time, in Chicago, did not Mr. White disparage the knowledge of Mr. Nichols of the steel business? A. No, sir, I don't think that he did. He said this, "that he doubted that Mr. Nichols knew as much as the officers of the American Brake Shoe and Foundry Co. thought he did."

Q. Didn't he say there were certain contracts which Mr. Nichols could best fill, that would take three or four weeks and that that is what they wanted him back for? A. I do not recall that he did; no, sir.

Q. Did they say anything about having contracts that he could best fill? A. I do not recall that he used language to that effect.

Q. Didn't he say that so far as the part of the contract regarding the secrets were concerned, it was of no consequence, that the Taylor Iron and Steel Company did not care whether he divulged it or not, that he had no secrets of any value? A. That Mr. Nichols had no secrets of value?

Q. Yes, that it was of no consequence, that the Taylor Iron and Steel Co. did not care whether he

divulged the secrets or not, and that he had no secrets of any value? A. I did not hear him, not in my presence.

Q. Didn't you hear the whole conversation? A. I think I did.

Q. Didn't he say that the Taylor Iron and Steel Co. brought an action to make an example of Mr. Nichols as a matter of discipline in your shop? A. He did not, not in my presence.

Q. What did they say about re-employing Mr. Nichols—what did you say about that? A. That we were ready to live up to our part of the contract.

Q. Didn't you say that you would take him back into the shop? A. No, sir.

Q. Didn't you say that you would not take him back into the employment of the Taylor Iron & Steel Co.? A. I did not say so.

Q. Didn't Mr. White? A. Not that I now recall.

Q. Didn't Mr. White say that the company did not intend to take Mr. Nichols back to his former place, but meant to give him work somewhere else? A. I do not recall that.

Q. Was anything said about what they meant to do with Mr. Nichols in that conversation? A. Why, no, not that I know of; we would not discuss that with the American Brake Shoe and Foundry Co.

Q. Didn't Mr. White say that Mr. Nichols was only a man of routine, that he was only useful with somebody else over him? A. He said that Mr. Nichols was not as important a man as the American Brake Shoe and Foundry Co. thought that he was.

Q. Well, didn't he say that he was only useful with somebody else over him? A. He might have said that, but I do not recall it, if he did.

Q. Didn't he say that Mr. Nichols' usefulness to the Taylor Iron and Steel Co. was at an end, at High Bridge? A. I do not recall that he said that.

Q. You had a long conversation, did you not? A.

We were in the office for some little time, an hour or more, perhaps.

Q. What is your, or what was your profession before you went into the business of the Taylor Iron and Steel Co.? A. I had none.

Q. Were you a practical worker on steel? A. I was not.

Q. Do you consider yourself so now? A. I do not so consider myself an expert; no, sir.

Q. In the year 1892 you first began the manufacture of steel at High Bridge? A. Yes.

Q. That was under the Hadfield process? A. Yes.

Q. Now, the Hadfield process was patented in 1894—— A. The process was never patented.

Q. Didn't Mr. Hadfield have patents for the manufacture of steel? A. Yes, but his process was never patented.

Q. What process? A. His process of making steel castings.

Q. Do you know what his patents are? A. I have read them.

Q. The process of making steel castings is a very old process, not patentable by anyone anywhere? A. No, sir, I assume that it is not.

Q. Did Hadfield have patents for making Manganese steel? A. Yes.

Q. And you work under those patents? A. We work under his patents; yes, sir.

Q. You had licenses from Hadfield? A. Yes.

Q. Well, Hadfield made patents for a great many different alloys, didn't he, for Chrome steel and others? A. Yes.

Q. And the Manganese steel was the one you worked under? A. Yes, and also his others as well.

Q. What is that? A. We made castings on other patents of his.

Q. Other patents of Hadfield's? A. Yes.

Q. The original patents, is that still in force, or

is it run out? A. The original patent for Chrome steel or Manganese steel?

Q. Manganese steel? A. The original patent has run out for Manganese steel.

Q. Now, when you began work, that patent was still in force, and you got a license under it, did you not? A. Yes.

Q. How many men did you employ at the time in 1896, when Mr. Nichols was first employed? A. I cannot answer that question.

Q. Can you give us anywhere near it? A. I would not want to make any estimate.

Q. Were you then doing very much business in Manganese steel? A. In 1896?

Q. Yes? A. Our business was beginning to increase then.

Q. It was really at the beginning then, the beginning stage? A. No, sir; the beginning stage was earlier than that.

Q. Well, you were just beginning to put it successfully on the market? A. No, sir, we had had it in the market for several years previous to that.

Q. What other business were you going? A. In 1896?

Q. At that time in 1896? A. We were making iron and steel axles, forgings, and car wheels of cast iron, and the steel castings——

Q. And Manganese steel was a new feature of your business? A. Yes.

Q. And you worked that up from that time, that is from July, until it has become an important part of your business? A. Since 1892, yes.

Q. You say you do not know how many men you employed in that business since 1896? A. No, sir, I do not know.

Q. Well, as many as fifty? A. Yes, more than fifty.

Q. More than a hundred? A. I don't want to guess; I don't know, sir.

Q. How many did you employ in the spring of 1905? A. In the spring of 1905?

Q. Yes. A. Between 500 and 700, I should think.

Q. That is in your entire business, in your entire plant? A. Yes, sir, between five hundred and seven hundred in our entire plant.

Q. How many of those were in the steam plant? A. Oh, I could not say.

Q. Your work covers other work besides Manganese steel, does it not? A. Oh, yes.

Q. You still manufacture iron or work of that character? A. Yes, iron car wheels—no, we do not manufacture any more iron work, we do not make any more iron car wheels——

Q. What do you do besides make Manganese steel? A. Oh, we make other lines of steel, Chrome steel, Nickel steel, Manganese steel, Carbon steel—we have a great many varieties of steel that we make for different parties.

Q. In the manufacture of Manganese steel, what are your raw materials? A. What are the raw materials?

Q. Yes, which you use—you buy the iron in the pig, do you not? A. Yes.

Q. And you buy steel in the bars, or the iron? A. We do not buy steel at all.

Q. You make your own steel? A. Yes.

Q. But you buy the pig iron? A. Yes, we buy the pig iron.

Q. You buy it in the open market, I suppose? A. Either in the open market or by contract.

Q. You go in as other dealers do to get the pig iron? A. We are not dealers.

Q. Well, as other manufacturers do? A. I presume so.

Q. That is, you do not own the mine? A. No, sir.

Q. You simply buy the pig iron in the market? A. Yes.

Q. What other raw materials besides pig iron do you procure for your steel? A. What kind of steel —the Manganese steel or——

Q. Manganese steel? A. We purchase the ferro-manganese.

Q. And then the steel is handled in furnaces; that is, the pig iron is melted—— A. In the ordinary way.

Q. The pig iron is melted in the ordinary way, in the ordinary manner, in the furnace? A. Well, I don't know what you mean by the ordinary manner, there are a great many ways of doing it.

Q. How do you melt the pig iron? A. The pig iron is melted in the cupola.

Q. You use the cupola for melting the pig iron? A. Yes.

Q. When the iron passes from the cupola what is the next step? A. It goes through a process of being changed from iron into steel.

Q. Well, that is what you call a converter? A. It can be done with a converter and it can be done by the open-hearth process, or it can be done by the crucible process.

Q. Your process is not the crucible process—what is the process? A. Am I obliged to answer that question, your Honor?

MR. LINDABURY—You may answer the questions by our direction, except so far as the question involves a disclosure of your secret process or processes. And we will then discuss those questions as they may arise.

WITNESS—I do not care to go on any further, and state how we manufacture our steel, unless it is insisted upon.

MR. LINDABURY—We object to this line of examination, first on the ground that it is not cross-examination. We did not examine this witness as to their process of manufacture of the Taylor Iron & Steel Co., and therefore it is not a cross-examination of anything that was testified to on the direct-examination. I may say here that there are other witnesses under whose examination the question may arise, but it does not under the examination of this witness, and we therefore object to it on the ground that it is not a cross-examination.

COURT—Do you think you have the right under the principal examination of this witness, on cross-examination to have him divulge the secrets which he is trying to prevent being disclosed?

MR. CORBIN—I do not think that I am pressing him to disclose anything that is not well known in the business, the procedure is in use in other furnaces, as I understand it——

COURT—The latter part of that question might compel him in answering it to disclose the very matter that they do not want him to disclose—your question is a double question and I think for that reason it ought to be excluded.

(*Mr. Corbin.*)

Q. I will amend my question—you do not make it by the crucible process, do you?

MR. LINDABURY—I object to that question as an effort to find out which one of the

processes we do employ. We have put in no evidence by this witness to justify any such cross-examination of this witness upon that point.

MR. CORBIN—I recognize this fact, that this witness has stated that he is not an expert in this line. Now I am not trying to get out any of these secrets, but I am trying to get before your Honor the nature of this process—but I think we can get it more conveniently from other witnesses, and I will therefore withdraw this question.

(*Mr. Corbin.*)

Q. You have referred to comparisons of the quality of the steel made by the Taylor Iron & Steel Co. with that made by other dealers, when were the last tests of that character made? A. Recently, within the past few months.

Q. Where were they made? A. At our works.

Q. And by whom? A. By ourselves.

Q. By what particular member or number of employees of your concern who had charge of these experiments? A. We have a chemical and a physical laboratory, where these things are tested.

Q. Who is the person who made these tests? A. Our head chemist.

Q. Who is he? A. He is a man by the name of L. Boutellier.

Q. How long has he been with you? A. A number of years.

Q. Who made these chemical tests? A. He made the chemical tests or some of those under him, some of his assistants.

Q. Were there any other tests besides the chemical tests made? A. Oh, yes, sir; we make physical tests of various kinds.

Q. And those are all done under his direction? A. The chemical tests, yes.

Q. Of whose goods were the comparisons made at that time—take that last test for example? A. I do not recall those tests in detail; I know, as I stated before, that we made a great many tests; I have not followed them up carefully.

Q. You cannot tell the details of those tests? A. No, sir, I do not know them.

Q. Or with whose goods you compared yours? A. I do not know; no, sir.

Q. Those tests were made by him and it was on his opinion that you say your goods are superior? A. No, not altogether; it is on the information of our customers also.

Q. You are testifying now about tests, and you said they were superior, that is, your goods were superior, and that you ascertained that as a result of his tests? A. So they have been reported.

Q. Because he told you that? A. No, not necessarily.

Q. You took part in the tests yourself? A. Yes.

Q. And you are not able to tell us the goods that were tested? A. I cannot recall them right off-hand.

Q. You cannot recall the particulars of the tests? A. No, not right off-hand. I can tell you this, that we have never had anything, where the tests of toughness and hardnes have ever compared with ours.

Q. Can you give the date of the last test? A. No, sir, I cannot.

Q. Was any record made of those tests? A. I doubt that there was, there would have been a record made of the test if it was found to be equal to ours.

Q. Of these previous examinations, have you any record of those? A. Possibly we have.

Q. You are able to give any details of them? A. Yes, I can say that all the tests——

Q. That is not details, that is too general—can you name the parties whose goods you tested, and can you show the results of the tests?

MR. LINDABURY—We will do that by others, who have a hand in them.

Question withdrawn.

(*Mr. Corbin.*)

Q. You have stated that your prices are higher than those of other dealers; what others have you in mind? A. Not dealers.

Q. Well, other manufacturers? A. Other manufacturers.

Q. What manufacturers have you in mind? A. Well, do you want specific names?

Q. Yes. A. The Pennsylvania Steel Co., the American Steel Foundries Co., I think that is their title; it is a combination of a lot of steel foundries; and then the Penn. Steel Casting Co. of Chester, Pa.

Q. Chester, Pa.? A. Yes, sir, Chester, Pa.; I think that is the correct title of them, although I am not positive that it is—it is the Penn. Steel Castings Co., or the Penn. Casting Co., I don't just remember which.

Q. And that is at Chester, Pa.? A. Yes.

Q. And the Penn. Steel Co., where is that? A. At Steelton, Pa.

Q. And the American Steel Foundries Co., where is that? A. The American Steel Foundries Co., I understand they have several plants, scattered all over the country.

Q. Any others? A. Well, those concerns that I have named are the principal ones perhaps in the

country. Yes, I can think of another one, the Standard Steel Works, of Burnham, Pa.

Q. Those that you have named are all in Pennsylvania, are they not? A. No, the American Steel Castings Co., I think they have a plant in Indiana; their plants are scattered all over the country, though.

Q. Now, then, what are your prices—— A. And I will mention another concern, the Atha Steel Casting Co.

Q. That is in Newark here? A. Yes, sir; that is in Newark.

Q. Now, what are those prices that you say are higher, by your concern, than by the others— prices by the pound? A. By the pound, yes.

Q. What are your prices by the pound? A. They run from say five cents a pound to a dollar a pound. That is a very difficult question to answer, because it depends entirely upon the class of castings——

Q. The basis of fixing the prices is by the pound? A. Not necessarily, no; it depends how intricate the casting is, it depends on its weight, and how much coring is to be done.

Q. What I mean is, that you fix the figure by the pound, after having done all this work on the casting that you refer to? A. As a rule.

Q. In what way do you compare your goods with other classes, to see that your rates are higher than theirs? A. Because our customers tell us that they would prefer to pay us a higher price for our goods than for any goods they can get elsewhere, and that they can get castings cheaper from others than they can from us.

Q. Your customers will tell you that other people will sell them goods cheaper? A. Yes.

Q. Is that the source of your information? A. And in talking to the officials of one of the steel casting companies——

Q. Are you able to specify any particular type of manufacture in which you can give us your price, and the price which others charge for a like product? A. Yes, sir, I can.

Q. Well, now give us an illustration? A. The bucket back castings, that we make, and charge from five to six cents a pound for, our competitors sell at from three to four cents a pound.

Q. What competitor? A. I recall the Standard Steel Works in that connection.

Q. And who are the customers for those goods? A. Oh, we have customers for those goods all over the country—Alaska, California, Indiana, Montana, and all over the country.

Q. For bucket back castings? A. Yes.

Q. You are talking about that particular casting now? A. Yes, I say in that instance.

Q. Do you think of any other particular style of manufacture that will illustrate your proposition? A. Just at the moment, no; except from what our customers tell us.

Q. Well, it is a very common thing for customers to try and beat down prices, and say that they can get goods cheaper of others than can of you? A. Our customers don't tell us that for that purpose; they tell us that, although our prices are higher, yet our goods in the long run are so much cheaper than the other goods.

Q. Let us have the customers' names? A. Our customers?

Q. Yes; if they throw bouquets of that description at you, you must know who they are; give us their names? A. I will mention one—the Ingersoll Rand Co., it is a combination between the Ingersoll Sargent Drill Co. and the Rand Co.

(*Mr. Lindabury.*)

Q. They are very large users? A. Yes, sir; they are very large users of castings.

(*Mr. Corbin.*)

Q. You have stated that you obtain royalties on the Hadfield patent? A. No, that we paid royalties.

Q. That you paid royalties? A. That we paid royalties on the system; we did not say that we paid royalties on the patents.

Q. You paid royalties to Hadfield? A. Yes.

Q. You paid royalties on his original patent, as long as it was enforced, did you not? A. We paid royalties on his system, not on his patents.

Q. Did you pay as much royalty after the patent ran out as you did before? A. I think we did.

Q. Do you know whether you did or not? A. I cannot swear to that positively, I did not make the original contract, but I think we are paying now the same as we have been for several years.

Q. Hadfield has taken out many patents, has he not? A. I don't know how many.

Q. Don't you know that he has been taking out patents right along? A. I know that he has taken out patents, I don't know what you mean by right along.

Q. Well, have you licenses under all those patents? A. Yes, I believe we have.

Q. Under all of his inventions, you have had licenses under the Chrome steel goods, and all those various alloys that he has invented? A. We have had a license to manufacture castings under his system and patents, and we consider his system——

Q. Never mind about that—you don't know anything about that——

COURT—I don't understand this witness wants to convey the idea that the thing they complain of is a violation of the patents. My understanding is, that while they have a license to operate a

certain system, and under certain patents, that they have introduced there, a system or modification of a system, which is peculiar to themselves—that is my understanding of the evidence of this witness.

MR. CORBIN—That is their theory, of course, but we deny it entirely; we say that their theory is a mere sham.

(*Mr. Corbin.*)

Q. Is your contract with Hadfield in writing? A. Oh, yes.

Q. You have more than one contract with Hadfield, haven't you? A. I think not, at the present time; no, sir.

Q. When was it made? A. I don't remember the date.

Q. Have there been more than one contract made with him? A. Oh, yes.

Q. When was the last one? A. I don't remember the date.

Q. Within a year? A. Oh, no, sir; longer ago than that; it runs out—I cannot tell you exactly—it runs out in 1908.

Q. You cannot tell how long it has been running? A. There have been modifications made of the original contract that was drawn in ~~1901~~ 1897 or ~~1902~~, as conditions changed. For example, we went into the manufacture of armor-piercing shells, which the original contract did not contemplate.

Q. Is that Manganese steel manufacture? A. The armor-piercing shell?

Q. Yes; is that Manganese steel manufacture? A. Oh, no, sir.

Q. That is not Manganese steel manufacturing? A. Oh, no, sir.

Q. Now, do you personally profess to know the details of the process used in the manufacture of steel? A. No.

Q. When did the Hadfield patent for Manganese steel expire? A. It has not not expired.

Q. Didn't it expire in 1902? A. He has had several patents on Manganese steel, one has expired, others have not.

Q. The one under which you took your original license in 1892? A. The patent had very little to do with the original license.

Q. I am not asking you what the patent had to do with the original license; you say you don't know anything about the process; how do you know that the patent did not expire, under which you had your original license? A. I know what our people thought when we took it out; we did not depend on the patent at all, it had very little to do with our original license; we depended on keeping things secret more than we did on the patent.

Q. I asked you when that patent ran out? A. I don't remember.

Q. You know that a number of them have run out, don't you? A. No, sir, I do not; I know that one patent for Manganese steel has run out, that is all I know of.

Q. And when was that—was not that in 1902? A. I don't remember that date, I say; you can very easily find out; it is simply a matter of record, it is not in my memory.

Q. Now, is it not a fact that the original agreement made by Mr. Nichols, to keep your secrets, at the time he went there, expired coincidently with the Hadfield patent, mainly in 1902? A. I don't know that such is the case.

Q. Do you know that it is not the case? A. I don't know when the Hadfield patent expired, as I said awhile ago.

Q. He was employed in 1896 for a term of six years, was he not? A. Yes—well, he was employed in 1896, but I don't know that it was for a term of six years.

Q. That agreement he signed in 1896 expressly limited his obligation until or for six years, didn't it? A. I have nothing to do with that agreement at all, it was done before my time; I have nothing to do with the making up of that agreement.

Q. You said it was before your time—what was your employment at that time? A. I was in the office of the company—I don't know just at what time, or just what my capacity was, I have been there from office boy up.

Q. Do you know what the reason for this provision in this contract was, "I will not, before January 1st, 1902, make known, &c.," do you remember what the object of fixing that particular date was—it reads, "I promise and give my word of honor, that I will not, before January 1st, 1902, make known to any person whomsoever, except the officials of the said Taylor Iron & Steel Co., any information which I shall receive at the said works"—now, what was the object of fixing that date there? A. Oh, I suppose some date had to be fixed.

Q. You do not know that it had anything to do with the operation of the patent? A. I doubt that it did.

Q. Has Mr. Hadfield an interest in the business of the Taylor Iron & Steel Co.? A. What do you mean by an interest—yes, sir; he has, certainly.

(*Mr. Lindabury.*)

Q. What do you mean by that? A. Why, he gets his royalties; he naturally has an interest in the business.

(*Mr. Corbin.*)

Q. What is his interest? A. He is a stockholder.

Q. A stockholder? A. Yes, sir; he is a stockholder.

Q. And he also gets royalties? A. Yes, sir; he also gets royalties.

HOWARD E. WHITE, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. Rye, Westchester Co., N. Y.

Q. What is your occupation? A. I am a member of the N. Y. Bar.

Q. Where is your office? A. 31 Nassau St., New York City.

Q. You were at one time, I believe, a director in the Taylor Iron & Steel Co.? A. I was.

Q. Do you recall about when it was you were such director? A. About the end of June, 1905.

Q. How long did you continue such? A. Until about some time in November, 1905, as nearly as I remember.

Q. Whose place did you take on the board? A. Dr. Alexander C. Humphreys, the president of Stevens Institute, a client of mine, and he was going abroad, and I took his place on the board, during his absence abroad.

Q. Do you know Wesley G. Nichols? A. I do.

Q. When did you first meet him? A. On the 3rd day of August, 1905.

Q. When did you first hear of Mr. Nichols? A. On the afternoon of the 3rd day of August, 1905.

Q. From whom? A. Mr. Percival Chrystie.

Q. Where did you first see Mr. Nichols? A. At his house in High Bridge, on the evening of August 3rd.

Q. Who was present? A. Mr. Chrystie, Mr. Nichols and myself.

Q. Did a conversation take place at that time between the three of you? A. Yes.

Q. What was the subject of that conversation? A. The expressed determination of Mr. Nichols to leave the employ of the Taylor Iron and Steel Co.

Q. Now tell us, as nearly as you can recollect, what was said there upon that subject—I don't care anything about any other matters, except as to the relations of Mr. Nichols to the Taylor Iron & Steel Co.? A. Well, it is a little hard to do that, without going back to make a preliminary examination, if I may——

Q. Do it in your own way? A. On the afternoon of that day, Mr. Chrystie came to me at Plainfield, where I was, and told me that they had in their employ——

MR. CORBIN—I object to that, he cannot state conversations with Mr. Chrystie. I object to this as incompetent.

Objection sustained.

(*Mr. Hardin.*)

Q. In consequence of what Mr. Chrystie told you, what did you do? A. At Mr. Chrystie's request, I went with him to Mr. Wesley G. Nichols' house on the evening of the 3rd of August. Mr. Nichols came into the room, and, as I recollect, Mr. Chrystie explained first who I was; he said that I was a director of the company; that I was also an attorney, and that he had consulted me in regard to Mr. Nichols' threat to leave, or the statement that he was going to leave the company, and that he had brought me there to talk with Mr. Nichols in regard to the matter. My recollection is, that almost

immediately I broached the subject of Mr. Nichols' contract with him, and asked him how it happened that he was going to violate his contract, the terms of which contract I think we had some little talk about. Mr. Nichols then stated that he did not feel that he could longer remain at High Bridge; that he had been attempting to live an upright life there, and that he had endeavored to live down certain objectionable features of his career there, and that he had succeeded, he thought; but he said that he was now being harassed by some members, some men connected with the Taylor Iron and Steel Works, to a certain surveillance and to which surveillance he took exception, and that because of that he was not going to stay there any longer—that was his first attitude. Mr. Chrystie then told him that he was entirely wrong, in supposing that any harm was being done to him, that no one had anything but the greatest kindness and good feeling for him, and that there was a general desire on the part of all concerned to help him and to see him progress in his work at High Bridge. I made a statement to the same effect, that I knew that to be the feeling of the Board of Directors of the Taylor Iron and Steel Co., and I suggested to Mr. Nichols that he was in an overwrought condition, owing, I supposed, to the fact that he had been sick for some time, and that that overwrought condition of his caused him to magnify the magnitude of the differences and difficulties attending his work at High Bridge. And after some conversation of that description, in a little while Mr. Nichols gradually seemed to recede from a position of anger, and then after some further conversation, in a similar line, Mr. Nichols stated—but first, I think, I asked Mr. Nichols what it was he contemplated doing. My recollection is, that I think I told him that I understood or had ascertained from some

source that he was going or that he proposed going with some other concern, or some other company—at all events, in the conversation the name of the American Brake Shoe and Foundry Co. was mentioned, whether Mr. Nichols said that he was going with the American Brake Shoe and Foundry Co., or whether in the conversation we took it for granted that that was the company he contemplated going with, I do not now recall, but I do know that throughout all our conversation we discussed the American Brake Shoe and Foundry Co. by name, using the name of Mr. Cutler as the representative of that company, whom Mr. Nichols had seen, as I understood. Mr. Nichols then said that he had had a very good offer to go elsewhere, and that he was about to accept it. He said that he had the definite terms under consideration at that time, but that he had about decided that that was what he would do. We then urged him to reconsider his position, and not to attempt to violate or ignore the contract that he had made with the Taylor Iron & Steel Co. And he stated then that he had been advised that his contract with that company was not binding. He said, however, if his contract were binding, that he should disregard it, no matter what the consequences were to him, because he felt that his position at High Bridge was or had been made so untenable that he could no longer remain there. There was quite considerable conversation, and he gradually receded from that position, until finally, I think ~~moreover~~ moves by what Mr. Chrystie said with regard to their personal relations and of the good feeling that existed towards him in High Bridge, and the offer by Mr. Chrystie to be of assistance to him, he finally said that he regretted that he had taken the steps that he had taken, he said that perhaps he had been hasty about it, and that he had overestimated the difficulties that he was under. I

then asked him to make a decision in the matter, and to give us a definite answer as to what he was going to do, because I told him that we, of course, should protect our rights—that is, that the Taylor Iron and Steel Co. would protect its rights, whatever it had under the contract with him. Mr. Nichols then said that he was not prepared to give any decision just then, that he would first, in view of the negotiations that he had had with Mr. Cutler, that he would have to see Mr. Cutler before he could give us any answer. Both Mr. Chrystie and myself then told him that it would be impossible to give him any length of time to decide it in; that it ought to be a matter that he could decide immediately, whether he would live up to his contract or not, and if he determined not to live up to it, then we ought to know it at once; that we had come there for a decision, and that we must have it that evening. Mr. Nichols demurred and again urged us to let him have some time in the matter, which we refused. And finally Mr. Nichols seemed to yield, and at last said, "Well, all right." Well, at first he said, "What do you want me to do?" Well, I said, "I want you to send word to the American Brake Shoe and Foundry Co. that you would have nothing more to do with the matter, that you would have nothing further to do with the matter, and that you are going to stay here." Whereupon he said, "Well, I will write them." And then we shook hands with him, and congratulated him on his decision, and offered to be of assistance and to help him in every way we could. And I think I asked him, or it might have been Mr. Chrystie asked him, "whether he felt well enough to go back to the works the following day." And he said, "No, he did not; he could not get back to work before the next week, but that he would report for work, as I recol-

lect it, the following Monday morning, at the works."

(*Mr. Hardin.*)

Q. Did you have any conference with any of the officers of the American Brake Shoe and Foundry Co. with reference to this Nichols matter in New York? A. Oh, yes, sir, I had subsequently.

Q. When was the first one, if you can recall? A. I think I recollect that it was on the following Monday, that is, that would be the 7th of August.

Q. The Monday following the interview that you had at High Bridge, that you have just described? A. Yes, sir.

Q. Do you know when it was you had the conference at High Bridge? A. I think it was on Thursday, the 3rd day of August, 1905, and I think it was the following Monday, following Thursday, the 3rd day of August, 1905, that I had my interview with the American Brake Shoe and Foundry Co.

Q. With whom did you have the first interview in New York? A. I first saw some one in attendance in the outer office, from whom I gathered some information, and then I was ushered into Cutler's room, and then shortly afterwards we were joined by Mr. Fallows.

Q. Can you tell us what was said at that conference in reference to Mr. Nichols at that meeting —was this meeting by appointment? A. Probably by telephone appointment—no, sir, pardon me, that is not so. I went round there on the chance of finding them, I recollect now. When I first got there, as I said before, I saw some one in the outer office, and I found from inquiries I made in the outer office that the Mr. Snow for whom I asked had left for Chicago on the preceding Saturday. I then asked for, or in addition I asked for Mr.

Gallagher, and was ushered into his room, and I told Mr. Gallagher that I was a director of the Taylor Iron and Steel Co.; that I was also an attorney, and that this matter had referred to me, that is the matter of Mr. Nichols, one of our employees, named Wesley G. Nichols—I think that is the way I put it—whom I said I understood had been negotiating with the officers of the American Brake Shoe and Foundry Co. I said that I had taken the liberty of coming to see him, so as to make sure that he understood the exact conditions, and I also said that I had been pleased to find, as I recollect it, I was pleased to find that Mr. Fallows, whom I knew very well, was connected with their company, and I think just at that time it was that he called Mr. Fallows in, and Mr. Fallows came into the office.

Q. Was this Mr. Gallagher or Mr. Cutler you were speaking with? A. This was Mr. Cutler, in New York.

Q. You said Mr. Gallagher? A. This was Mr. Cutler, not Mr. Gallagher. I told them that I thought there must be some misapprehension about our relations to Mr. Nichols, because I could not understand how their company would voluntarily take or attempt to take away a trusted servant of the Taylor Iron and Steel Works Co., or of any other corporation in fact, under such circumstances as I understood existed here. I stated that he was under contract with our company, and Mr. Cutler said that he was not under contract with their company, and that he had been informed by Mr. Nichols that he had terminated any contract that he might have with the Taylor Iron and Steel Co., and he said, as I recollect it, that he did not have Mr. Nichols in their employ, although he admitted that they were considering the employing of Mr. Nichols. And I then explained the situation

in detail to them, that is, to Mr. Cutler and to Mr. Fallows, and Mr. Fallows' opinion was asked, I think, of the contract, and Mr. Fallows said that he had not seen the contract, and I promised to give him a copy of the contract, and I then left, and subsequently I sent a copy of the contract to Mr. Fallows for his inspection.

RECESS.

(*Mr. Hardin.*)

Q. How did you happen to go to Mr. Fallows or to the office of the American Brake Shoe and Foundry Co.? A. I was advised by Mr. Knox Taylor and by Mr. Chrystie, of the Taylor Iron and Steel Co., that Mr. Nichols had left High Bridge, instead of going to work the following Monday morning, he had left High Bridge, and that it was reported that he had started for Chicago, and on receipt of that information I went to the office of the American Brake Shoe and Foundry Co.

Q. Did you say anything there or make any inquiry there as to the whereabouts of Mr. Nichols? A. Yes.

Q. What did you learn? A. I asked whether Mr. Nichols was in Chicago, whether he had gone to Chicago, and I was not able to get any satisfactory reply from the office of the Brake Shoe Co., their position seemed to be that if they wanted to take him, it was all right—they would not say whether he was in Chicago with Mr. Snow or not.

Q. This interview that you have described was the first interview, as I understand it, in New York? A. It was.

Q. Did you have any further interviews with any of these gentlemen in New York, within a day or two after? A. No, sir, not within a day or two; I went to Chicago immediately after the New York interview.

Q. Did you see Mr. Nichols in Chicago? A. I did.

Q. Did you have any talks with him there? A. Yes, lengthy ones.

Q. Did he tell you anything about his relations or expected relations with the American Brake Shoe and Foundry Company? A. Yes, sir, he stated that he had come there to Chicago in pursuance of the facts that I had already had knowledge of, and that he was looking over the ground out there, and that he was about to enter the employ of the American Brake Shoe and Foundry Co.; he was out there with Mr. Snow——

Q. Did he say whether or not he had been at the American Brake Shoe and Foundry Company's works? A. I do not think he said whether he had been there, I knew it, and we talked of it as a matter of fact, I do not recollect that he stated that he had been there.

Q. Now, did you have any interviews with any of the officials of the American Brake Shoe and Foundry Co. in Chicago? A. I did.

Q. After or before you had seen Mr. Nichols there? A. After.

Q. Where was such interview held? A. The first official of the company that I saw was Mr. Snow, who came to the room where Mr. Nichols and I were talking, on the Wednesday evening——

Q. Where was that? A. That was in the Grand Pacific Hotel, that was a very brief interview, and culminated my interview with Mr. Nichols, in which interview I had been trying to persuade him to reconsider his decision, and to return to High Bridge. The next interview that I had was arranged for the following morning, I think it was in the morning; I went to the office of the American Brake Shoe and Foundry Co. and there I saw Mr. Gallagher, and, if my recollection serves me right,

a Mr. Terbell, a second vice-president of the company, and also Mr. Snow was present, and at the interview there was present Mr. Nichols and myself; Mr. Cutler was in New York at that time, as far as I know.

Q. Mr. E. J. Snow present? A. Yes, sir.

Q. Did you talk with those gentlemen about the Nichols contract with the Taylor Iron and Steel Co.? A. I did.

Q. What was said about the Nichols contract with the Taylor Iron and Steel Co., at that interview, if anything? A. Mr. Gallagher stated that he had been in receipt of an opinion from Mr. Fallows, to the effect that the contract was not binding upon Mr. Nichols, that is, it would not serve as a basis for injunctive relief. It might go as for some claim against Mr. Nichols, but that it could not be enforced to the letter. The conversation was complicated, by a fact that you have not brought me out yet, which was that I had in the meantime obtained an injunction against the company, that is, immediately I got to Chicago I commenced an action against Mr. Nichols and the company, to restrain them from utilizing the services of Mr. Nichols. A preliminary injunction was granted that afternoon, *pendente lite,* and I served, or it was served on Mr. Nichols that evening, and when I saw Mr. Gallagher the next evening we had already got Mr. Nichols under injunction.

Q. Was that injunction discussed also at this meeting? A. Yes, sir.

Q. Was Mr. Chrystie present at this meeting? A. No, sir.

Q. Did Mr. Gallagher say anything else about the Nichols contract with the Taylor Iron and Steel Co., or about what the American Brake Shoe and Foundry Co. proposed to do with Mr. Nichols? A. They proposed to disregard the contract with

the Taylor Iron and Steel Co., and, if they saw fit, to employ Mr. Nichols to do so.

Q. Did they make any reference to the pending legal proceedings? A. Except to state that they proposed to put a seidlitz powder on the injunction and dissolve it.

Q. Is the injunction in Chicago still in existence? A. When I last heard of it, it was still in force.

Q. Is that the only interview you had while in Chicago this time? A. You mean with the officers of the American Brake Shoe and Foundry Co.?

Q. Yes? A. Yes, sir, because at that interview Mr. Gallagher stated that he was hardly able to take any definite action, being separated from Mr. Cutler, who was in New York, and from Mr. Fallows, the counsel, and so I returned to New York that afternoon, and it was determined that it was wise to have a further conference; we did not finally come to any open rupture at that interview. Mr. Gallagher said that he would like to hear further from Mr. Cutler and from Mr. Fallows, and I returned to New York that afternoon.

Q. Did you see any of those gentlemen in New York before you returned to Chicago? A. Yes, sir, I saw Mr. Fallows while I was in New York.

Q. Did you talk with him about this matter? A. Yes.

Q. Can you recall the conversation? A. Well, the conversation was largely in regard to the interpretation of the contract, that was really the object of my seeing Mr. Fallows; he had by that time seen it, and I had heard of his opinion, and, knowing Mr. Fallows very well, I thought it was worth while to go and see him, to see if we could not come to some understanding or agreement about the contract.

Q. And this was before your visit to Chicago? A. This was between my two visits. I went to

Chicago and then I returned to New York, and on the day after my return to New York I saw Mr. Fallows.

Q. Was anything said as to what was wanted by Mr. Nichols by the American Brake Shoe and Foundry Co.? A. Nothing, except to state that they had been making Manganese steel there, and that their superintendent had proved unsatisfactory, and that they were looking for a man to take his place and they had in contemplation the employment of Mr. Nichols.

Q. And after that you returned to Chicago? A. I think it was the following day I returned to Chicago, now it might have been two days later, but I think it was the following day. Mr. Fallows started for Chicago with Mr. Cutler, and I went with Mr. Chrystie.

Q. Did any conference follow your arrival in Chicago? A. Yes, sir.

Q. How many conferences did you have there? A. One.

Q. Where was it held? A. It was held at the office of the American Brake Shoe and Foundry Co., at the same place where I had been previously.

Q. Who was present at that conference? A. Mr. Gallagher, Mr. Cutler, Mr. Fallows, Mr. Terbell, Mr. Whitman, and, I think, Mr. Snow—I would not be sure as to Mr. Snow's presence at the second conference, but I think he was present—and Mr. Chrystie and myself for the Taylor Iron and Steel Co.

Q. Was anything said at that time as to the purpose of the American Brake Shoe and Foundry Co. people in reference to the employment of Mr. Nichols? A. Not except that they intended, if he met with their approval, to place him in charge of their factory at Chicago Heights. The most of that interview was occupied with a discussion of

the possibilities of coming to some speedy determination of the legal proceedings. I think the most of the latter portion of that conference was between Mr. Whitman, the attorney for the American Brake Shoe and Foundry Co., and myself.

Cross-examination by Mr. Corbin.

Q. In the matter of the relations between Mr. Nichols and the company, you went to High Bridge on the request of Mr. Chrystie, I suppose? A. To High Bridge? yes, sir, I did.

Q. And represented the company in these other matters in Chicago; that is, you employed counsel there to get an injunction? A. I employed counsel, yes, sir.

Q. You went there on that business? A. Yes, sir.

Q. And in your interviews with Mr. Cutler and others, you went there on behalf of the company, did you not? A. I did.

Q. The Taylor Iron and Steel Co.? A. Yes, sir.

Q. Your first conference in New York was with Mr. Cutler, I think you said, was it not, whom you say was the president of the company? A. I saw Mr. Cutler, and almost immediately afterwards Mr. Fallows was ushered in.

Q. That was the conference which closed with your undertaking to send a copy of the contract to Mr. Fallows? A. It was.

Q. And that was the 7th of August? A. It was Monday I think, it was the 7th of August, if my recollection serves me right.

Q. Now, in that conference did you tell Mr. Cutler that if his company expected to acquire from Mr. Nichols any secrets about the manufacture of steel, or the process employed by the Taylor Iron and Steel Co., then they would be disappointed, because Mr. Nichols did not have in his possession

the secret methods, or proceses, of the Taylor Iron and Steel Co.? A. I did not.

Q. Did you tell him that he was—that Mr. Nichols was without any secret information in regard to those methods and processes? A. I did not.

Q. Did you tell him that there were a number of persons who knew the secret processes of the Taylor Iron and Steel Co., but that Mr. Nichols was not such a person? A. In the form in which you put the question, I shall answer, I did not.

Q. Well, what form would you put it in? A. I stated that there were persons at the Taylor Iron and Steel Co. works who knew what the American Brake Shoe and Foundry Co. thought Mr. Nichols knew, but that the American Brake Shoe and Foundry Co. was mistaken in supposing that Mr. Nichols knew the entire story.

Q. Did you not tell Mr. Cutler that the continuation of Mr. Nichols' employment by the Taylor Iron and Steel Co. was desired, not because of his knowledge of the processes, but because he knew the needs of customers, and that you had on hand large contracts, which were under performance, and you needed him for a few weeks to fulfill those contracts? A. Not as you read it.

Q. What did you state? A. I stated that the Taylor Iron and Steel Co. was very busy at that time, that there was a large amount of work in process in the factory with which Mr. Nichols was familiar, and that it would be a great hardship on the Taylor Iron and Steel Co., particularly at that time, to have a man like Mr. Nichols taken away from that work.

Q. Didn't you tell him that and further tell him, that if the Taylor Iron and Steel Co. had his services for a few weeks, his services might be then readily dispensed with? A. I must answer again, as read—no—but as I said it, I stated that if

this heavy work was off the hands of the Taylor Iron and Steel Co. that I should advise the Taylor Iron and Steel Co. not to keep a man who was dissatisfied there.

Q. Did Mr. Cutler tell you that the American Brake Shoe and Foundry Co. would not employ Mr. Nichols until he was free to accept employment from them? A. He did at the first part of his interview, that was his first statement.

Q. Did he tell you that they did not wish to employ him with reference to any special process or secret process of the Taylor Iron and Steel Works Co., that they simply wanted a competent superintendent for steel castings? A. My recollection is that he did.

Q. Did he not tell you that they had a vacancy in the office of their superintendent of their steel works? A. Yes, sir; at Chicago Heights.

Q. And were hunting for someone for the place? A. Yes.

Q. And did you tell him that Mr. Nichols' character and habits were not such as to recommend him for such a place as superintendent? A. Not as you read it.

Q. How did you tell him? A. Mr. Cutler asked me why Mr. Nichols had left or was proposing to leave High Bridge, and I stated to Mr. Cutler that all I could say about that was, to repeat the reasons which Mr. Nichols had assigned for it to me, and I then went on to repeat what Mr. Nichols had told me on the occasion of my interview with him at High Bridge, namely, that his position had become untenable at High Bridge, owing to surveillance, etc.

Q. Did you mention any details, certain facts relating to Mr. Nichols' personal habits and character? A. In that connection and in response to Mr. Cutler's questions, I did.

Q. Coming now to the interview in Chicago, that was August 15th, was it not, that last interview at Chicago? A. You are speaking of the second interview when Mr. Chrystie was present?

Q. Yes. A. I think it was on the 19th.

Q. Was it not on the 15th? A. Well, my first interview was on the 10th—yes, sir, it was probably on the 15th, either that day or the day previous or the following day; I cannot be sure which.

Q. That was at the office of the American Brake Shoe and Foundry Co. in Chicago? A. Yes, sir, it was at the office of the American Brake Shoe and Foundry Co. in Chicago.

Q. No. 138 Jackson Boulevard? A. Yes.

Q. Now, in that conversation, did you say that Mr. Nichols hadn't any secret, or special information, about steel, but that the Taylor Iron and Steel Co. desired to make an example of him, so as to prevent other employees, who did have special knowledge, from violating their contracts and leaving their employment? A. There are two questions in that. To the first portion of the question, in which you say, did I state that he had no knowledge of the secrets, I answer, No. To the second portion of your question relating to the matter of the effect on other employees, I will state that I said in connection with other matters, that it was also of considerable importance to the Taylor Iron and Steel Co. that the employees of the Taylor Iron and Steel Co. at High Bridge should not be permitted to violate their contracts and leave their employment, at a time when the Taylor Steel Co. needed their services, for any particular work they had in hand.

Q. Did you say that the Taylor Iron and Steel Co. stood ready to spend any amount of money necessary to prevent Mr. Nichols obtaining employment elsewhere? A. Not as you put it, I did not

say that, but I did say that they would spend any amount of money necessary to enforce their contract.

Q. You think you did not say that the Taylor Iron and Steel Co. stood ready to spend any amount of money necessary to prevent Mr. Nichols obtaining employment elsewhere? A. I think I might have done so, in the sense indicated.

Q. Did you tell them that Mr. Brinton had detailed two employees of the Taylor Iron and Steel Co. to watch Mr. Nichols? A. I do not recollect that I made the statement in that way, but I undoubtedly did say that Mr. Nichols complained that Mr. Brinton had set two employees to watch him.

Q. Did you tell him that in fact it had been done? A. I do not recollect whether I did or not.

Q. Did you tell him that you had had no detectives watching Mr. Nichols? A. I certainly told him that, I did that as soon as I reached Chicago, but not prior to that; two or three days prior to this interview was the first time that I had ever employed detectives to watch Mr. Nichols, or that I had any knowledge of its being done.

Q. Did you say that you did not think any self-respecting man in the position that Mr. Nichols then was in could ever return to High Bridge? A. I think it is quite likely I did.

Q. And did you say that the Taylor Iron and Steel Co. intended to give employment to Mr. Nichols in some other position than that which he had theretofore had? A. My recollection is that I was making the same statement to Mr. Gallagher that I had made to Mr. Nichols, that if he found it impossible to come back to High Bridge and stay there permanently, owing to those facts which he had complained of, that we would be able to give him work at some other place, which would relieve him

of that embarrassment. I had already said that to Mr. Nichols the night previously.

Q. And in this conversation at Chicago, you made some statements on that subject, did you not? A. I presume I did repeat what I had already said to Mr. Nichols, because I was called upon to practically state what I had stated to Mr. Nichols the night before.

Q. Was the proposition made at that interview that the matter in controversy should be submitted to arbitration? A. It was.

Q. And you declined that? A. Unless we were permitted to appeal from the arbitration.

Q. You did not acquiesce in the suggestion of arbitration? A. Not in the way that Mr. Gallagher proposed it.

Q. The suggestion came from Mr. Gallagher, did it? A. That I cannot say, possibly I suggested it myself, because the object of the interview was to get some way of terminating the position by which Mr. Nichols was retained at the works of the American Brake Shoe and Foundry Co. pending a decision of the case.

Q. Did you at that conversation say that Mr. Nichols knew nothing as to which the Taylor Iron and Steel Co. cared whether he divulged it or not? A. I did not.

Q. So far as that part of the contract was concerned, that it was of no consequence? A. I did not.

Q. And that your object was to give the employees of the Taylor Iron and Steel Co. to understand that they could not jump their contracts? A. I have already explained that.

Q. Did you also in that conversation say to Mr. Gallagher that Mr. Nichols was not a good superintendent, that he was simply good when directed by some one over him? A. Not in precisely those

words. I stated to Mr. Cutler at my first interview, to Mr. Gallagher, at both of my subsequent interviews, the position that I understood Mr. Nichols occupied, namely, that he was a valuable man for the Taylor Iron and Steel Co.; that he was in possession of their secrets and processes, but that he was not the man that the American Brake Shoe and Foundry Co. were looking for, in that he was not competent to take the sole control of a foundry; that he was of great value to the Taylor Iron and Steel Co., but not of such value to outsiders as the American Brake Shoe and Foundry Co. thought.

Q. Didn't you say to Mr. Gallagher in that conversation that the usefulness of Mr. Nichols to the Taylor Iron and Steel Co. was at an end? A. I do not recollect whether I did or not.

Q. Didn't you tell them that if they supposed that if Mr. Nichols could direct them in the manufacture of Manganese steel that they would be disappointed, that he did not know what they thought he did of that process? A. In the same sense that I explained——

Q. Did you not say that? A. Not as you have read it.

Q. In the affidavit which you made in this cause appears the statement, that at several interviews you stated to the officers of the American Brake Shoe and Foundry Co. that you supposed they wanted Mr. Nichols to direct them in the manufacture of Manganese steel; if that was the case, you feared they would be disappointed, as you did not think Mr. Nichols knew what they thought he knew of that process—did you say that? A. I did.

Q. Is that correct? A. If you take it in connection with my explanation which I have already made, it is correct.

WILLIAM J. OSWALD, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where is your home? A. My home is Darby, Montana, at the present time.

Q. And what is your occupation? A. My occupation has been machine shop foreman.

Q. Have you had experience in the construction and repair of dredges? A. I have.

Q. Whereabouts? A. At Oraville, Cal.

Q. In the shops of what concern? A. In the shops of the Boston Machine Shop Company.

Q. When? A. From about the 2d of May, 1902, until the 1st of August, 1906.

Q. What was your line of employment in that concern, the Boston Machine Shop Co.? A. I was employed as machine shop foreman.

Q. What is the business of the Boston Machine Shop Co.? A. The Boston Machine Shop Co. do a regular or general repair works on dredges, that is, gold dredges, that is the stockholders of that company also own a number of dredges in the Oraville district.

Q. What do you mean by "gold dredges." A. A gold dredge is a machine which elevates the gravel and washes the gravel, and separates the gold from it, and saves the gold.

Q. How is the gravel scooped up? A. The gravel is scooped up by what they call "buckets," an endless chain of buckets.

Q. From where? A. From the earth.

Q. Is the dredge a floating dredge, or is it anchored on the banks? A. It is a floating dredge, floating on a pond of water.

Q. Do they dredge in streams? A. They do

dredge in streams also, but most of them at the present time are land-locked dredges, they are in a pond of water.

Q. An artificial pond? A. Yes, sir, they usually dig a pit in a field, so that they can fill the pit with water and float the dredge in the pit or pond.

Q. And then establish the dredge in that pit or pond? A. Yes, and then they install their machinery for operating the dredge——

Q. Have you had experience in your association with the work of the Boston Machine Shop Co., in the use of different kinds of steels? A. Yes, sir, we have tried several different kinds of steels.

Q. For what purpose do you need a hard steel? A. They need a hard steel for the wearing parts of their tumblers or their idlers, their lower tumblers and their idlers, that the bucket chain revolves upon; also they need a hard steel in the bucket bottom and on the lips of the buckets, which does the digging.

Q. What parts of the dredges you described are most subject to wear? A. The wearing plates on the upper and the lower tumbler, and the lips of the bucket and the bucket bottoms.

Q. What steel was used largely by the Boston Machine Shop Company for this purpose? A. We have used mostly Manganese steel for the lips of the buckets and the wearing plates on the tumblers, and we have used ordinary steel for the bucket bottoms.

Q. Where did you get the best steel for that purpose? A. The best steel that we have ever been able to get so far for that purpose has been from the Taylor Iron and Steel Co.

Q. From the High Bridge works? A. Yes, sir, from the High Bridge works.

Q. Have you seen other steels tried for that pur-

pose? A. Yes, sir, there have been several other steels tried for that purpose.

Q. How many within your experience? A. Do you want me to name the different steels?

Q. The different steels in your experience that have been tried for this purpose? A. There was a steel furnished by the Benjamin Atha Co., so-called Manganese steel, which we have tried for bucket lips and the wearing plates, and a steel furnished from the Columbia Iron Works, at Portland, called also a Manganese, which we also tried, and then the Marion Steel Shovel Company, we got a steel from them, a so-called Manganese steel, and the Bueyres of South Milwaukee, Wisconsin, and we have also used a nickel steel, it is a high carbon steel, we used that for the wearing plate, and also for the bucket lips.

Q. Made where? A. We bought that from the Bangor Doppel Co. of San Francisco, Cal.

Q. And you have also used the Taylor Iron and Steel Co. steel? A. Yes, sir, we have used the Taylor Iron and Steel Co. steel.

Q. And any other steels? A. I think that is all I remember at the present time.

Q. How did the Taylor steel differ from the other steels you have mentioned? A. The Taylor steel was tougher and harder.

Q. How about the comparative wear? A. Of course that would give a longer life than the other steels, and also would not be so liable to break in coming in contact with the rocks and the ground in digging.

Q. Do you know anything about the prices that were paid for the different kinds of steel? A. I did see the prices of some of them, yes, sir; I think if I recollect exactly, the Benjamin Atha Company furnished steel from three and thee-quarter cents —no; I am mistaken—that is for the cast steel, the

ordinary steel for the bucket bottoms, that is from three and three-quarter cents to four and a half cents a pound—and the Manganese steel, I don't remember what it was, but it was very much lower than the price on the Taylor steel.

Q. What was the Taylor steel price, under your observation, at the same time that the three and three-quarter cents to four and a half cents was paid for the ordinary steel? A. Six cents per pound.

(*Mr. Lindabury.*)

Q. Did you find this hardness and toughness in the Taylor steel to be uniform? A. Yes, sir, it seemed to be very uniform.

Cross-examination by Mr. Corbin.

Q. How long have you been using the Taylor steel? A. They were using the Taylor steel when I first went there.

Q. And how long ago is that? A. That was in May, 1902.

Q. And how long is it since you have used any other steel? A. Well, it has not come under my observation, but I believe there was some steel furnished by the American Brake Shoe and Foundry Co. somewhere in the latter part of my employ there, but it did not come under my observation.

Q. That was the latest you know of? A. Yes, sir; that was the latest I know of.

Q. And how long ago was that? A. I left there in August, 1906, and I don't know exactly when this other steel was used, although I was told that they had bought some.

Q. All you know is what you have been told? A. Yes, sir.

Q. Prior to that, when did you get other steel?

A. They get other steel at the present time, some of it with the new work, that is where they contract for an entire new dredge, or for the machinery with the entire dredge, they get some of the other steel on the first buckets that are made.

Q. Then your purchase of steel is by way of repairs or something of that kind usually? A. Our purchase of steel is in the way of repairs.

Q. You never tried any steel of the American Brake Shoe and Foundry Co.? A. It has not come under my obsrevation; no, sir.

Redirect by Mr. Hardin.

Q. Is this Boston Machine Shop Co. a large concern? A. Well, yes, sir; they haven't such a very large shop, it is a pretty fair sized shop, too, but it has been doing an amount of repairs for the dredges now, and the general management——

Q. Do they buy in large quantities? A. Yes, sir; they buy in very large quantities.

Q. Can you give us any information of the amount they buy? A. Well, they will average anywhere from two cars a month to a little over, some months they will have four cars and other months they will have five cars, but it will average for the whole time as much as two cars a month.

Q. For Manganese steel? A. Manganese steel will constitute about one-third of that quota, there will be about one-third of it Manganese steel.

Q. Some of the Taylor's steel that came under your observation was not Manganese steel, or was it all Managanese steel that came under your observation? A. All except the ordinary steel that was used for bucket bottoms and tumblers.

Q. Did you find the same superiority in the ordinary steel from the Taylor Iron and Steel Co. that you found in the Manganese steel? A. Yes,

sir; the ordinary steel that we got from the Taylor Iron and Steel Co. was very much superior to any other that we have had so far.

Q. And in the same properties, that is, in regard to its hardness and toughness? A. Yes, sir; in regard to its hardness and toughness.

WALTER BRINTON, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. What is your age? A. 43 last birthday.

Q. You are in the employ, I believe, of the Taylor Iron and Steel Co.? A. Yes, sir.

Q. And what is your position there? A. Superintendent of their steel works down there.

Q. How long have you been in the employ of that company? A. Since 1895, the 15th of March, I believe it was.

Q. And you had had previous experience in the manufacture of steel? A. I had.

Q. Where? A. In the State of Pennsylvania, at Chester, with the Wellman Steel and Iron Co.

Q. What was your original trade? A. That of a moulder.

Q. Where did you learn that trade? A. At Christiana, Lancaster Co., Pa.

Q. How long were you there? A. I started there in 1880, and left there the early part of 1888.

Q. Where did you go then? A. Chester, Pa.

Q. With whom? A. With the Chester Rolling Mill.

Q. How long were you there? A. I was there with the Chester Rolling Mill within a year or two, the Chester Rolling Mill merged into the Wellman Steel & Iron Co., and I remained with them until 1895.

Q. Did you go to the Taylor Iron and Steel Co. with the idea of going into any particular manufacture? A. Yes.

Q. What? A. The Manganese steel.

Q. Did you understand the Bessemer process when you went there? A. Yes, sir.

Q. Where did you learn that process? A. At the Wellman Steel and Iron Co.

Q. Did the Taylor Iron and Steel Co., or was it prepared then to manufacture steel when you went there first? A. Yes.

Q. It had erected the property, the foundry there? A. Yes; it had.

Q. And it had acquired the Hadfield process? A. Yes.

Q. Did you know anything about the process when you went there first? A. I did not.

Q. What had you to do with the coming of Mr. Nichols there? A. I recommended Mr. Nichols to come there.

Q. When, with respect to the time you went there? A. In less than a year after I went there.

Q. You had known Mr. Nichols previously? A. Very well.

Q. What had he been doing before? A. He was engaged in the same business as myself, with the Wellman Steel and Iron Co., he was engaged as foreman in the Bessemer department of that concern.

Q. Did he know anything about the manufacture of Manganese steel then? A. Not to my knowledge.

Q. And I think you did not either, you said? A. I did not.

Q. How did you learn the business? A. I learned the business with the Taylor Iron and Steel Co.

Q. Before you went there, did you, or were you

required to sign any pledge of secrecy? A. No, sir.

Q. Have you seen this paper, Exhibit C 1, signed by Mr. Nichols when he went there on March 16th, 1896? A. I have.

Q. Who got him to sign that paper, do you know? A. I think probably I was the author of it.

Q. The author of it? A. Well, not the author of the paper, but I think Mr. Nichols—well, I took Mr. Nichols to the office and had him sign that paper, I arranged it.

Q. And you signed some paper of that kind also? A. Oh, yes, sir.

Q. When? A. Immediately on my entering the employ of the company.

Q. Before you were shown the process? A. Yes, sir.

Q. Now, did you go to England to study the process further at the Hadfield works? A. Just a specific part of the process.

Q. When did you do that? A. I went there in 1898.

Q. What was that—what was the line of manufacture that you went there to study? A. That of the hardening of projectiles.

Q. Were you projected into the works there without entering into any contract of secrecy? A. Well, hardly.

Q. I show you a paper dated June 13th, 1898, look at that paper, is that a copy of the paper which you signed before getting into their works? A. It is quite evidence, it is; yes, sir.

Q. You know it is? A. I have every reason to think that it is, if I read it over I would be positive of it.

Q. Well, read enough of it to make yourself sure? A. I think I can swear to it; yes, sir.

Q. It is? A. Yes, sir.

Q. Now, were you shown about the works after signing this paper? A. I was.

Q. Were they using there the process that you were using at High Bridge? A. The same; yes, sir.

Q. Were you acquainted with the license or agreement existing between the Hadfields and the Taylor Iron and Steel Co. when you went there? A. In a general way; yes, sir.

Q. Did you become acquainted with them? A. Yes, sir.

Q. And were they added to before you went to England in 1898, that is, were others taken, other contracts or licenses taken from Hadfield between the time you went there and 1898? A. Between the time I went there and 1898—I don't quite understand your question.

Q. Do you remember now whether any new contracts were entered into, or any other new licenses taken between the Hadfields and the Taylor Iron and Steel Co. after you went there and before you went to England in 1898? A. I cannot give you a positive answer to that, only through hearing it.

Q. You became familiar with these licenses and patents, did you not? A. Yes, sir.

Q. And were the processes therein referred to used in the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Whilst you were there? A. Yes, sir.

Q. And were the whole processes and methods disclosed by these papers, that is, did you use in connection with the processes there described, methods or processes not disclosed in these papers? A. I do not think I get that question clear.

Q. No; I meant to ask you whether or not the licenses and patents which you had, and which will be put in evidence, fully disclosed the processes

that were in use when you went there? A. No, sir.

Q. How did you become acquainted with them, by teaching from some other individuals, or writings, or how? A. Now, does this question apply to High Bridge or abroad?

Q. High Bridge—when you went to High Bridge you were shown the patent specification annexed to the Hadfield patents, and you were shown the Hadfield license, you have said that, haven't you? A. That is right.

Q. You understand me? A. Yes, sir; I understand you.

Q. You were also instructed by some one or in some way in the process of manufacture in use at the Taylor Iron and Steel Co.? A. Principally by obesrvation.

Q. That was instruction, was it not? A. Yes, sir; of course.

Q. What I asked you was, whether or not the processes and methods employed there were fully disclosed in these papers or whether some of them were not? A. No, sir; they were not fully disclosed.

Q. They were not fully disclosed? A. No, sir.

Q. Did any of these licenses or papers disclose any outline or otherwise, outline the method of making projectiles which occasioned your trip to Europe? A. No.

Q. Well, now, I wish you would state in a general way the method employed at the Taylor Iron and Steel Works in the construction of Manganese steel, omitting any details of it ~~until~~ mat you regard as secret, or that the company has undertaken to preserve as secret—I want an outline so that we can ascertain what it is, that the secrets relate to —first, you use, as already appears, pig iron? A. Yes, sir.

Q. Well go on from there? A. Would you like me to draw a line between the ordinary operation in the manufacture of Bessemer steel and that of the manufacture of Manganese steel?

Q. Of course, you understand my question requires you to omit those processes which are considered a secret—there are not so many of those, and you can give the others? A. It starts first in the ordering of that material which is best suited for the manufacture of the steel—it is received at the works, analyzed by the chemist, which the chemist——

(*Mr. Corbin.*)

Q. What is analyzed? A. We analyze to find out what the chief material, the pig iron and other materials——

Q. Pig iron? A. Not pig iron alone, because we use a number of materials. After that has been carefully analyzed the mixture is made up in the laboratory, suitable for the melting of the same in the cupola.

(*Mr. Lindabury.*)

Q. Please go on and answer my original question —state your process of manufacturing Manganese steel, omitting the parts of it that are secret? A. Well, then, the materials necessary for the refined iron are selected, melted in the cupola, after which it is put into a receiver. From the receiver it is transferred to the converter—we do not hesitate to tell you that there is a converter there—and during that time there is also being prepared what we call the "Physics," anyone who knows what the physics are—you understand it is simply, if you don't understand what it is, you will have to guess at the rest of it. We prepare the physics then, for

the treating of the blown metal. The blown metal is prepared under the greatest skill that we are possessed of, in order to get it at the right heat and temperature. That we have in mind or in view, to pour the metal into—after the metal is blown or converted as we call it, it is turned down and out into a receiving ladle, the physic is added, the two are perfectly combined, and it is then taken to the melting department, where it is distributed and forged into separate moulds, that may be prepared for it, special or otherwise, but generally special. After it has been poured into the moulds, the castings are carefully washed, taken out, selected for the later process of treatment. Now, do you care for me to go on any further than that?

Q. Now taken out and subjected to a further treatment? A. Taken from the moulds and subjected to a further treatment.

Q. Now, that treatment is known as the heating treatment, is it not? A. Yes, sir.

Q. And is applied for what purpose? A. For the toughening of the hard castings.

Q. And that is applied in another furnace, is it not? A. Yes, sir.

Q. And when it is taken out of that furnace, it is ready for the finishing or polishing or whatever it is called? A. Not immediately after being taken out of the furnace; it undergoes another process.

Q. Is that a secret? A. It certainly is.

Q. After it is taken out of the hot furnace, it goes under another process? A. Yes, sir.

(*Mr. Corbin.*)

Q. After it is taken out of the hot process, it is put in water, is it not? A. Yes, sir, that is what it is.

Q. And then it is ready for fettling? A. Yes, sir.

(*Mr. Lindabury.*)

Q. Now, are there any parts of this process, with respect to which the company had observed secrecy? A. Oh, yes, sir; all of it.

Q. Not the fact that they put it in this furnace, not that mere fact, the company has not tried to keep as a secret that the fact that they put the moulten metal into moulds, or some of those things, is it? A. No, sir; the general process throughout; we tried to keep those secret always.

Q. Are there any particular portions of this process or processes that are different, as you understand, from those employed elsewhere, and with respect to which the company observe special secrecy? A. Yes, sir; the very careful manipulation of the steel, in the first place, is one of those things we deem of great importance.

Q. How have you undertaken to guard that secret? A. In——

Q. To how many is it disclosed, who knows about it? A. It is known by only the very trusted men, they are the only ones that is given that information and knowledge.

Q. You knew it, of course? A. Yes, I knew it.

Q. You superintended this manufacture of the steel all the years that you have been there, after you went there? A. Yes, sir, I have.

Q. Now, did you make this known to Mr. Nichols while he was there? A. Yes, sir, Mr. Nichols did so all of this work, he had all of this information made known to him.

Q. How soon after he went there, or rather how long was he acquiring this information? A. Mr. Nichols was probably there the best part of a year, well, say six months, before he started in that end of the manufacture. We were very busy when he came there, and he went into the fettling department first.

Q. How long was he there? A. I should say six months.

Q. And from the fettling department, where did he go? A. As I had opportunity, I brought him in there with me, I was making all the steel at that time, and had no one to assist me——

Q. And this matter of constituting and selecting materials, you instructed him in all that? A. Well, that is kept generally in the laboratory under the supervision of the chemist. Mr. Nichols was of course familiar with it all.

Q. From whom did he learn it, you or the chemist, how did he get familiar with it? A. He got familiar with it from the reports of the chemist, as they came into the general office.

Q. What was the next step in the manufacture, with regard to which you observe a special secrecy, and which you regarded as different from that in use anywhere else? A. I explained to you the great care exercised in the manipulation of the steel. Now, we are very careful in the tempering of our metals, to see that certain castings that we have in doing our casting or poring, that we guard from the outsider, or from the general men, as much as it is possible to guard it from them——

Q. And always have? A. Always have.

Q. Is the information with regard to that limited to a very few in number? A. Yes, sir, it is.

Q. Was Mr. Nichols instructed in that? A. Mr. Nichols was entirely familiar with it.

Q. He became entirely familiar with it? A. Yes, sir.

Q. Was anyone besides you and Mr. Nichols of the employees of that company instructed with regard to the details of that at that time? A. Not at that time.

Q. When he was there? A. No. I would like to state that we took one other man into our confi-

dence; now whether it was before Mr. Nichols left or after—well, now it was before he left, I know there was one other man——

Q. Was he likewise put under a pledge of secrecy? A. I cannot answer that question.

Q. That you don't know personally, do you? A. No, sir.

Q. Now, what has been the effect upon the finished product by these special methods and special processes, which you have employed, and which are not employed elsewhere? A. We claim uniformity, and a superior product there.

Q. In what respect? A. Uniformity and toughness, strength, hardness, durability, the resistance to abrasion, resistance to shock, high tensile strength. We make numerous classes and kinds of castings to suit all classes of work that we are familiar with, and the special steels for all special grades of work.

Q. Are these features covered by the general term "toughness and hardness" pretty well? A. Yes, sir.

Q. And have you been able to secure by these methods and processes uniformity in respect to hardness and toughness? A. We have.

Q. And a superior hardness and toughness in your product? A. We claim it, and have every reason to claim it, so far as indications go.

Q. What has been your observation or experience, in testing your product, in comparison with other steels? A. I have never yet found other steels that would equal ours, so far as my judgment in distinguishing would discern or go.

Q. Equal yours in what respect? A. Equal ours in respect to fineness, quality, hardness and toughness.

Q. What means have you pursued to ascertain how your steel actually compared with other steels?

A. We have tested them physically and chemically, we have given them every known strain and wear that we could devise, in order to demonstrate this fully.

Q. Where have you done this? A. At our works.

Q. And have you tested all the well-known steels in the market? A. I have tested perhaps not all the well-known steels, but I have tested a number of them.

Q. A considerable number of them—I mean of the Manganese steel? A. Yes, I could give you a list of those I have tested.

Q. Do so, please? A. The Marion Steel Shovel Co. of Marion, Ohio; the New Jersey Steel Co. of Rahway, N. J.; the Pennsylvania Steel Co. of Harrisburg, Pa., or Middletown, Pa.; I. G. Johnson of Spuyten Duyvil, N. Y.; and a concern by the name of the Smith Foundry Co., a manufactory up in Milwaukee, Wis.; the American Brake Shoe and Foundry Co. recently—this was a small piece of Manganese steel I have reference to, in this case, not very large. Then I have tested the steel of the Atha Foundry Co. here in Newark. Now I have made and have had tests made under my supervision of steels purporting to come from all of these concerns. I have found it not normal, as to the chemical makeup, neither did it contain or have the combined hardness and toughness, essential for a Manganese steel. I found in some cases that it would be hard, but lack toughness, and in other cases it was tough and laked hardness and so on.

Q. To what do you attribute this superiority of your steel over the other steels? A. To our careful observation in the manufacture of it for a long number of years.

Q. Is it or not due to this process which you say are secret? A. Yes, sir, it must be, or the other fellow would be making it as good as we are.

Q. That is what I want to know, whether it is due to these undisclosed methods? A. Yes, sir.

Q. Was Mr. Nichols or not, when he left you, familiar with those secret processes, which you say has resulted in your making this product? A. Mr. Nichols was a very confidential man to me, and he was a very great friend of mine, and I was a very great friend of his. I may say that I was as deeply interested in Mr. Nichols as it was possible for one man to be interested in another. I was always deeply interested in his welfare, and I always saw to it that he should have everything that it was possible that I could influence in his behalf, or that I was likely to have. I might say that we differed somewhat in some traits of character perhaps. I might have had one trait a little stronger than Mr. Nichols, and he may have had other traits which were somewhat different to mine, but I think on the whole I might have been a little stronger than he was in certain respects, but with all that, we were the best of friends, and during Mr. Nichols' employment by the Taylor Iron and Steel Co. he was in possession of all the methods and processes that were employed in the making of its product——

(*Court.*)

Q. The question is, was he in possession of these secrets? A. Yes, sir, he was.

(*Mr. Lindabury.*)

Q. Mr. Nichols had possession of these secrets? A. Yes, sir, Mr. Nichols was in possession of these secrets, all of them, so far as I know.

Q. I think it has been testified to that you talked to Mr. Nichols after Mr. Snow was out there in March, 1905, and took to Mr. Nichols the contract

said to have been prepared by Mr. Hardin, and that Mr. Chrystie gave to you? A. After Mr. Snow had been there?

Q. Yes? A. Yes, sir.

Q. You took it to Mr. Nichols? A. I did.

Q. What did you say to him? A. I told Mr. Nichols that I thought it would be a very good thing for him to enter into that contract.

Q. Yes, and what did he say? A. He said he would look it over, as near as I can recall.

Q. Did you ask him to sign it at once—give the conversation? A. As I recall it, there was very little conversation connected with it, I cannot recall the conversation that we had at that time in regard to it.

Q. Did he take it away with him? A. He retained it.

Q. When did he speak to you again about it? A. I cannot recall whether it was that day or the next day.

Q. Some hours, was it, after you gave it to him? A. I certainly think it was.

Q. Then what did he say about it? A. He told me he would sign it.

Q. Do you remember anything else he said about it? A. I cannot recall anything positively.

Q. Were you present when he signed it? A. I was.

Q. And where did he sign it? A. He signed it in the main office of the Taylor Iron & Steel Co.

Q. Do you remember anything being said to him about it then? A. Yes.

Q. What? A. Mr. Nichols was very much pleased, and seemed to be very well satisfied, and expressed himself so.

Q. Do you remember what he said, and to whom he said it? A. I believe he expressed himself in that way to all three of us who were there, Mr. Chrystie,

Mr. Budlong and I, Mr. Chrystie at least, and he expressed himself as being very happy and I really believe he was.

Q. Did he go to work then? A. He did not go to work, he had some reason for going away just about that time, I think that afternoon he went away owing to the death of a sister.

Q. And then he came back and worked along until the following July? A. Yes, sir.

Q. Did you know of Mr. Snow's coming there? A. Oh, no, sir.

Q. When did you first hear that he had been there and from whom did you hear it? A. I heard it from Mr. Nichols.

Q. And what did he say to you about it? A. Mr. Nichols told me that he was very much surprised that Mr. Snow would come there and make an offer of that kind, that Mr. Snow wanted Mr. Nichols to keep the matter secret——

Q. Well, he didn't begin that conversation that way, I should imagine, did he? A. I don't know how he did begin it.

Q. What offer did he refer to? A. He said Mr. Snow had offered him a position with the American Brake Shoe and Foundry Co., and he further stated that the reason they wanted him was because they were attempting to make Manganese steel, and they were not successful, and they wanted to get some one to go there with them who knew how to make Manganese steel and who would be successful in making it.

Q. Now go on—what else? A. I cannot recall.

Q. Well try? A. And he told me further that he had made him a very good offer to go with them.

Q. Did he say what it was? A. I am not positive that he did just at that time; I am not positive that he told me what the amount was, but it was in ex-

cess, largely in excess, of what the Taylor Iron & Steel Co. were paying him.

Q. Did he later tell you what it was? A. Yes, he later told me.

Q. How soon after? A. I cannot tell you exactly how soon, it must have been in a few days.

Q. What did he tell you the offer was? A. That there was an offer of $7,000 a year, with a block of stock to go with it of $10,000.

Q. What did he say on that first interview, if anything, in addition to what you have already told us? A. He said that he could not accept a proposition of the kind, owing to the kindly relations that had existed between himself and myself and the company.

Q. Did he tell you how he came to meet Mr. Snow? A. Oh, yes, sir.

Q. How did he say he met him? A. He said he was sent for, and it was as great a surprise to him as it could possibly be, that he had been called up to the office and this gentleman was there to take the matter up with him and talk it over.

Q. Did he say where the gentleman was? A. At the time office of the steel works.

Q. Did he mention anybody else as being there with him? A. Mr. Estes.

Q. Did he say who had sent for him? A. I believe he told me Mr. Estes sent for him.

Q. And he told you also, I think you said a while ago, that Mr. Snow wanted it kept a secret? A. Yes, sir, that was after he had given up, he was engaged at the time, down in the foundry.

Q. Now, had he definitely told you that he would not go to Chicago, or to the American Brake Shoe and Foundry Co., before you gave him the contract to sign? A. He did.

Q. Now, when did you first hear that he was proposing to ~~hear~~ leave anyhow, when did you first hear

that, somewhere along in July, was it not, that you first heard that he was proposing to leave the Taylor Iron & Steel Co. anyhow? A. Probably just before he left, or about the time he left.

Q. And from whom did you hear it? A. It was simply a remark, I cannot tell you who it was first made it.

Q. Did you meet him? A. No, sir, I did not.

Q. Did you have any talk with him before he left, about his going? A. No, sir, I did not.

Q. Did you put spies on his track? A. No, sir, never.

Q. It has been suggested, and I think the answer says that you put two of his subordinate employees to spy upon his private conduct? A. Never.

Q. Nothing of the kind? A. Never. May I explain that to you and the Court—I can explain it satisfactorily. Mr. Nichols had been ill for three weeks preceding the time that this occurred; these spies and my wife and I had watched very carefully day by day over the situation, and we were very much concerned about Mr. Nichols. And then Mr. Nichols got well enough to leave his bed, and came to see me on the Saturday in the latter part of July it must have been; he came into the works, and we had a very pleasant talk. Mr. Nichols told me that he was feeling better, and assured me that he would be at the works the following Monday morning, and then he was going to leave to go to the barber shop, and he said then he would go to his home. Now, I was very anxious about him, and in the evening I felt that owing to his illness it might be, or it might in some way give him a little back set, because he was then very delicate, and I called at his home, and Mrs. Nichols told me that he had not returned, and I was very much alarmed, and I did then try to find him. It was altogether my

feeling of friendship for him, and nothing else under the sun, that ever prompted me to do it——

Q. How did you try to find him? A. I asked Winsell and O'Rourke, two of my men, to find him if they could.

Q. Those two men you asked to go and find him if they could? A. Yes.

Q. And they went out to look for him? A. Yes.

Q. And beyond that, did you have anything to do at any time with the putting of any one upon his track to follow him or to spy upon him? A. I may have asked previously to that one or the other of these men to try and locate him for me.

Q. What do you mean by "previously" how much previous to that? A. Well, it might have been six months, or it might have been a year.

Q. Why was that done? A. Because I had misgivings about where he might be.

Q. His habits at one time had not been good, had they? A. Well, he would get away from me sometimes, and I would be worried about him.

Q. On your own account was it? A. Oh, altogether, no one else's.

Q. And from motives of friendship? A. Altogether.

Q. And nothing else? A. Nothing else under the sun.

(*Court.*)

Q. In the preparation of the iron or steel, what stage is it at when your secret processes are first used as distinguished from care and skill in selecting materials, etc.? A. In the unique method of controlling the heat changes during the processes of conversion.

Q. Is that described in their patent? A. It is not.

Q. Is it described anywhere in writing or in print? A. It is not, not to my knowledge.

Q. And so far as you know, or have ever heard, is it used anywhere else? A. Not to my knowledge.

Q. Except as it may be used at Hadfield's? A. And I don't know that it is used there.

Q. You don't know that it is used there even? A. No, sir.

Q. Since your attention has been called to it, I will ask you this question—the patents mentioned in fact that the steel is tempered by being subjected to heat, do they not? A. Please don't ask me to quote what they state, I am not familiar enough with them to do it.

Q. Do you not remember that the patents mention the fact that the steel is subjected to heat between certain limitations? A. Yes, sir.

Q. That is what I mean? A. Yes, sir.

Q. The limits being between 100 degrees Fahrenheit and 1,200 degrees? A. Yes, sir, that is as I recall it, between 100 or 1,000 degrees.

Q. And one of the secrets is the temperature between those limits? A. Yes, sir.

Cross-examination by Mr. Corbin.

Q. When did you work at Chester, Pa.? A. From 1888 to 1895.

Q. And while you were there, was Mr. Nichols with you? A. He was.

Q. All the time? A. No, the latter part of the time, I cannot give you the date he left; he left just before I did, I cannot give you the date though.

Q. While there you and he were working together? A. We were.

Q. In what capacity? A. The capacity of foreman of the Bessemer department.

Q. You were foreman? A. Yes.

Q. And what was his work? A. He was a foreman.

Q. You were both foremen there? A. Yes, sir.

Q. What did you handle there—steel? A. Yes, sir, we did.

Q. What did you make—merchantable steel? A. Yes, sir, we did.

Q. What was your raw material—pig iron? A. Yes.

Q. You got pig iron and carbon? A. Well, the carbon came in the pig iron.

Q. Came in the iron? A. Yes.

Q. All this steel has a certain percentage of carbon in it? A. Well, yes, iron has carbon in it, but it is not steel.

Q. There is a mixture of carbon and iron required to make the steel? A. Yes.

Q. What did you have there at that place, how many men were employed at Chester? A. I should say 400, probably.

Q. Now, when orders came in for steel, that order would prescribe the percentage of carbon, usually? A. Yes.

Q. That part of the business—was it your business or Mr. Nichols' business to determine the amount of the carbon to put in—was it yours? A. It was.

Q. Now, the first process would be the melting of the iron in the cupola, would it not? A. Yes.

Q. And after the iron is melted in the cupola, where did it pass to? A. From there into the converter.

Q. And in the converter, what treatment was given to it—I am talking now about your Chester experience? A. There it was converted into steel or blown metal.

Q. What is done to it, air blown through it? A. Yes, sir.

Q. That is the Bessemer process practically? A. Yes, sir, that is right.

Q. And that blows out part of the carbon, and part of the manganese that is naturally in the iron? A. Yes, sir.

Q. That is a part of the process, to get rid of that carbon and manganese, is it not? A. Yes.

Q. You find manganese in all pig iron, do you not? A. All that I know anything about.

Q. Now then, in the manufacture of steel, you have to put in some manganese, as well as carbon, have you not? A. Usually.

Q. That is true of the general manufacture of steel, is it not? A. Generally, yes, sir, that is the crucible process.

Q. Then you put in the carbon and the manganese into the converter, do you not? A. There is manganese and carbon in the iron, that goes into the converter, the iron contains it in the first place.

Q. After you have treated it with the blast, then you put in more carbon and more manganese, do you not? A. We recarbonize, yes, sir.

Q. You find out from the chemist what there is in the pig iron, and base your calculations on that? A. Altogether.

Q. Now then, where do you put the carbon, directly into the converter or into the ladle? A. We might put it in the——

(*Court.*)

Q. What did you do at Chester? A. He is speaking of carbon——

(*Mr. Corbin.*)

Q. You put your carbon into the ladle, and then pour the melted iron from the converter into the ladle, don't you? A. Yes, sir.

Q. That would make a chemical combination, that would be a chemical combination, immediately when it was poured into the ladle, would it not? A. Yes, sir.

Q. You would put the carbon in hot, into the ladle? I am asking you now what you did at Chester? A. Well, I know, but you were asking me about carbon, and I say we recarbonize, we put iron in for recarbonizing——

Q. You put the carbon hot into the hot ladle and then pour the iron on it? A. Yes.

Q. That was the usual practice? A. Yes.

Q. You must always be careful about heating the carbon, that was the best practice? A. That was the practice in use there; I would like to correct that carbon to manganese.

Q. You add carbon when you made the steel? A. Yes, sir, we add carbon when we make steel.

Q. You were not making manganese at Chester? A. No.

Q. But you had to put some manganese in? A. Yes, that is right.

Q. And you add carbon in too? A. When we made special for rails, we did.

Q. It depends on whether there was enough carbon already in the iron, is that it? A. Yes, sir.

Q. And you had to put manganese in? A. Yes.

Q. Now, having got the melted iron and the carbon and manganese into the ladle, what was done with it from the ladle? A. It was poured into the ingots.

Q. That is into the moulds? A. Ingot moulds.

Q. How long would it take, how long would it stay in the ingot moulds? A. Just long enough to solidfy, to raise the moulds from the ingots, and then pass them to the heating process.

Q. So that they would hold their form? A. Yes.

Q. You would not leave them in any longer than necessary? A. No, sir.

Q. Then where would you put them? A. We would put them into soak, and then they would be reheated for rolling.

Q. So that they would acquire an even temper? A. Yes.

Q. And you would leave them there some hours? A. No.

Q. An hour or more? A. No.

Q. Well, sometime? A. Unless we were held up for some reason, when things are running well, we don't leave them there more than half an hour.

Q. They were left there in order to get a fine temper? A. Yes, sir.

Q. And from there they go to the rolling mill? A. Yes.

Q. And they were there rolled into bars or whatever was wanted? A. They were rolled into billets, blooms, etc.

Q. Now, that is a familiar process, is it not, that I have described? A. It was to me, yes, sir.

Q. And it is well known, is it not? A. I think it is very well known.

Q. And it is the common process of making steel, and running it into moulds? A. Yes.

Q. Now then, at the Taylor Iron and Steel Works, when you run it into moulds, you do not run it into ingots; you run it into the shapes of the objects you were manufacturing, do you not? A. Yes, we do.

Q. And up to that time you follow the Bessemer process substantially, as described? A. Yes, in some respects we do.

Q. In what respects do you not?

Mr. Lindabury—We object to that—I do not object to the witness indicating in

some general way, without disclosing the process—my objection does not go to the witness describing in a general way the points of difference, but it does go to his describing specifically the difference in the treatment of the material observed in the Taylor Iron and Steel Works, for therein consists one of the secrets.

MR. CORBIN—We do not admit that there is any secret at all.

COURT—I think the witness can give that without disclosing any secret.

A. I would say, then, in general, special care and observation of the charging of the materials, making the proper combinations for melting, and the unique methods of controlling the temperatures, during the time of the conversion, and the method of preparing the special physics, for making the special steel.

(*Mr. Corbin.*)

Q. The material is furnished with a chemical analysis, is it not? A. Yes.

Q. That is the pig iron, and the mixture of manganese and carbon, and the material that goes into the ladle, that is all furnished by the chemist? A. That is furnished by the chemist.

Q. And that was the case also at Chester, was it not? A. Well, it came there in a big pile to us, and this had that, and this had another, and that another, and, if you will allow me, I will tell you what we have done there——

Q. I would like you to answer my questions—this pig iron that comes there, mixed with the manganese and the carbon, and the material that goes

into the ladle as furnished by the chemist, I say that is the case also at Chester, is it not? A. It is not as carefully observed, no, sir.

Q. But the chemist did furnish you the test, and you would determine how much to put in, on the basis of that test, would you not? A. That is right.

Q. And you were not as careful you say there, as you are at the Taylor's works? A. We were not.

Q. Now, after having obtained your material, you put it in the cupola and melt it, just simply to make it fluid, that is all there is to that? A. That is with the exception of the kind of material which we melt.

Q. You have the same kind of material at Chester, haven't you? A. Yes.

Q. And you find out what it was? A. Yes, sir.

Q. And you use it somewhat differently? A. Well, we use ~~chlorie~~ calorie and oxygen.

Q. ~~Chlorie~~ calorie is heat, is it not? A. Yes, and we use that just the same here.

Q. After drawing it off the cupola, and going into the converter, that is the process off the manganese and the carbon, and the forcing of oxygen into it? A. Yes, sir.

Q. And after it is thrown into the ladle, that is where the combination is made of manganese and carbon, is it not?

MR. LINDABURY—I understand that the point of time at which they put in this physic, as it has been called, is one of the secrets of the processes.

COURT—As I understand the witness, they observe great care in the selection of the materials they are going to use. Now that may not, or it may be a secret, but still that is only a statement of fact. Then that they put it in what is called a cupola, and it is there melted

as I understand it, and that they then have some secret temperature.

MR. CORBIN—I am showing, if your Honor please, that that is all a humbug, there isn't any secret about it at all, it is done everywhere, where steel is made.

COURT—What I understand is, that when it goes to the cupola, there is a certain temperature that is known to them——

MR. CORBIN—No, sir; that is not right. The pig iron goes into the cupola, and from there the melted iron is drawn off into a converter. The converter has no heat except the heat of the iron itself, and then the oxygen, or the air is forced into it——

(*Court.*)

Q. I will ask you this question, where does this question of temperature first arise? A. In the changing in the converter.

Q. In what instrument? A. In the converter, during the conversion of the iron into the steel, during the time we are converting the iron into steel.

(*Mr. Corbin.*)

Q. What pains do you take—— A. I ain't going to tell you any more——

Q. You melt the iron in the converter, do you not? A. It goes into the converter melted.

Q. You do not apply any more heat to the converter except in the form of pumping oxygen into it?

MR. LINDABURY—We object to that for the reasons already given.

COURT—I do not see why he cannot answer that question, he need not say how much.

A. We do; we have special ways of controlling that, as I said in my particular answer.

Q. Controlling what? A. The heat at which the charge is entirely governed during the entire blow.

Q. That is just so in the Bessemer process, is it not, the controlling and the time during which you continue to force air and keep up the combustion is always governed by the sound judgment of the operator, is it not? A. It may be, and it may not.

Q. It is supposed to be governed by the sound judgment of the operator, is it not? A. I cannot answer that question.

Q. Then you say that you can blow short or long, just depending on the will of the operator? A. That is just it, you can blow it for fifteen minutes or you can blow it for more than that——

Q. When you were working the Bessemer process, you have to control the time during which you continue the combustion or conversion, haven't you? A. Yes.

Q. And when you are working at High Bridge you have to control it, too, haven't you? A. Yes.

Q. Then you are treating your metal with a view to getting it to a certain stage, and that is done by blowing air through it, just as it is done in the Bessemer process, is it not? A. Yes, sir.

Q. And then it goes into the ladle, along with the Manganese and the carbon, just as it does at Chester?

MR. LINDABURY—I object to that.

COURT—He may answer that yes or no.

A. No, sir; it does not; just as it does at Chester.

Q. Where does it go? A. Into the ladle.

Q. And there is the Manganese in the ladle? A. Yes.

Q. And the carbon is also in the ladle? A. Yes.

Q. Why then do you say, it don't go in same as it does at Chester? A. It does not go in same as it does at Chester.

Q. Well, how does it go?

MR. LINDABURY—I object to that question on the ground that it would disclose the secret processes, and for the reasons heretofore given, that it is not a cross-examination upon anything brought out on direct-examination.

COURT—I will allow the cross-examination.

(*Mr. Corbin.*)

Q. In what manner is it carried from the converter into the ladle differently than it is at Chester? A. The metal—the blown metal goes into the ladle just the same.

Q. It does go into the ladle in the same manner? A. Yes.

Q. Is not the ferro-manganese mixed with it in the ladle?

MR. LINDABURY—I make the same objection that this would be disclosing the secret processes of this manufacture, and also on the ground that it is not cross-examination of anything brought out on direct-examination.

Adjourned to Monday, November 12th, 1906, at 10 A. M., at Newark, N. J.

NOVEMBER 12, 1906.

THOMAS F. BUDLONG, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Plainfield, N. J.

Q. Are you connected with the Taylor Iron and Steel Co.? A. I am.

Q. How long have you been so connected? A. Fifteen years.

Q. What official position do you hold, if any? A. Secretary and Treasurer.

Q. Have you been secretary a long time? A. About fifteen years, the full length of time, fifteen years.

Q. I asked you to look up the company's contracts with Mr. Hadfield, have you done so? A. I have.

Q. Have produced them? A. Yes, sir (produces).

Q. How many of them are there? A. There seems to be nine of them.

Q. When was the first one dated? A. August 10th, 1891.

Q. And who are the parties? A. Robert Abbott Hadfield, of Sheffield, England.

Q. And who were the other parties? A. The Taylor Iron and Steel Co.

Q. Who are the parties—all of them? A. Robert Abbott Hadfield, of Sheffield, England, and Henry M. Howe, Robert E. Jennings, and William J. Taylor.

Q. What is the date of the second one? A. December 24th, 1891.

Q. Who were the parties to that one (handing witness paper)? A. Henry M. Howe, Robert E.

Jennings, and William J. Taylor, and the Taylor Iron and Steel Co.

Q. I call your attention to the execution of that document by the Taylor Iron and Steel Co.; is that the seal of the company, and was it attested by you at the time of its execution? A. It was.

Q. What is the date of the next one? A. June 9th, 1892.

Q. Who are the parties to that? A. The Taylor Iron and Steel Co., Henry M. Howe, Robert E. Jennings and William J. Taylor, and Robert Abbott Hadfield.

(*Mr. Lindabury.*)

Q. Who is the party of the second part? A. Henry M. Howe and Robert E. Jennings and William J. Taylor.

Q. And who is the party of the third part? A. Robert Abbott Hadfield.

(*Mr. Hardin.*)

Q. I call your attention to the signature and seal of the Taylor Iron and Steel Co., was the execution of that paper attested by you—does your signature appear there as secretary? A. It does.

Q. Are you acquainted with the handwriting of Henry M. Howe, Robert E. Jennings, William J. Taylor and Robert Abbott Hadfield? A. I am.

Q. Are these signatures thereto attached in their handwriting? A. I recognize these signatures as the handwriting of those people.

Q. Is there another agreement on the 9th of June, 1892? A. There is.

Q. Who are the parties to that agreement? A. Robert Abbott Hadfield, of Sheffield, England, of the first part, the Taylor Iron and Steel Co. of the second part.

Q. That is the paper formerly known as the shell license? A. It is.

Q. I direct your attention to the execution of that paper by the Taylor Iron and Steel Co.; do you find the seal of the company attested by your signature there? A. I do.

Q. Do you recognize the handwriting of Robert Abbott Hadfield as the other signature? A. I do.

MR. HARDIN—These papers that I am identifying, the signature of Robert Abbott Hadfield, by this witness are witnessed by law clerks in England.

(*Mr. Hardin.*)

Q. What is the next paper, give its date and tell what it is, and who are the parties? A. Robert Abbott Hadfield and the Taylor Iron and Steel Co.

Q. Is that paper executed by the Taylor Iron and Steel Co.? A. It was.

Q. Attested by you in its execution? A. It is.

Q. What is the date of that paper? A. December 13th, 1892.

Q. And what is the date of the next one? A. July 5th, 1892.

Q. And who are the parties to it? A. Robert Abbott Hadfield, of Sheffield, England, party of the first part; Henry M. Howe, Robert E. Jennings, William J. Taylor, of the second part, and the Taylor Iron and Steel Co. of the third part.

Q. I call your attention to the signature of the company to that document, is that attested by you? A. Yes, sir; it is.

Q. Does the company's seal appear there? A. Yes, sir; it does.

Q. Do you recognize Robert Abbott Hadfield's signature to that document? A. I do.

Q. Do you know the handwriting of the wit-

ness L. C. Voorhees, as to the signature of Henry M. Howe, Robert E. Jennings and William J. Taylor, to that document? A. I do.

Q. Is Mr. Voorhess living or dead? A. Dead.

Q. And do you know also that the names of Henry M. Howe, Robert E. Jennings and William J. Taylor appear there, are in the handwriting of those gentlemen? A. I do.

Q. What is the next one? A. Supplemental shell contract dated March 12th, 1897.

Q. Who are the parties to that contract? A. Robert Abbott Hadfield, party of the first part, the Taylor Iron and Steel Co., party of the second part.

Q. Was that executed by the Taylor Iron and Steel Co.? A. It is.

Q. Does your attest as secretary appear there? A. Yes, sir; it does.

Q. Was it executed also by Robert Abbott Hadfield? A. Yes, sir; it was.

Q. What is the next one? A. A shell agreement.

Q. What is its date, and who are the parties? A. November 19th, 1898, it is between Robert Abbott Hadfield, party of the first part, and the Taylor Iron and Steel Co., party of the second part.

Q. Was that paper executed by the Taylor Iron and Steel Co.? A. It was.

Q. Attested by you as secretary? A. Yes, sir.

Q. Do you find Robert Abbott Hadfield's signature there? A. Yes, sir; I do.

Q. I call your attention to a note at the bottom of the contract, with reference to interlineations within it, and signed by William B. Middleton and R. A. Hadfield; is Mr. Hadfield's name there in his handwriting? A. It is.

Q. Did you know William B. Middleton? A. I did.

Q. Is that in his handwriting? A. It is.

Q. And is Mr. Middleton living or dead? A. He is dead.

Q. Was he at any time connected with the Taylor Iron and Steel Co.? A. He was.

Q. In what capacity? A. General manager.

Q. Was he connected with the company at the time this contract was executed in December, 1898? A. He was.

Q. And what is the last agreement? A. This agreement is dated December 16th, 1901.

Q. And who were the parties? A. Robert Abbott Hadfield, party of the first part, Taylor Iron and Steel Co., party of the second party.

Q. Was that executed by the company? A. It is.

Q. And attested by you as secretary? A. It is.

Q. And do you recognize Mr. Hadfield's signature? A. I do.

Mr. Lindabury—Mr. Hardin is the subscribing witness to a number of these agreements, and I will ask you, Mr. Corbin, whether you will waive an examination of him on that.

Mr. Corbin—They may be admitted subject to our examination.

No cross-examination.

Frank Stone Tainter, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. Where do you live? A. Bernardsville, N. J.

Q. What is your business? A. Civil engineer.

Q. How long have you been practicing that profession? A. Twenty-four years.

Q. How exclusively during the later years? A. During later years?

Q. Yes? A. I hardly know how to answer that question.

Q. Have you executed any work at all? A. Yes, sir.

Q. Any contracting work or superintending? A. Yes, sir; very large work, I think.

Q. Can you mention any that you have done? A. Well, I did all Mr. Blair's work at Bernardsville, amounting to about one million dollars worth of work, various kinds and descriptions of construction work, and latterly I have been doing the work of Mr. Andrew Carnegie, of Princeton, N. J.

Q. That work was what? A. The construction of a lake and with a re-enforced steel dam and bridges, and various kinds of construction work amounting in all to about half a million of dollars.

Q. And you have done during the last ten years still other construction work, have you? A. Yes, sir.

Q. Have you used in your work any of the Taylor Iron and Steel Co.'s Manganese steel? A. Yes, sir; I have used it—well, I have used it on two occasions that I have in my mind just now.

Q. What were they? A. The first was in 1898, I had organized a little crushing company for the crushing of trap rock at Bernardsville, and we purchased a crusher from the Gates Iron Works at Chicago, and they had a steel jaw in the crusher which was supposed to be a very hard steel jaw indeed. The first three months' running the jaws gave out, and it threatened to be quite an expense to have to renew them all the time. Just about

that time I met Mr. William J. Taylor, whom I have known for a long time, and I told him about the trouble we were experiencing with the jaws of the crushing machine, and he said that I should use Manganese steel, and he said further that he had made a specialty of making jaws for different kinds of crushers, and I bought these Manganese jaws at that time for these machine, and those jaws are still in use and show no appreciable sign of wear.

Q. Has it been used steadily since that time? A. Yes, sir; it has been used steadily since that time and all the time.

Q. What other use have you made of Manganese steel? A. In connection with the work at Bernardsville sand was very scarce, and I had to crush rock so as to make my own sand, I could not get sand for my operations, and that is the way that I had to make the sand, by crushing the rock, and I got a sand machine also from Philadelphia, that was a machine that had a revolving pin with rolls working on top, with an opening in the shape of slits, so as to let the sand go down into the size of mesh that we wanted, and after working that machine for a few weeks the pin began to show very bad signs of wear, the slits allowed the crushed sand to go through and down to such an extent that the size was entirely too large, and having had this experience with the Manganese steel jaws in the stone crusher I thought it would be a good thing to have a Manganese plate made at the Taylor Iron and Steel Co.'s works, and I sent for a drawing and had it made, and that lasted the rest of the work, which was very nearly two years.

Q. Have you used other steels? A. Yes, sir.

Q. How many and what kinds? A. Well, off

hand, I should say perhaps eight or ten different kinds.

Q. During what period of time? A. During the last fifteen or sixteen years.

Q. How did the Taylor Iron and Steel Co.'s steel, which you used on the occasions you have mentioned, compare with the other steels you have used?

MR. CORBIN—There is no comparison, he is talking now about Manganese steel, as compared with other steels. Of course Manganese steel is a very valuable product, for a great many purposes. It shows nothing to make that proof.

COURT—I think it is competent evidence, I will allow the question.

A. Well, my opinion is, Mr. Lindabury, that the Taylor Iron and Steel Co.'s steel is very much better for certain purposes than any other steel that I know of.

Q. What are those purposes? A. Well, for any purpose where it is to be subject to a grind or to a laminating wear, or to heavy impact, I should not say it would stand up so well as some other steels, has a cutting edge, that is, I do not think, it would hold a cutting edge as well as some of the other steels might.

Q. But for other uses you think it is better than any other steel that you have ever seen? A. Yes, sir; for other uses, such as for a grinding, or wear, or heavy impact, as I said before, I think it is superior to any other steel that I have ever seen.

Q. And does that combine the toughness and hardness? A. Yes, sir.

Q. Was it not the hardness and the toughness of the steel combined, the reason you think it is superior? A. Yes, sir.

Cross-examination by Mr. Corbin.

Q. Did you ever conduct any series of tests of this Manganese steel as compared with any other steel? A. No, sir.

Q. Then the comparison of the Taylor Iron and Steel Co.'s steel is with the ordinary steels that you have used? A. Yes, sir.

VICTOR ANGERER, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Red Hill Park, Pa.

Q. What is your occupation? A. Vice-President and General Manager of the William Wharton, Jr., & Co., incorporated.

Q. How long have you been connected with that company? A. For twenty-two years.

Q. How long have you been the manager of the company? A. I became the superintendent of the works in 1889, and I have been their general manager for the last six or eight years; I cannot tell exactly—well, six years now.

Q. What is the special line of the Wharton Co.? A. The manufacture of what is special contract work, such as switches, frogs, crossings and curves for street railways, and also for steam railroads.

Q. Has the company an extensive business in that line? A. Our company is considered one of the largest companies in the business in the United States.

Q. And with what large railroad companies do you have contracts? A. We do considerable business with the Pennsylvania Railroad Co., the Philadelphia and Reading Railroad, the New York Central Railroad, the Illinois Central Railroad,

and all the street railroads, the Boston Elevated Railroad, the Philadelphia Rapid Transit Co., the New York City Railroad Co., the Brooklyn Rapid Transit Co., in fact nearly all the large railroads in the country.

Q. What steel or steels do you use for this contract work? A. Prior to 1894 the work was made generally out of Bessemer steel rails, or steel or iron castings. And in 1894 we introduced into the parts subject to the greatest wear Manganese steel made by the Taylor Iron and Steel Co.

Q. Were they the first makers of Manganese steel in this country? A. They were the first as far as we know.

Q. And have you used the steel since that time, that is, the Taylor Iron and Steel Co.'s steel? A. We have used that steel since that time.

Q. And still use it? A. Yes, sir.

Q. In large quantities? A. Very large quantities.

Q. Can you tell us whether the use is exclusive or not; for the special purposes, do you use the Taylor Iron and Steel Co.'s steel exclusively? A. For that purpose, for the points of greatest wear in contract work, such as I have described, we use the Taylor Iron and Steel Co.'s Manganese steel exclusively.

Q. Have you found that steel to be superior—have you found the Taylor Iron and Steel Co.'s steel to be superior to other steels for the purpose? A. We have.

Q. How have you arrived at that conclusion? A. By observation of what other steels in a similar condition did in service.

Q. Where have you made this observation? A. On various railroads and railways, in cities, and also on the steam roads in Philadelphia, Brooklyn and other places, Boston and other places.

Q. What are the peculiar features that you find in the Taylor Iron and Steel Co.'s Manganese steel possesses over other steels? A. It seems to withstand the wear to which it is subjected by the action of the wheels better and longer than other steels that have come under our observation.

Q. And is that due to any special physical properties it possesses that you know of? A. It is due undoubtedly to the combination of hardness and toughness that it possesses.

Cross-examination by Mr. Goode.

Q. Did you ever make any comparative tests of the Taylor Iron & Steel Co.'s steel with that of other Manganese steel by other manufacturers? A. Tests in service, that is, by observation of tests in service.

Q. You mean by that, you examined steels in use on steam railways? A. By the observation of the results under practically equal conditions of traffic.

Q. What other steels did you examine? A. Well, various steels. Harveyized steel, and then there was Manganese steel, what was called Manganese steel made by one of our competitors, the Loraine Steel Co., and the Manard steel made by the Pennsylvania Steel Co.

Q. Did you ever make any tests of any steel made by Johnson & Co. of Spuyten Duyvil? A. No tests—in service, we went and obtained a few castings from the Johnson Co., of Spuyten Duyvil, to examine them to see how they would act on the bending and how hard they were, but they were not put into service.

Q. You say you use the Taylor Iron and Steel Co.'s steel exclusively? A. Yes, sir.

Q. You haven't then, other than by observation, had any experience of other steels? A. None, except by observation of the results.

Q. You have done all of your business exclusively with the Taylor Iron and Steel Co.? A. Yes, sir; we believe them to be the best.

Q. You believe them to be the best? A. Yes, sir.

Q. Do you know anything about the steel frogs made by the Pennsylvania Steel Co.? A. I have seen a good many of them.

Q. They are pretty generally in use in the Pennsylvania Railroad, are they not? A. Yes; a good many of them.

Q. They are Manganese steel, are they not? A. They call it Manard steel.

Q. What is the difference between the Manard steel and the Manganese steel? A. Well, now, I am not a metallurgist, and I cannot tell you.

Q. Then you are not a metallurgist? A. No, sir; not at all.

Q. Are you interested in the Taylor Iron and Steel Co.? A. No, sir.

Q. What did you mean by speaking of those Manard and Lorraine companies being competitors of yours? A. In the contracting work.

WALTER BRINTON, recalled, his cross-examination resumed, saith:

Cross-examined by Mr. Corbin.

Q. The last question was not answered, which was, "is not the ferro-manganese mixed with the blown metal in the ladle?"

MR. CORBIN—Your Honor will recall that we had some argument in regard to the unwillingness of the witness to answer the questions, or to answer this question; your Honor will also recall that

the issue raised by the pleadings is whether there is——

MR. LINDABURY—We will withdraw the objection to that question.

(*Mr. Corbin.*)

Q. Is not the ferro-manganese mixed with the blown metal in the ladle? A. It is.

Q. In operating the converter, whether for the Bessemer process such as you used at Chester, or for the similar process used in the Taylor Iron and Steel Co.'s works, you sometimes find the heat insufficient, do you not? A. Yes.

Q. And there are various methods of increasing the heat in use, are there not? A. I only know of one.

Q. What is that?

MR. LINDABURY—I object to that question. Since the other day we have taken pains to inquire into these methods and processes very closely, very much more so than before, so as to get exact information, and so that everything might be divulged by this witness in cross-examination, that it was at all safe for us to do, and we concluded that this other question might be answered.

Now, we have come to this situation. That the iron is melted in the cupola as it already appears, it is then put into a converter, as also appears; and it also appears, too, that some control over the temper of the metal in the converter is necessary, to increase it or decrease it, in that important process of conversion. The Taylor Iron and Steel Co. do that by a method different from that in use

anywhere else, as they understand and believe—a method communicated in part, at least, by Mr. Hadfield, under terms of secrecy, detailed, or enjoined in these contracts, which have been offered. To tell what that method is, would be to violate our contract with Mr. Hadfield, it would be to disclose one of the most important features of our processes, and we think that we Should not be required to do that. If the other side think that our method is one in common use, that would be another question; if they should be allowed to prove what that method is, and what that process is, then we will meet that, when we come to it. This witness has testified that we simply put the metal in the converter, and then they subject it to a certain blower process, and it now appears, as the fact is, that while it is in this converter attention has to be paid to the temperature, that is, it must not be allowed to get too hot, the blowing of the air into it increases the heat, and the temperature must not be allowed to be too low either. The method of regulating that temperature is something regarded by the Taylor Iron and Steel Company as of the greatest account, and to that method they attribute, in a very large degree their phenomenal success in producing in the finest form a product of hardness and toughness, which they have produced, and we therefore submit that we should not be called upon to reveal that process. We have gone far

enough to show that one of our secrets is in the method of controlling the temperature, and they knew, and we know that it is required to be controlled, and they know and we know that it was controlled before we got the ~~Harvey~~ Hadfield process, by an admixture in the cupola, and not by any method or methods pursued after the metal was put into the converter——

COURT—The real issue is whether you have a secret method, is it not? Otherwise there would be no reason why the court should enjoin a man from telling what everybody knows. Now, that is the issue, as I see it. Now, how do I know that you have a secret method? The mere statement of a witness is not sufficient, because that allows him to be the judge. Of course, if this process is to be revealed, then I would cause everybody to leave the court-room, except counsel, and I would do all that I could to prevent the secret being spread. Have yau any authorities to submit?

MR. LINDABURY—Mr. Hardin has collected some authorities, which, with your Honor's permission, he will now present.

(After some discussion.)

COURT—All questions of this character are very difficult to determine, because the court wants to do exact justice to each side. Counsel can well see that in examining the decided cases, that there seems to be a great uncertainty about

the course that ought to be pursued in each case. Here is a case, as it stands, where a servant entered into a contract with his employer, to preserve the secrets and to keep or not to divulge the processes or methods of doing business. That is where this case stands now. And counsel asks that notwithstanding he, by his contract, has admitted that there are matters that he ought not to divulge, because he has so contracted and agreed, that because he violates his contract—because he makes this contract and then walks out and undertakes to divulge what he agreed not to divulge, then he is permitted by cross-examination of a witness for the complainant, who is seeking to protect his rights, to practically destroy his rights——

MR. CORBIN—We deny that, we say these things are not secrets.

COURT—The complainant is seeking to protect what he considers to be his property. The defendant, after making a contract that he would not divulge those secrets, walks out and threatens to do that very thing, and when the complainant undertakes to compel him not to divulge those secrets, the penalty he pays is, that he must divulge what he is trying to protect. Now, I know that courts have had great difficulty, how to handle this question. In some cases they send everybody out of the room, and try the case in what is called "Camera." Well, the practical result of that is, that everybody knows it, that

is what it amounts to. You cannot by any exclusion of witnesses or parties preserve the secret in that way. So that it amounts at last to this, that a man must either submit to the destruction of his property, without contest, because if he undertakes to protect it, he would also necessarily have to submit to his property being destroyed.

Counsel for the defendant in his argument says that this contract that has been offered in evidence, and which is now evidence, is not good; that the defendant Mr. Nichols never made any such contract, or, if he made it, he made it without knowing what kind of contract he was making, and therefore, the court is not justified in assuming the conditions which I have stated as existing, at this time when this question is now propounded. I think that in view of the peculiarity of this cause; in view of the fact that the complainant ought not to have his property destroyed, while trying to protect it—if the court can do that, I will therefore overrule this question and all questions of a like character. But in doing this, I will require that this witness, remain in attendance, so that if it should turn out later in the case, that the defendant made no such contract, as is alleged, and that therefore my present conclusion is based on a false opinion, of the facts, then I will require this witness to be recalled, so that he may be cross-examined to an extent that the court then thinks proper. I do not see any

more equitable method of settling this controversy just now.

(*Mr. Corbin.*)

Q. You have stated that the method of increasing heat known to you was only one, and that that method was used at Chester, as well as at the Taylor Iron and Steel Co.'s works? A. I did not say that—it had reference to the converter, during the conversion.

Q. I will ask the Stenographer to read that portion of the evidence again (the following question and answer being read):

"Q. In operating the converter, whether for the Bessemer process, such as you used at Chester, or for a similar process used in the Taylor Iron and Steel Co.'s works, you sometimes find the heat insufficient, do you not? A. Yes, sir.

"Q. And there are various methods of increasing the heat in use, are there not? A. I only know of one.

"Q. What is that?"

You have stated that the method of increasing the heat know to you, was only one and that that method was used at Chester, as well as at the Taylor Iron and Steel Co.'s works? A. In the converter, in answering that question, during the process of conversion in the converter—the previous question got me to make that remark—I have only the one method of increasing the heat in the converter, during the process of the blow.

Q. What was the method used at Chester? A. Charging the iron sufficiently, charging it with silicon in the cupola.

Q. Then silicon was the material you relied upon

to increase the heat? A. At Chester, in the cupola.

Q. I am talking now about the converter—what in the converter? A. In the converter, silicon and carbon—that is, at Chester?

Q. Yes—what was the method used for diminishing the heat? A. We used pig iron and steel.

Q. In all these Bessemer processes, there are occasions when the operator can see—in all these conversion processes—that the heat is too great or when it is too low, and then a certain application is called for to increase or diminish the heat—is not that the case? A. In the two cases, that I have had something to do with, yes, sir.

Q. In all these converters——

(*Mr. Lindabury.*)

Q. That was at Chester? A. Of the practice that I have had direct connection with at the Taylor Iron and Steel Co.'s works and the Chester Co.'s.

(*Mr. Corbin.*)

Q. Now what do you mean by physics? A. Alloys.

Q. Does that include the manganese and the carbon? A. Alloys include manganese and carbon.

Q. In the manufacture of manganese steel at the Taylor Iron and Steel Co.'s works, you say you put in the physics—do you mean by that, manganese and carbon? A. The physics include manganese and carbon.

Q. Yes—the physics include Manganese and carbon? A. Yes, sir.

Q. Now you have stated that you made a uniform product of Manganese steel—what was the percentage of Manganese approximately, in that product?

MR. LINDABURY—You mean put in, by them?

MR. CORBIN—I am asking him the question, what percentage of manganese, there is in the product.

MR. LINDABURY—I objected to the question, upon the ground that it is inquiring as to one of the secrets of manufacture.

COURT—Do you claim that it is different from what other people use?

MR. LINDABURY—Oh, yes, sir. If your Honor please, I assume now that the question asks for the amount of Manganese put into the mixture at some time or other, and not for the amount of the Manganese which is in the finished product, that is discoverable by analysis the other is not.

(Question read as follows): You have stated, that you made a uniform product of Manganese steel—what was the percentage of Manganese, approximately, in that product?

COURT—That you admit yourselves can be discovered by analysis.

MR. LINDABURY—Well, understanding that the question relates to the finished product——

MR. CORBIN—I object to counsel instructing his witness——

MR. LINDABURY—Well, he may answer the question.

A. It may vary for various purposes.

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(*Mr. Corbin.*)

Q. Take the product that you make of the standard quality, the one that you make more than any other? A. Twelve per cent. of Manganese.

Q. And how much carbon? A. One and one-quarter per cent. of carbon.

Q. Now then, in preparing what you call the physics, you put together, or do you melt Manganese and mingle it when heated in the ladle with a molten metal? A. We do.

Q. What percentage of purity is there is the ordinary Manganese of commerce, used in the manufacture of Manganese steel? A. Eighty per cent.

Q. And what percentage of carbon is combined with it? A. It is variable, say about three and a half or four per cent.

Q. Now then, is there necessary for the purpose of the manufacture of Manganese steel, to use any other carbon and Manganese, than that in those materials, ordinarily in the ladle? A. Usually not.

Q. That is to say, the melted Manganese contains with it a sufficient quantity of carbon, so that the twelve per cent. of Manganese and the relative portion of carbon, can be obtained from that material? A. We order for our own uses, special Manganese for the special purposes, and one of those special purposes is the making of Manganese steel. Therefore, we prepare ourselves with Manganese containing the right ~~proportions~~ proportions for the special art.

Q. Now then, is not the practice—I will present this, so that the issue may be fairly before the court—is not the practice to melt this Manganese containing a percentage of carbon, with other substances, and to put it heated into the ladle and to mingle it there, with the melted steel, to make the Manganese steel, and is not that the practice substantially the world over? A. I could not answer that as to the world over.

Q. Is not that your practice? A. Yes, sir.

Q. Do you think it makes any difference whether you put the Manganese in first, or the steel in first, into the ladle—it is done both ways, is it not?

MR. LINDABURY—I object to that question as not being cross-examination.

COURT—I shall sustain the objection, that is entering into the method which I have held I would not now permit you to cross-examine upon, because the defendant himself has stated, that there is some secret about it, there may be something in that, and I will hold as I said before, this witness, subject to your order, to be cross-examined hereafter, if it should be found necessary.

(*Mr. Corbin.*)

Q. Take your experience at Chester, was it the custom there to put the carbon into the ladle, and then pour the melted iron upon it from the converter? A. In some processes, yes, and some not.

Q. It was in some processes? A. Yes, sir, ordinarily.

Q. Now then, from the ladle the steel is poured into the moulds of the castings, is it not? A. You mean the ladle that receives the steel from the converter?

Q. Yes, what becomes of the steel after it passes from the ladle, where does it go to? A. It is distributed to the moulds.

Q. That is what I said, that the steel after it passes from the ladle, is distributed to the moulds? A. Yes, sir; and sometimes it is transferred into other ladles.

Q. That is just a matter of convenience, is it not? A. Yes.

Q. You may distribute it to the moulds, or you may distribute it to other ladles, or you might put it in the moulds, all from one ladle, might you not? A. Yes.

Q. It might not be very easy to reach the mould from that particular ladle, so that you would have to distribute it to other ladles, in order to reach the proper mould that you wish to reach—it is merely a matter of convenience, is it not? A. Yes.

Q. And you would not handle it twice, if you could do it all at once, would you? A. No, sir.

Q. The moulds are prepared by a number of moulders there, are they not? A. Yes, sir.

Q. How many moulders have you? A. We have 100.

Q. And these operations you have described, are all carried on in their presence? A. The ~~melting~~ moulding process—yes, that is all carried on in their presence.

Q. They see the converter, and they see the ladle? A. Yes, but they are at their own work, they are not entitled to attend to anything that is going on, except their own work.

Q. It is right before their eyes, is it not? A. Well, not exactly before their eyes, no, sir.

Q. They do see it, do they not? A. Well, we generally speak, if we can find any one spying, we prevent it, where we can.

Q. As a matter of fact, there is no doubt about it, that they do see it? A. They may.

Q. You know that they do see it, do you not? A. I don't know that they do, possibly, no, I know that they can see it though, if they insist on it.

Q. And you know that they cannot help it? A. I know they can see it, if they insist on it.

Q. The casting is taken while still hot to the furnace? A. Sometimes, yes, and sometimes not.

Q. You prefer that the casting should be taken

while still hot to the furnace, do you not? A. That is according to the kind of casting it may be.

Q. It would save heat on the reheating to take it hot, would it not?

MR. LINDABURY—I object to that question on the ground that it is part of our secret process.

COURT—It is a question that can be answered yes or no.

A. It is easy to answer it—yes, it would save heat, certainly.

(*Mr. Corbin.*)

Q. If the metal is allowed to grow cold in the ~~bowls~~ moulds, there is some risk of cracking, is there not?

MR. LINDABURY—I object to that question for the same reasons heretofore given.

Question allowed.

A. Yes.

(*Mr. Corbin.*)

Q. That makes it an object to take it out before it is entirely cold, does it not? A. Yes, it does.

Q. Then to save the heat, you take it out as soon as you can handle it, do you not?

MR. LINDABURY—I object to that question for the reason that that is an inquiry as to the degree of heat, which is one of our secrets.

COURT—I will overrule that question because it is inquiring into the process or method in which they conduct their business.

(*Mr. Corbin.*)

Q. Did you not, in the year 1904, apply for a patent on that very thing yourself? A. I think that was the year, yes, sir.

Q. Applied for a patent on the idea of saving the cracking in the metal, by removing it, as soon as possible from the mould? A. Yes.

Q. On that identical thing? A. Yes.

Q. Why do you call it a secret then, if you got a patent on it? A. I am not calling it a secret.

Q. You understand you are sworn to tell the truth—what does that mean? A. I mean to tell the truth.

Q. Why do you wait for counsel to tell you what to tell then? A. I am under oath, and I am telling the truth.

Q. It is taken, as you have stated, from the moulds to the annealing furnace, or to the furnace? A. Yes, sir.

Q. And there it is heated to a bright red color, is that the fact?

MR. LINDABURY—I object to the question for the reason that the temperature to which it is to be heated is one of the secrets.

Question allowed.

A. Yes, sir.

(*Mr. Corbin.*)

Q. Well, then, it is plunged into a cold bath, is it not? A. Yes.

Q. And that gives it the hardness? A. No, sir.

Q. Well, what does it give it—it gives it a quality you need for it? A. It gives it a quality.

Q. Do you mean to say that the plunging of the red hot steel into a cold bath of water or brine, does not make it hard? A. Not necessarily in this case.

Q. If you had a very low percentage of carbon, it might not—there would have to be a very low percentage of carbon, if it did not harden it, would there not? A. Not if there are other elements in it to prevent it.

Q. I am not trying to get at the elements in it, that is a well-known scientific fact, is it not—that is the procedure known as the tempering of the steel, the last step? A. Yes, sir.

Q. And then the steel goes to the shops to be cleaned and trimmed, etc.? A. Yes, sir.

Q. Now then, have you not practically told us about the whole process, and if so, what is there that you have not told us? A. Care and skill in operating the different processes.

Q. Simply a matter of care and skill in operating the different processes? A. Yes, sir.

Q. That was so in the making of the Bessemer steel at Chester, was it not? A. There was always care observed there.

Q. How many foremen do you have in the shop? A. In what shop?

Q. In the Taylor Iron and Steel Co.'s steel department? A. One.

Q. That is in the Manganese steel department? A. Yes, sir.

Q. How many foremen do you have in the establishment altogether? A. Eight or ten.

Q. And what are the departments? A. The steel making department, the foundry department, the finishing department, the machinery department, the blacksmithing department, the yard department and the laboratory.

Q. You have testified that you have made tests of Manganese steel made by other manufacturers,

did you ever test the steel made by the Johnson Steel Co., of Spuyten Duyvil? A. As far as bending was concerned, yes, sir.

Q. Is that the only test you made of it? A. I cannot recall the record further, of the I. G. Johnson Co. steel.

Q. What article did you test? A. As I recall it, it was either a small presser jaw, or a frog casting.

Q. Did you test the tongue of a rail switch? A. I cannot recall just what the article was.

Q. Did you ever test anything of the Penn Steel Co.? A. Yes, sir.

Q. What did you test for them? A. I tested a part of a railroad frog.

Q. Did you find that good material? A. I found it tough.

Q. And this tongue, this other article you tested, do you remember how you found that? A. Yes, sir, I found that tough, too, but it did not attain the hardness that our steel did.

Q. You thought it was not as hard as your steel? A. Yes, sir; from the careful bending it showed greater ductivity.

Q. You have given us some evidence in regard to the execution of the contract by Mr. Nichols—do you recall whether Mr. Nichols had been, or where Mr. Nichols had been, just before that contract was presented to him? A. I think he had been in Camden, N. J., as I recall it.

Q. On what occasion? A. On the illness of his sister.

Q. And she died, didn't she? A. During that time, yes, sir.

Q. And he just returned from that visit? A. I think it is likely.

Q. And on the same visit, was he about to go to the funeral with his family? A. He was about to

return there, whether it was the funeral or not, I do not remember.

Q. He was about to go back to Camden, was he not? A. Yes, sir, he was about to go back to Camden.

Q. Didn't he ask for some advance of money to pay his expenses? A. He stated that he needed money, yes, sir.

Q. And didn't he go to the office to get the money? A. He went to the main office, yes, sir, to get the money.

Q. And didn't you keep him waiting some time, because there was a contract being typewritten for him to sign? A. I do not recall.

Q. You do not recal it? A. I do not.

Q. Do you say that is not so? A. I do not say that it is not so, but I do not recall it.

Q. Wasn't he kept waiting some time, to get the contract? A. I cannot answer that question positively.

Q. Don't you know that he had to examine it very hastily, and to hurry away, to go to the funeral that day? A. I do not.

Q. Didn't he afterwards come to you and make objections to the contract? A. He stated some objections probably, at some time.

Q. Didn't you tell him that you had refused to sign a similar contract? A. I think I did.

Q. Didn't you tell him that you had advised with counsel, when you were asked to sign a contract of that description, and that you had concluded not to sign it? A. I may have so stated, yes, sir.

Q. That was true, was it not? A. I might have said so.

Q. That is not an answer to the question—hadn't you refused to sign a similar contract, on the advice of counsel? A. I might have stated so.

Q. Didn't you tell him the contract was no good

—answer that question? A. That I might have said, too.

Q. Didn't you throw down the contract on your table, and didn't you tell him that? A. I might have said so.

(*Court.*)

Q. What do you mean by "you might have said so?" A. I don't know whether I did or not.

Q. Don't you know whether you told him, that the contract was not any good—now that is a plain simple question—you were asked by counsel, if you did not tell him that that contract was no good—now you certainly ought to know when you were getting a man to sign a contract, whether you told him that that contract was no good or not? A. Well, it has been some time ago, and I cannot recall, possibly I did, and I say I might have said so.

Redirect by Mr. Lindabury.

Q. When was this conversation with Mr. Nichols in which he threw down the contract, and made objections to it—when with respect to the time it was signed, how long after? A. As I recall, it was—I don't know whether it was before or after, whether he had the contract before or after, but it was afterwards, I guess.

Q. What—I don't understand you—after what? A. After the contract was signed.

Q. Well, don't you know whether it was or not? A. I do not recall positively, we were all, at least I was, more or less confused about it. It is not my intention to evade the honest truth in this matter, I don't want to do that, and I don't want it understood that I want to do it.

Q. You don't want what? A. I don't want you to think that it is my intention to evade the honest

truth in this matter, I don't want to do that, and I don't want you to understand that I want to do it, the whole trouble is that I do not recall positively about it.

Q. I don't suppose you do—you don't know when it was you had this talk with him? A. I think it was after the contract was signed.

Q. Don't you remember that the matter was in your minds when you made an affidavit in this cause? A. I think so.

Q. Did you consider the fact then? A. I did.

Q. Now, do you recall what time of the day it was you gave the contract to Mr. Nichols to sign? A. Just before dinner, I think it was.

Q. When you first gave it to him? A. I think it was.

Q. Well, what did he do with it? A. He looked it over.

Q. Was it then in your presence? A. No, sir, I left the office, as I recall, and went into my own apartments.

Q. Did you have any conversation with him then? A. Not until he had looked it over.

Q. What conversation did you have with him, after he had looked it over? A. Well, he expressed himself, as I recall it, that he was not just at that moment pleased with it, but afterwards, after he had signed it, he expressed his most perfect satisfaction with it, and he wrote me a letter to that effect, which I have not, at the present time.

Q. What has become of the letter? A. I don't know what became of it.

Q. What conversation did you have with him, at this time, when he at first expressed himself as doubtful about it? A. I think it was some part of the wording of the contract that he did not just like.

Q. What was the wording that he objected to—

I want the conversation as nearly as you can recall it? A. As nearly as I can recall it, why it was that he was forever bound to keep inviolate the secrets.

Q. What did he say about that? A. He didn't approve of it.

Q. Being forever bound? A. No, sir.

Q. What did he say about it? A. He didn't like it, as I recall it, he said "I don't like it."

Q. And what did you say? A. I told him—I said, "What is the difference, you will be with us always, what does it matter, what is the difference, I want you with us always, no matter whether you had a contract or not."

Q. And what did he say then? A. I cannot recall that he said anything to that, at that time.

Q. Did you tell him at that time, you doubted whether it was good or not, that it was no good or something like that? A. I might have said that, I cannot recall.

Q. You don't know whether you did or not—you don't know what you said? A. I am not positive.

Q. What is it you might have said? A. I cannot remember.

Q. You cannot think of what you might have said—did you tell him that you had refused to sign such a contract yourself? A. I told him one time, whether it was that time or not, I cannot now say.

Q. Did you tell him why or anything like that —I want to get the whole conversation on the subject, if I can? A. Well, I was not pleased with some of the wording of the contract.

Q. Is that what you told him? A. I think it is yes, sir.

Q. Did you tell him, that part of the contract, that particular wording you were not pleased with was, this being bound forever? A. That, and to never use any of the information that I might have

had, it seemed to cover the ground so thoroughly, that it left me without very much.

Q. To do? A. Yes.

Q. Did he take further time to consider or not, as to this contract, after you had this talk with him? A. Not as I recall it, no, sir.

Q. Do you mean that this conversation was on the day that he signed the contract, or that it might have been at some date after he had signed the contract? A. I think it was afterwards. I think the day he signed the contract, we went to the main office, and he signed the contract then, and it was after he had signed it, as I recall it, he expressed himself, as not being satisfied with it, and threw it down on my desk.

Q. What did he say about it then, besides expressing himself as dissatisfied—did he say how he became dissatisfied? A. No, sir.

Q. Did he claim that he had been misled into this signing of the contract, by anything you had said or done? A. Oh, no, sir, I would not mislead him, he knows that I would not mislead him.

Q. I want to know whether he claimed that he had been misled, or fooled into the signing of it by anybody or not? A. No, sir, he did not.

Q. Did he claim that he did not understand it, when he signed it? A. No, sir, he did not.

Q. Are you sure of that? A. I feel morally certain about it, that he never claimed anything like that to me, that he was misled or fooled into signing it, of course he knew very well that I would not mislead him or fool him into signing anything.

Q. Have you looked for that letter that you said he wrote you? A. Yes, sir.

Q. Could you find it? A. No, sir.

Q. Tell us what it contained? A. As near as I can recall, he wrote and stated that he was now extremely happy over matters—now if you will par-

don me, I just now recall about Mr. Nichols calling at my house and talking over these matters, most seriously with me, before any contract was entered into.

Q. Let us have that? A. He gave me to understand that he had decided most fully to remain with the company and myself, and that he had arrived at that conclusion, after having consulted his own conscience in the matter, entirely as he said, owing to the fact, that we were all good friends, and had been associated together for so long, and that we had been good and kind to him. And I said to him, "Why, yes, I am awfully glad of that, because I wanted to tell you something and I didn't want to tell it to you, until you had made a statement of that kind to me, but I wanted to tell you, that the company has arranged with me, whereby they are going to increase your salary very much," and I know that that made him very much happier. Now, that must have been before the contract, that must have happened before the contract was signed.

Q. That particular conversation must have been before the contract was signed? A. Yes, sir, I cannot recall these things positively, but that I think must be so.

Q. I asked you to tell us about the contents of that letter?

MR. CORBIN—If it appears that the letter was written before the contract was signed——

A. No, sir, it was written after the contract was signed. He wrote me and told me how glad he was that everything was straightened up, that he felt he was going to be one of us, always after that—that is about the contents of it—it was expressing the satisfaction of his feelings towards myself and

towards the company, even though he migh thave felt badly over some part of the wording of the contract.

Q. How long was it, about, after the contract was signed that you got that letter? A. I should say it was inside of two weeks.

Q. Well, was it about that—two weeks after? A. I cannot positively state.

Q. Well, approximately? A. Approximately, yes, sir.

Q. Now then, come back to your processes—I want to ask you a few questions with regard to them—you spoke the other day of your primary mixture, as I will call it? A. Yes, sir.

Q. I think you said you made castings chiefly upon order, did you not? A. We do, yes, sir.

Q. And for various uses and of varying sizes? A. Yes.

Q. Now, do you make the same primary mixture for all purposes? A. Oh, no, sir.

Q. How many different mixtures do you make, how many primary mixtures I mean now? A. The primary mixtures, there is a very large scope of variation in the primary mixtures, to suit the work that we have in view to make.

Q. Do you make an unlimited number of varieties in your primary mixture? A. Not an unlimited number, no, sir.

Q. Cannot you approximate the number of various mixtures you make for different classes of work? A. I should say from six to eight mixtures that we are using.

Q. Are these mixtures of different ingredients, or of the same ingredients in different amounts? A. They may be different ingredients, and they may be similar ingredients, with different amounts, yes, sir.

Q. Do you observe secrecy with regard to these primary mixtures? A. Entirely so.

Q. Have you always observed secrecy, with regard to these primary mixtures? A. Yes, sir, we have.

Q. To how many persons have they been known, in your practice? A. They are only known to the chief chemist and myself.

Q. Were they communicated to Mr. Nichols? A. To Mr. Nichols of course, but he is not there now.

Q. When he was there, were they communicated to him? A. Yes, sir, Mr. Nichols knew of the mixtures that were used.

Q. Now, you spoke of the method of controlling the heat, how do I understand you that was controlled, while you were at Chester? A. By the additions of irons, that contained a higher percentage of silicon—now you are asking for Chester?

Q. Yes. A. For Chester, yes, sir.

Q. Where were those added? A. They were added and charged in the cupola.

Q. Was any method of treatment then in use, for increasing the heat in the converter? A. Not at that time.

Q. Where do you control the heat? A. We control the heat——

Q. In the converter or the cupola? A. In the converter, blowing——

Q. In the converter? A. Yes, sir.

Q. Is control of the heat in the converter, of account? A. Very essential.

Q. Are the methods by which you control the heat in the converter kept secret by you? A. They are.

Q. Have they always been? A. They have.

Q. Was Mr. Nichols made acquainted with them? A. He was.

Q. After the metal is taken from the converter,

it is put into a ladle and physic is applied you say —is that right? A. Usually the physic is applied first, in the ladle——.

Q. No, I mean to say, that in the ladle, physic is applied—I did not ask you which is put in the ladle first—is the physic applied in the ladle? A. It is.

Q. Now, is the contents of the physic always the same? A. It is not.

Q. Is it generally the same or is it varied for different kinds of metal you produce? A. It is varied for the different kinds of metals we make or produce.

Q. Does the variation consist of the materials used or the quantity of material used or both or neither? A. All.

Q. Is that kept secret? A. It is.

Q. Was that communicated to Mr. Nichols? A. Yes.

Q. Now then, with regard to the original mixture, and with regard to this percentage of physic applied, do you observe a rule of practice or is it a mere matter of indivdual judgment in each individual case? A. We have a rule of practice on certain lines. If there is new work comes in, it is necessary then to make some change.

Q. To make a new rule? A. Yes, sir.

Q. But have you followed this long enough, from the points spoken of, to have reached what might be called a rule of practice? A. Yes, sir; we have an established rule.

Q. Now, when you were at Chester, what was the time, with regard to the temperature, of taking the castings from the mould, after it cooled or before? A. Before they were cold. You see we do not make castings there as a rule.

Q. No matter—now, under the original Hadfield process—I think the Hadfield patent, the original Hadfield patent I think stated the temperature at

which the casting should be taken from the mould, do they not? A. I think not.

Q. Yes, they do? A. It states how they should run the furnace.

Q. Have you, at the beginning of your operation of the Hadfield processes, to take them out after they had cooled or before—at the beginning, is it not? A. They were removed from the mould, before they were cooled.

Q. At the beginning? A. Yes, sir.

Q. Were they put in the furnace hot or cold? A. They were put in the furnace cold.

Q. Now, as the result of your practice there, have you adopted a different rule about that? A. Yes, sir.

Q. And do you put them in, different castings, in the furnace at temperature with respect to which you follow a rule? A. We do.

Q. Do you follow in that respect, any disclosure in the patents, any rule disclosed by the patents?

MR. CORBIN—How does he know?

MR. LINDABURY—There is a rule mentioned, and he knows all about it.

MR. CORBIN—Well, which of the patents?

MR. LINDABURY—All of the patents together.

(*Mr. Lindabury.*)

Q. Do you or do you not follow the exact temperatures disclosed by the Hadfield patent?

MR. CORBIN—I object to the question because, as I said before, it does not appear that the witness knows anything about it—it does not appear that the witness has seen all the patents, that is the Hadfield patents, and they were not

offered in evidence and I think before this evidence can be competent, the specific patents ought to be offered in evidence.

COURT—I will take it; he can answer yes or no.

A. No, sir.

(*Mr. Lindabury.*)

Q. Are you familiar with these Hadfield patents that were offered this morning? A. Yes, sir.

Q. Or rather the Hadfield agreements that were offered this morning? A. Yes, sir.

Q. Has this practice of yours with regard to the temperature of which the castings shall be put into the annealing furnace, been the outgrowth of your experience there? A. It has.

Q. Is it the same as it was at the beginning? A. It is not.

Q. And have you reached a rule of practice with regard to that applied in varying ways to the different products? A. We have.

Q. Was Mr. Nichols made acquainted with them? A. Yes, sir.

Q. Was that being preserved as a secret? A. It is.

Q. With care or not? A. With great care.

Q. You have testified that after you put the castings in the annealing furnace, you heat it up to a temperature of what you call what—red heat or what do you call it? A. "Bright red."

Q. 1,700 or 1,800 degrees—is there any rule with regard to the time when the castings shall be raised to that heat? A. A very close rule; yes, sir.

Q. Is the rate of heating of consequence? A. It matters very much according to the size, shape and designs of the castings.

Q. So you have a different rule for the different sizes and designs of the castings, do you? A. Yes, sir.

Q. And you say that rate of heating is of great consequence, is it? A. It is.

Q. Has that been a matter to which you have given great attention? A. Always.

Q. The rate of heating? A. Always.

Q. Have you taken any means to preserve the secrecy with regard to that? A. We have.

Q. I think this heating is done in ovens, you said? A. In the furnace.

Q. Furnace I should have said? A. Yes, sir.

Q. Have you any method of registering the heat? A. Yes, sir, we have.

Q. Where does the heat register? A. It registers in the steel works office, in my office.

Q. So that you sitting in your office, have the register of each furnace? A. Yes, sir, I have the register of all the furnaces at any time.

Q. And are the public allowed in that office? A. No, sir, but they would not understand the register if they were.

Q. Is it a key register? A. Yes, sir.

Q. And you have a code? A. We have a code for it.

Q. Did Mr. Nichols know that code? A. Yes, sir, Mr. Nichols is acquainted with it.

Q. Did anybody but you and he know it, when he was there? A. No, sir.

Q. Who taught you? A. Who taught me?

Q. Never mind, I will withdraw that—the Hadfield system, where did you learn that? A. At the Taylor Iron & Steel Co.'s works.

Q. And by whom were you taught it? A. By a Mr. Nallaband.

Q. Who was he? A. A man sent over here by Mr. Hadfield to start the plant up in the beginning.

Q. What year, when was that? A. That must have been—that question should be asked somebody else, I was not with the Taylor Iron and Steel Co. at the time he started.

Q. When he taught you? A. I came here in 1895.

Q. And how long was he teaching you? A. He was nearly a year.

Q. And that is the way you learned it? A. Yes, sir.

Q. And these different processes which you say you have kept secret, are they or not parts of the Hadfield processes, with your own variations? A. That is right; yes, sir.

Q. The process is essentially the Hadfield process, with such modifications as you have made up there, is it? A. Yes, sir.

Further Cross-examination by Mr. Corbin.

Q. You spoke of receiving a letter from Mr. Nichols—did that letter come from Camden, N. J.? A. I cannot state positively.

Q. He must have been away somewhere, to write you a letter? A. I think it was not at High Bridge, but whether it was I cannot state now.

Q. When heat was deficient in the converter at Chester did you have no methods of increasing the heat? A. Not in the converter.

Q. Didn't you put Manganese into it sometimes? A. No, never.

Q. Did you have a side blow? A. Yes, sir.

Q. That increased the heat, didn't it? A. Yes, sir, it caused a good bit of oxidation.

Q. It assisted to correct that evil, didn't it? A. Yes, sir.

Q. Silicon was too expensive to use in these cheap steel, was it not? A. No, sir, I think not.

Q. Was not that one of the reasons they did not use silicon? A. No, sir.

Q. Was not it a well-known method to increase the temperature? A. No, sir, it was not.

Q. It was not? A. No, sir.

Q. Didn't you know that the use of silicon was one of the methods to increase the temperature? A. I knew that the addition of silicon was one of the methods to increase the temperature, but I say we did not use it at ~~High Bridge~~ Christ.

Q. Didn't you think that silicon was too expensive to use for that purpose in the making of these cheap steels? A. I did not think it was very expensive.

Q. It would accomplish the purpose of increasing the heat, would not it? A. Yes, sir.

Q. And you used it at the Taylor Iron and Steel Co., didn't you? A. Yes, sir.

Q. You have spoken of different manufactures, I forget what you call it, process or rules; was it not a fact that more than nine-tenths of your product was of the standard Manganese, of the standard quality such as you have described, twelve per cent. Manganese and one and one-quarter per cent. of carbon in that steel? A. No, sir, I don't think nine-tenths—oh, no, sir.

Q. Well, pretty near that? A. No, sir—well, say two-thirds then.

Q. You do not always get the precise percentage you aim at, do you? A. No, sir, not precisely, there is always a slight variation.

Q. Sometimes it would be fourteen per cent., would it? A. When we want fourteen per cent. we always arrange to make fourteen.

Q. When you aim at twelve per cent. you do not get exactly that twelve per cent., do you? A. No, sir.

Q. And when you aim at one and one-quarter per cent. of carbon, you do not always get it one and

one-quarter per cent., do you? A. No, sir, not exactly.

Q. There is no precise exactness; that is, it varies according to the quality of your material and according to the length of time you conduct the operations in the converter—it is a matter of judgment when you stop the conversion, is it not? A. Oh, yes, sir, when you stop the conversion, there is a variation due to some oxidation that may take place; yes, sir.

Q. When you regulate the temperature you want to get it high enough so that it will properly mingle with the Manganese, do you not? A. Always; yes, sir.

Q. That is what you are aiming at, to have the proper temperature to mingle with the Manganese? A. That is one of the objects.

Q. Was not that one of the principal objects? A. That is one of the objects.

Q. Was not that one of the principal objects?

MR. LINDABURY—You may answer that yes or no only.

A. Yes, the principal object.

Q. Do you measure the temperature in the converter? A. We do not, with any instrument.

Q. Then you do not aim at any particular temperature there, beyond getting it hot enough to mingle properly with the Manganese? A. Yes, we do.

Q. Well, what?

MR. LINDABURY—I object to that as seeking one of the secrets of this business.

(*Court.*)

Q. Is that what you claim to be one of the secrets—that is to answer that question, would it be

disclosing a secret, as you claim? A. No, sir, I don't think so.

Q. Then answer the question—then you do not aim at any particular temperature there beyond getting it hot enough to mingle properly with the Manganese? A. There is more than one object in creating heat, we create sufficient heat with the Manganese and blown metal, so that the Manganese and the blown metal will become as nearly perfectly saturated as possible, but we have to be very careful not to allow that heat to become extreme, or, on the other hand, too cold.

(*Mr. Corbin.*)

Q. There is no exact degree of heat, as you have stated? A. No, sir, we have no instrument for getting the exact temperature.

Q. Now, do you know whether it is one of the methods described in one of the Hadfield patents, that the temperature of the castings and of the furnace, which I call the annealing furnace, should be the same, when the casting is put in the furnace? A. It calls for that in my patent, I believe.

Q. Does it not call for that in one of Hadfield's patents too? A. I think it does.

Q. That is no secret then, it is described in the Hadfield patent? A. No, sir, it cannot be a secret.

Q. Then the heating is raised from that point gradually, and more rapidly at the end of the heating, is it not, until it reaches approximately 1,800 degrees, under the Hadfield patent?

MR. LINDABURY—There is no objection to your answering that question.

A. Yes, sir.

(*Mr. Corbin.*)

Q. Is that what you do?

MR. LINDABURY—I object to that, that is asking for one of the secrets.

Question allowed.

A. That and more.

(*Mr. Corbin.*)

Q. What more?

MR. LINDABURY—I object to that for the same reason.

COURT—That is getting beyond the point my ruling restricts you to, up to the present. Unless the witness will say that it is not a secret, I will overrule the question.

(*Court.*)

Q. Mr. Corbin asked you this question—"Then the heating is raised from that point gradually, and more rapidly at the end of the heating, is it not, until it reaches approximately 1,800 degrees, under the Hadfield patent?" and you answered, "Yes"; and then Mr. Corbin asked you, "Is that what you do?" and you said in reply to that question, "That and more"; and then Mr. Corbin asked you, "What more?"—now before you answer that question you must understand that if it is a part of the secret process, I have overruled that line of investigation at present, but if not, then you must answer it? A. The "More" has reference to the special care that some castings must receive——

(*Mr. Corbin.*)

Q. That is not an answer to my question?

COURT—No, that is not an answer to the question.

(*Court.*)

Q. Is it a secret? A. So far as I can determine, it is a secret.

COURT—Then he need not answer the question.

MR. CORBIN—Your Honor rules, then, that he need not answer what the further processes are?

COURT—Yes.

(*Mr. Corbin.*)

Q. Mr. Hadfield does define the time and mode of heating, does he not? A. He does.

Q. That is one of the points his patents describe, is it not? A. Yes, sir.

Q. In dealing with these castings, the time of heating must depend on the size of the castings, to a great degree, does it not? A. Yes, sir.

Q. To take these very large steel castings, whether Manganese steel or not, it is a well-known thing in the trade, is it not, that in annealing them you must take a very long time? A. Ordinarily, yes, sir.

Q. And you have, therefore, to take this into account in this heating? A. We do.

Further redict by Mr. Lindabury.

Q. Now, with regard to this heating—is there a definite time observed in bringing the heat up to a certain degree in this process of annealing? A. As near as it is possible to do so.

Q. That is what I mean—you stated that the Hadfield patent provides for the slight initial heat, with a greater terminating heat? A. The Hadfield patent states so?

Q. Yes? A. Yes, sir.

Q. Have you been able to reduce the matter of slight initial heat to a rule, so that in the different cases you observe the rule as to the time within which you bring the castings to a certain intermediate hot point? A. It follows very closely.

Q. Does that vary with regard to the different castings? A. It does.

Q. Is the rate of temperature at the end of as much consequence as at the beginning? A. It is important at both ends.

Q. Is it of as much consequence at the beginning, the rate of the heat—suppose you were starting with a temperature of five hundred degrees, and running it up to 1,800 degrees in annealing, is the time to be taken in reaching the last half as important as in the first half? A. It is a hard question for me to answer.

Q. Do you understand the question? A. No, sir, I do not.

Q. Let me put it again—say you put in a piece of casting at a temperature of 250 degrees in the annealing furnace, and you heat it up to 1,800 degrees; now, I understand you to have said already that you begin slower and increase the heat towards the end; in other words, that more time is taken in reaching one thousand degrees than is taken in reaching from one thousand degrees to eighteen hundred degrees, is that right? A. Yes, sir.

Q. Now, is the rate of heating during the first part of that process more important than the rate during the last part of the process? A. It is.

Q. Do you observe a rule with regard to this time

of reaching some fixed intermediate point in the heating? A. We do.

Q. And is that a secret? A. It is.

Q. That is one of the secrets you alluded to a while ago? A. Yes, sir.

RECESS.

(*Mr. Corbin.*)

Q. I will ask Mr. Brinton a few more questions. I questioned you with regard to the means of creating initial heat in the converter; what is the risk to be run if the heat becomes excessive in the converter? A. There is a condition of oxidation takes place there, causing a condition of unsoundness.

Q. It would damage the metal? A. Yes, sir.

Q. So that condition would need to be checked? A. Yes, sir.

Q. As a rule, is it necessary to do anything with the metal in the converter then, to increase or decrease the heat? A. Yes, sir.

Q. In the majority of cases, does it not maintain a proper degree of heat under the action of oxygen, without special applications? A. No, sir, I think not.

Q. You think you have to apply these special applications? A. In which case? There is very rarely a case where we do not have to apply either one or other of the remedies.

Q. Either to increase or diminish the heat? A. Yes, sir.

Q. Is it not one of the well-known methods to decrease the heat, to put in steel scrap and wash metal? A. Steel scrap and pig iron was known well to me.

Q. And wash metal? A. No, sir.

Q. Is not that a method of reducing the excessive heat?

MR. LINDABURY—I object to that question, if it applies to the method employed at High Bridge, but I do not object to his answering, if it applies to the method employed elsewhere.

MR. CORBIN—He will have to take the question as I put it.

COURT—Does the question apply generally, or to a special method, because I shall sustain the objection to that extent.

A. Not to my knowledge, that is, outside of High Bridge.

(*Mr. Corbin.*)

Q. Is that a method which is found valuable at High Bridge?

MR. LINDABURY—I object to that for the reasons heretofore given.

Objection sustained.

(*Mr. Corbin.*)

Q. In the annealing furnace, is there danger to the metal of a constant application of heat, when the metal is first put in at its lowest stage of temperature? A. Yes, sir.

Q. It is liable to crack, is it not, if you put on the heat too fast? A. Yes, sir.

Q. When the iron is brought into the yard, the chemist tests it, that is, he tests the raw material of all kinds, does he? A. He does.

Q. And then is that material piled on the premises? A. Yes, sir, it is.

Q. And are not the different piles distinguished by numbers? A. They are.

Q. And does the chemist have in his book an analysis opposite each number? A. He does.

Q. Do you say that Mr. Nichols had access to the chemist's books? A. He had access to the chemist's books at any time he might so wish.

Q. Do you know whether he ever did, in fact, have access to the chemist's books? A. I don't know positively that he had.

Q. There would be the place that you would go to ascertain the character of the raw materials, is it not? A. We would have to go there.

Q. When the material is to be put into the cupola, does the chemist furnish the information as to the materials to be used—for instance, would he say, take so many from this pile and so many from this pile? A. Ordinarily, yes, sir.

Q. Then the information would be given to the superintendent by the designation of the number of pounds to be taken from a certain number of pile, would it not? A. It would go to the man whom we had in charge.

Q. It would not be necessary for him to know what the chemical analysis was, it would be his duty to obey that order, would it not? A. Altogether.

Q. He would say, "so many pounds of this number and so many pounds of that," according as he was directed by the chemist, would he not? A. That is right.

Q. And that order would not show what the analysis was, would it? A. It would not.

Q. Now, you and Mr. Nichols had practical control of the manufacture at Chester, didn't you? A. Of the Bessemer steel, yes, sir.

Q. All the steel? A. Yes, sir.

Q. And sometimes you were under his direction

and sometimes he was under yours? A. Yes, sir, in the beginning.

Q. And you both understood that method? A. Yes, sir.

Q. Now, did you not bring more knowledge of the steel business to the Taylor Iron and Steel Co. than you ever got there? A. No.

Q. Didn't you introduce your methods there of handling steel? A. I worked out the methods that were in vogue at the Taylor Iron and Steel Co.'s works when I went there.

Q. Didn't you introduce methods of your own there, and didn't you often say that your methods made the business successful at the Taylor Iron and Steel Co.'s works?

MR. LINDABURY—I object to that on the ground that there are two questions there.

MR. CORBIN—Then he may answer either one of them.

(*Mr. Corbin.*)

Q. Didn't you introduce methods which you had learned at Chester there, and have you not often said that it was your methods that made the business successful at the Taylor Iron and Steel Co.'s works?

MR. LINDABURY—There are still two questions, but you can answer them together, if you can.

A. Only so far as the knowledge that I might have possessed previous to going there would fit in to develop the further work that I had taken up with the Taylor Iron and Steel Co.

Further Redirect by Mr. Lindabury.

Q. You spoke of the chemist directing where the material could be obtained to make your initial mixture—I do not understand from you yet, however, who decides what that mixture is to be, whether it is you or the chemist? A. Very largely the chemist decides himself, from the knowledge he possesses of the contents of the material.

Q. I know, but if you are going to make a mixture of this variation you speak of, who is it that decides what the ingredients of that mixture are to be, and in what proportion they are to be used? A. Then I would decide.

Q. You would decide? A. I do, yes, sir.

Q. And do you furnish the chemist with the information or the formula of what you wanted? A. I would tell him what I wanted.

Q. And then he would tell you where it is to be gotten? A. Yes, sir, that is the idea.

Further Cross-examination by Mr. Corbin.

Q. A customer often announces what particular percentage he wanted in orders coming there; that was frequently done, was it not? A. They do at times.

Q. And you report to the chemist that those are the qualities to be had in the finished product, and he is expected to prepare the materials accordingly? A. That would only be in so far as the alloys were concerned that we put in the finished product.

Q. Of course the whole of the steel is an alloy? A. Oh, no, sir.

Q. You cannot have a steel without an alloy of carbon, can you? A. That is true, but that is not the case in the best practice of manufacture, of either steel, iron, brass or anything else; if you do not make the first mixtures out of the right kind

of material, you will not get as good results in the end as if you made it out of anything.

Q. It takes good iron to make good steel, does it not? A. It takes a good mixture to make good steel.

Q. That is good material? A. Yes, sir.

Q. You want good iron and good carbon and everythin else—that is, you want good material to make good steel, do you not? A. Yes, sir.

Q. That is just the same as it is with everything else, you want good cloth to make good clothing, and good leather to make good shoes, it is just the same with everything else, is it not? A. I suppose so.

Further Redirect by Mr. Lindabury.

Q. Is it possible by any chemical analysis of the finished product to tell all the ingredients that have gone into an article at some stages, or do they disappear? A. They disappear and are admitted in again, and by admitting the different alloys, are all finished into the mass.

Q. You will observe you have not answered my question yet—my question is, is it possible by any chemical knowledge of the finished product to determine all the ingredients that have gone in with their common proportions, that is? A. It is not, no, sir.

Mr. Hardin—I would like now to have these various papers, agreements and contracts, which have been referred to this morning, put in evidence.

Court—They may be admitted, they are all dated and sufficiently identified, I think.

Mr. Hardin—I would like to have them marked.

Marked in evidence as follows:

The agreement of August 10, 1891, marked Exhibit C 8.

The agreement of December 24, 1891, marked Exhibit C 9.

The agreement of June 9, 1892, marked Exhibit C 10.

Another agreement of June 9, 1892, marked Exhibit C 11.

The agreement of December 12, 1892, marked Exhibit C 12.

The agreement of July 5, 1894, marked Exhibit C 13.

The agreement of March 12, 1897, marked Exhibit C 14.

The agreement of November 9, 1898, marked Exhibit C 15.

The agreement of December 16, 1901, marked Exhibit C 16.

JOHN RICE, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Easton, Pa.

Q. What is your occupation? A. Vice-President, General Crushed Stone Co.

Q. What is the business of that company? A. Crushing stone.

Q. Where does it operate? A. We have five plants, one in New York and four in Pennsylvania.

Q. Where are they located? A. One is about fifty miles from Buffalo, at North Leroy; one about seven miles from Wilkesbarre; one at Redington, near Easton; one at Rocky Hill, near Philadelphia; and one at Glen Mills, near Philadelphia, on the Pennsylvania Railroad.

Q. What kind of rock do you crush at these various plants? A. Limestone and Flint at Leroy; quartsite at Wilkesbarre; Limestone at Redington; trap rock at Rocky Hill; granolite at Glen Mills, near Philadelphia.

Q. How do you crush the rock? A. Between two surfaces of metal working together, which break up the rock.

Q. And what are the metal surfaces used for, the purpose of crushing the rock? A. We have used cast iron and we have also used Manganese steel, they are the things I happen to know most of.

Q. What Manganese steel are you using now? A. The Manganese steel of the Taylor Iron and Steel Co.

Q. How long have you used the Manganese steel of the Taylor Iron and Steel Co.? A. For six years.

Q. Have you used any other steels? A. We have used some of the firm of Isaac Johnson & Co. of Spuyten Duyvil.

Q. Manganese steel so called? A. Yes, sir, Manganese steel so called.

Q. Have you used anything else? A. Nothing but the chilled iron of various kinds, grey and charcoal iron.

Q. What have you found as to the variations of the wearing qualities of iron of the various kinds of iron and Manganese steel you have used? A. From four to six, to one.

Q. And where was that test made? A. One test that I have specially in mind was at Leroy.

Q. Tell us about it? A. Well, we were using Manganese steel, and the Lehigh Car Wheel and Axle Works were making chilled car wheels, and they urged us to use their material, claiming that they thought we would get an equal result by the use of their material or better result, and we bought a set of jaws and they lasted about one month, and

then they replaced them, on the ground that they thought they might have been defective, and then that lot lasted another month, and then we threw them out and went back to the Manganese steel, and the Manganese steel jaws would last from seven to eight months.

Q. Where was the test made of the Johnson & Co.'s Spuyten Duyvil steel? A. At Rocky Hill.

Q. Tell us about that? A. Well, I hadn't any record of the time on that, but it lasted such a short time that they replaced one casting and I really have not any record of the time, but it was not long enough to make it worth while to make a record of.

Q. How do the prices of chilled iron and the Johnson & Co.'s steel compare with the prices that you paid for the Taylor Iron and Steel Co.'s steel? A. About three to one—did you ask me as to the Johnson & Co.'s?

Q. Yes. A. Well, thye charged us, if I remember rightly, they charged us about nine cents a pound.

Q. Is that more or less than the Taylor Iron & Steel Co.'s price? A. Well, the Taylor Iron & Steel Co.'s price is about ten or eleven and one-half cents, fluctuating, and this is nine cents for that class of work. The Taylor Iron & Steel Co.'s steel is a little more expensive on other classes of work.

Q. Which was three to one? A. The chilled iron was three and one-quarter cents, and the Manganese was about ten or ten and one-half cents.

Q. Did you ever try any other steels than the three you have mentioned, the Taylor Iron and Steel Co.'s and the Johnson of Spuyten Duyvil, and the Lehigh Car Wheel and Axle Co., have you ever tried any others? A. No, sir, we have not tried any others.

Q. When did you get this steel from the Johnson Co. that you made this test of? A. Well, it is within the last two or three years, I cannot give you

the exact date, but I should judge about two years ago.

Q. About two years ago? A. Yes, sir, it cannot be much more than that.

Q. Did it crack or wear out? A. I did not see it personally.

Q. You did not see the test personally? A. No, sir.

Q. You don't know anything about the test yourself, then? A. Only from the reports at the plants.

MR. GOODE—We move to strike that testimony out, as it leaves only the test of the chilled iron.

(*Mr. Hardin.*)

Q. You knew from the reports, as they came to the office, didn't you? A. Yes, sir, that is all.

COURT—I will let the evidence stand for what it is worth.

Cross-examination by Mr. Goode.

Q. You never used any other Manganese steel? A. No, sir.

Q. Except that one casting from the Johnson Co.? A. Yes, sir, that one, and they replaced one.

Q. You don't know whether it was cracked or whether it was worn out? A. It was worn out; I give you the information, as it was reported to the office, from our superintendent.

Q. Did the first one wear out, or did it crack? A. It simply wore out.

Q. How long did it last? A. About three weeks, I should judge.

Q. And how long did the second one last? A. I don't know, sir.

(*Mr. Lindabury.*)

Q. Cannot you approximate? A. No, sir; I haven't any information from the information that I got, I saw that it was no good, and that it was no good, and that it was no use getting any more of it.

(*Mr. Goode.*)

Q. As far as you know, it might have lasted just as long as the Taylor Iron & Steel Co.'s casting, mightn't it? A. No, sir; I know that it did not.

Q. How do you know that? A. Because the Taylor Iron and Steel Co.'s casting was put back again.

Q. You don't know how long it was before the Taylor Iron & Steel Co.'s casting was put back again? A. I cannot give you the actual date.

(*Mr. Hardin.*)

Q. Have you used large quantities of this Taylor Iron and Steel Co.'s steel? A. About $30,000 worth.

Q. During the last three years? A. Yes, sir.

HENRY M. HOWE, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Professor Howe, where do you reside? A. New York City, or rather Bedford, N. Y.

Q. Have you occupied, and do you now occupy any position at the present, with any college? A. I am Professor of Metallurgy of Columbia University.

Q. How long have you been professor there? A. Since 1897.

Q. Have you a practical and theoretical knowledge of the manufacture of steel? A. Yes, sir.

Q. Do you mind telling us what your education in that line has been—first tell us of your theoretical education—you have graduated from Harvard College? A. I graduated from Harvard in 1869, and I graduated from the Massachusetts Institute of Technology as a Mining Engineer in 1871, with special attention to metallurgy.

Q. Now, were you after that engaged at any time in the manufacture of steel? A. I was engaged in the manufacture of steel for a number of years after that, and in metallurgical manufacture until 1882.

Q. Where? A. At Joliet, Ill., at Troy, N. Y., and Pittsburg, Pa.

Q. Did you serve any apprenticeship anywhere? A. I served an apprenticeship at Troy, N. Y., for about a year, and at South Boston, Mass.

Q. Have you at any time, been the manager of any steel works? A. I have been the manager of the Joliet Steel Works, or superintendent of the Bessemer Works at Joliet, Ill., the superintendent of the Blair Iron and Steel Co.'s Works at Pittsburg, Pa., and of the Orford Nickel and Copper Co.'s Works in Canada, and in Bergen Point, and Phœnixville at the same time.

Q. And have you acted as the designer and builder of any steel works? A. Yes, sir; I have acted as the designer of copper works, I have acted as designer and part builder of steel works, and as sole designer and builder of copper works.

Q. Since 1883, what special line have you been engaged in—I understood you to say that down until 1882 and 1883, you were actually engaged in manufacture? A. Yes, sir, I was actually engaged in the manufacture of steel, until as late as 1882 or 1883, and since then I have been and for the last

nine years, professor of metallurgy in Columbia University, and during the whole of the time since 1883, I have been engaged as an investigator of metallurgical processes and acted as an expert in metallurgical causes, and for six or seven years, until I came to Columbia College, I was the lecturer on metallurgy at the Massachusetts Institute of Technology.

Q. Have you done special work as expert in patent causes, in the heating line? A. I have testified at great length to many important patent causes.

Q. I understand you are a member of a number of mining technicological and scientific societies here in this country, as well as in Europe? A. Yes, sir, I am a member of a number of technicological and scientific societies both here and in Europe.

Q. What institutions are you a member? A. I am a member of the American Institute of Mining Engineers, and the American Society for Testing Materials——

Q. Have you done some writing on metallurgical subjects? A. I have published several books on metallurgy of which some have been translated into other languages.

Q. Have you received any recognition of your work by way of honorary degrees? A. I am a doctor of laws of Harvard University and of Lafayette College.

Q. Have you received any medals? A. I received the Bessemer medal of the British Iron and Steel Institute, the great gold medal of the Society for the Promotion of Industry of Berlin, the Elliot Cresson gold medal of the Franklin Institute of Philadelphia.

Q. Are you a member of some foreign societies also? A. I am a member of a great many foreign

societies, as I said before, I am an honorary member of a number of them.

Q. Are you a member of the British Institution of Mining and Metallurgy? A. I am an honorary member of that institution.

Q. Are you a member of the Russian Imperial Technicological Society? A. I am an honorary member of that society, and also of the——

Q. Society for the Encouragement of Natural Industry of France? A. Yes, sir.

Q. One other American engineer has the honor of a membership in the Russian Imperial Technicological Society besides yourself—there is only one, is there? A. I believe it is Mr. Edison.

Q. You two gentlemen are the only American members of that society? A. I think we are the only Americans that are members of that society.

Q. Did you serve in any capacity in connection with the Columbian Exposition? A. I was president of the jury of awards of mines and mining.

Q. Were you connected with Paris Exposition of 1899 and 1900? A. I was a member of jury on each of those expositions of metallurgy, mining and metallurgical processes.

Q. I understand you have received the honorary membership of the Legion of France? A. I have received the Legion of Honor of France and also received the Knighthood of the Order of St. Stanislaus of Russia.

Q. These distinctions are in recognition of your professional scientific work, are they? A. Yes, sir.

Q. Are you familiar with the introduction of Manganese steel in this country? A. Yes, sir.

Q. Tell us about that?

Mr. Corbin—I think the question should be more specific than that—that is not a

pertinent question under the issues in this cause.

COURT—I will take it.

A. Mr. Hadfield, of Sheffield, England, employed me as his agent to introduce the manufacture of Manganese steel and also the use of his processes into this country.

Q. And when was that? A. In 1890.

Q. Who was Mr. Hadfield? A. Mr. Hadfield is the patentee of the process for making Manganese steel, and is the son of Robert Hadfield, who was the inventor of Manganese steel, the two, father and son, were—it might be said—joint inventors or discoverers of this substance, Manganese steel.

Q. Where did they carry on the manufacture of Manganese steel? A. In Sheffield, England.

Q. Are you able to tell us when you became Mr. Hadfield's agent? A. In 1890.

Q. The manufacture of Manganese steel had been undertaken in this country, had it not? A. It had been undertaken by a large number of concerns.

Q. Do you know the circumstances and the results of their efforts? A. The results were a complete failure, in every case, so far as I knew.

Q. Had Mr. Hadfield been concerned in these efforts? A. In most of them.

Q. Where was the first manufacture of Manganese steel made a commercial success in this country? A. At Highbridge by the Taylor Iron and Steel Co.

Q. When did you first become connected with the Taylor Iron and Steel Co.? A. At the time of its organization.

Q. In 1891? A. I think it was in 1891, yes, sir.

Q. Have you been connected with that company ever since that time? A. Yes, sir.

Q. As I understand you are a stockholder and

director of that company? A. Yes, sir, I am a stockholder and a director, and second vice-president of that company.

Q. Did you take an active part in the organization of the company? A. Yes, sir.

Q. Did you find, at Highbridge, when this company took this work up, a plant ready, or did you design and build a plant for it? A. We designed and built a plant.

Q. Where was it constructed? A. At Highbridge, N. J.

Q. As part of an existing plant, or an extension of an existing plant? A. It was an independent plant, there were other buildings attached where other processes were carried on, but this steel plant was an independent venture, and it was carried on as a separate venture and undertaking.

Q. What was done at the plant? A. Well, in in order to attain the required secrecy, the place was walled off with high walls, so as to keep it from special observation.

Q. High walls of brick? A. Yes, sir, it was walled off with high brick walls.

Q. What, if anything, did you have to do with the acquisition by the Taylor Iron and Steel Co. of the Hadfield patent? A. I negotiated the sale of the license to the Taylor Iron and Steel Co. as Mr. Hadfield's agent.

Q. Who were associated with you at that time? A. Well, I represented Mr. Hadfield, on his side.

Q. Who were associated with you in acquiring this license from Mr. Hadfield, that afterwards went over to the Taylor Iron and Steel Co.? A. Robert E. Jennings, and William J. Taylor.

Q. Were you yourself instructed in the Hadfield system? A. Yes, sir, I spent quite a time at the Hadfield's works, in Sheffield, for that purpose.

Q. Do you recall whether that was in connec-

tion with the license of the Taylor Iron and Steel Co.? A. Yes, sir, it was immediately on the completion of the license.

Q. Who was with you there representing the Taylor Iron and Steel Co.? A. Mr. Chrystie and Wm. J. Taylor.

Q. Do you know whether any other concerns than the Taylor Iron and Steel Co. have been licensed by Mr. Hadfield in other places than in the United States? A. Yes, sir, the Krupp Co., of Essen, in Germany, that is the Krupp, the celebrated makers of guns, the greatest steel manufacturers in Europe, was one of his licensees, and the Creusot Steel Works in France, the largest works in France, they are also his licensees.

Q. Who are the Creusot works? Where are they? A. They are part of the Krupp works.

Q. Do you know whether the Hadfield system is used in any of these works, in Germany and in France, that you have referred to? A. I believe it to be.

Q. You visited the Krupp works, I understand? A. Yes, sir, I visited the Krupp works in Germany, and also the Creusot works in France.

Q. Do you know whether any one came from abroad, in addition to the visit of yourself, Mr. Taylor and Mr. Chrystie to the other side—do you know whether any one was sent abroad over here, for the purpose of instructing your company in working under the Hadfield system? A. Mr. Hadfield sent over two men, one particularly for the system and the other principally for the working up of the product.

Q. Who were they? A. Mr. Mallaband was the one that came over to teach the use of the process, the name of the other I have forgotten.

Q. Can you recall when Mr. Mallaband came

here? A. He came at the time we started the works, as nearly as I can remember.

Q. You remember that the Taylor Iron and Steel Co. was organized in the summer of 1891—about how soon after that did you have the works ready? A. Well, I shall have to refresh my memory—it was within, I think six months of that—that is rather a random statement though.

Q. Do you know, or can you recall, how long Mr. Mallaband stayed here? A. He stayed a great many months here.

Q. Do you know how he instructed the people here? A. With very great care.

Q. Was it the Mr. Chrystie that was here? A. No, sir, it was the father of this Mr. Chrystie.

Q. Then the Mr. Chrystie to whom you referred is now dead? A. Yes, sir, the Mr. Chrystie to whom I referred is now dead, but I am inclined to think he was the superintendent of the whole works.

Q. He was a brother-in-law of Wm. J. Taylor, was he not? A. Yes, sir, he was the brother-in-law of Mr. Wm. J. Taylor.

Q. Do you know whether Mr. Hadfield came over himself, in reference to this license? A. Mr. Hadfield has been over—certainly twice.

Q. Do you know whether he gave any attention to the introduction of this system in the Taylor Iron and Steel Co.'s works? A. He gave very close attention, the first time he was over.

Q. That was while Mr. Mallaband was here? A. Yes, sir, that was while Mr. Mallaband was here, I think it was, I think it was while Mr. Mallaband was here, although I am not perfectly sure about that now.

Q. You are familiar with the ordinary processes of steel making, are you not? A. Yes, sir.

Q. In use in this country? A. Yes, sir.

Q. Do you know what steps have been taken

since the introduction of this system, at Highbridge, to keep the system secret? A. All visitors have been excluded, visitors and customers have been excluded from the works, and even the directors of the company have been excluded from the works, that is, the directors have not been allowed to go into the works, and in the parts most private, and in enlarging the works, as we have now been doing, we have made further special provision for a further concealment of other stages of the processes, which we thought it unwise to have known by any one——

Q. At what points in the process of making steel, under this system, has it been deemed essential to preserve secrecy, or have you preserved secrecy? A. Special secrecy has been preserved, and has to be preserved up to the time when the molten metal is ready to pour into the moulds.

Q. Has any secrecy been observed with reference to the proportions of the original mixtures? A. Yes, sir.

Q. And also as to the ingredients? A. As to the ingredients and proportions.

Q. Has secrecy been observed as to the processes in the cupola and converter? A. Yes, sir.

MR. CORBIN—I do not see that the witness is being examined about matters that he has any special knowledge of.

COURT—The examination, I think, is open to that criticism.

MR. HARDIN—I will ask him some further questions.

Q. Are you familiar with the processes of making steel at Highbridge, and steel castings? A. Yes.

Q. From what time have you been familiar with it? A. From the beginning until now.

Q. Have you frequently been there? A. Yes, sir, I go there frequently now.

Q. Have you been present during the various operations conducted there? A. Yes, sir, I am now.

Q. On many occasions? A. Very often.

Q. Who is the supervising director of that company, who among the directors, who supervise it? A. Mr. Jennings, the president, supervises the general policy of the company, more than anybody else. Two of the other directors are officers, and connected with the management there, Mr. ~~Wm. J.~~ Knox Taylor is the general manager, and Mr. Chrystie is vice-president, the first vice-president, and he is on the spot in charge, and I am next, myself, that is, I am supposed to be in charge of the quality of the product, and responsible for it, and I direct the investigation for the governing and protecting the quality——

(*Mr. Lindabury.*)

Q. We might call you the metallurgical supervisor then? A. That would be a very good title for it.

MR. CORBIN—I still make the same objection.

COURT—I think the witness is shown to be sufficiently qualified to tell what is going on there, when, as he says, he is there very often. Of course we all understand that he does not know what goes on every day, because he is not there every day, but he knows the general course of the business there. You may proceed with the examination.

(*Mr. Hardin.*)

Q. Has secrecy been maintained with reference to the pouring of the moulten metal in the moulds?

MR. CORBIN—I object to that question as not within his knowledge, and it is not a proper matter to prove by his opinion, and also that it is not shown to be within his knowledge.

COURT—He will have to confine it to the times that he has been there. You may ask him what they do when he is there—you must limit it to what he knows, and what he has seen when he has been there.

(*Mr. Hardin.*)

Q. State, if you know, on what other points in the manufacture of steel castings, at Highbridge, the company has undertaken to secure secrecy? A. It has been the aim of the directors from the beginning to maintain everything as secret as possible, from the beginning to the end, except of course the finishing, that is the machining of the finished products, of course we have not attempted to keep that secret, but we have endeavored, as far as it has been possible, to keep everything else secret, and our endeavor is now continued in that line, and our secrecy is made much more stringent than before, that is, we have increased the stringency by every device we could arrange.

Q. Are there any difficulties in the manufacture of Manganese steel castings as distinguished from common steel works? A. Yes, sir, the difficulties are incomparably greater.

Q. What is the special reason for the increase of difficulties in reference to the Manganese steel castings? A. There really are two difficulties which act cumulatively—do you want me to explain them?

Q. Yes, explain them? A. The difficulties are, essentially, that you have material—Manganese steel itself is so hard that it cannot be machined

into shape, therefore it has to be cast substantially in the shape in which it is going to be used, it cannot be subsequently cut to shape by other steel tools as other steel castings can be. That is the first great difficulty.

The second difficulty is, unlike other metals used for founding castings, it is a non-conductor of heat, instead of being, as the others are, very good conductors of heat. And this fact, that it is a non-conductor of heat, makes the art of casting it incomparably more difficult than the art of casting other metals and alloys. The art of founding or casting metals is a relatively simple one when the metal melts at a low temperature. Because in cooling down from the temperature at which it is cast, to the ordinary temperature, it goes through relatively a small range of temperature. The range of temperature they cover in their cooling is relatively small, so that the degree of contraction which they undergo from the time they assume a heated condition to the time they are cool, is comparatively slight.

If the metal has a very high melting point, as the case of common steel castings, then the art of casting becomes very much more difficult, because it is necessary to cast them into the mould, at a temperature above their melting point—they must be absolutely fluid when poured into the moulds. They will solidify at the melting point—it is a very high temperature—and in cooling down they will undergo very great contraction. This contraction will be more rapid on the outside of the piece than in the inside, so that the different parts will cool and contract at different rates. This cooling and contracting at different rates produces two effects. In the first place, it causes cavities to form in the casting itself—cavities due to the difference in the rate of contraction.

In the second place, it leaves the material in a state of very great stress, so that a very small stress applied from without might suffice to break it. It is in the condition, as we might say, of a violin or guitar when its strings are all tuned up and very tight. The strain on the strings is liable to break the strings on the application of a very slight stress from the outside; the screwing up of the string of a violin already strained or drawn up to tune would need but a very little more strain before it would break; so that a very slight strain from the outside would cause it to break. Witness, for instance, the breaking of the strings of violins at concerts. The fact that in a steel casting there are certain parts which cool more slowly than the rest of the casting, implies that they must continue the cooling process after the rest of the casting has ceased to cool, and that, therefore, they must continue to contract after the rest of the casting has ceased to contract. And it is a familiar case, and you have probably noticed it, where the strings of a guitar, at the seashore, snap when the weather turns damp because it causes them to contract through the dampness of the weather when the body of the guitar has not contracted.

Now, in the case of an ordinary steel casting this is a sufficiently serious difficulty. But in the case of Manganese steel the difficulty is incomparable greater than in that of a common steel casting. for the reason that Manganese steel is such a very poor conductor of heat. In a common steel casting, which is a pretty good conductor of heat, there is a certain amount of lagging behind, the slower cooling parts lagging behind the cooling of the faster cooling parts. But, because the material is a good conductor of heat, that lagging behind is not so very great. It is great enough to make trou-

ble, but the trouble is held within reasonable limits. But in the case of Manganese steel castings, the material is such a bad conductor of heat, the difference between the rate at which the outside of the casting cools and that at which the inside cools, the difference is enormous, so that the cooling of the inside and of the thicker part of the casting lags behind the cooling of the outside of the castings, or of the thinner parts of the casting very greatly, with the consequence, that these thicker parts of the casting undergo a large amount of cooling, and a large amount of contraction, after the thinner parts have already become cold and rigid, and this contraction of the thick parts after the thin parts to which they are integrally united, have become cold and rigid, is very liable to tear the casting. It is because the slowest cooling parts contract after the rest have become rigid that they are liable to be torn in two by their own contraction, as the strings of a guitar tear in two, at the seashore, on the approach of damp weather, and if they are not torn in two, then they are left in a state of very great stress, like the stress in the tightly tuned violin string.

Q. Have you been able to control this difficulty, under the methods pursued at Highbridge? A. We have been able to control these difficulties.

Adjourned to Monday, November 19th, 1906, at 10 A. M., Newark.

NOVEMBER 19, 1906.

ROBERT A. MONTGOMERY, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. Lambertville, N. J.

Q. What is your business? A. Quarrying and contracting.

Q. And with what contracting company are you connected? A. The Delaware River Quarry and Construction Co.

Q. Is Mr. John F. Shanley, of Newark, here, interested there? A. Yes, sir.

Q. And what is the business of that concern? A. Breaking stone and building roads, and in the general line of contracting.

Q. Where do you have your quarries? A. We have our quarries at Moore and Rock Hill.

Q. What sort of rock do you quarry? A. Trap rock.

Q. And do you crush this rock? A. Yes, sir.

Q. Do you use in your crushing machines any of the Taylor Iron and Steel Co.'s steel? A. We have; yes, sir.

Q. About how long have you been using that steel? A. Six or eight years about.

Q. What did you use before you used the Taylor Iron and Steel Co.'s steel? A. Ordinary chilled steel.

Q. What did you find as to the comparative tests between the old chilled steel and the Taylor Iron and Steel Co.'s Manganeses steel? A. We find the Manganese steel very much better and very much more economical for use in our business.

Q. Why more economical? A. Because it lasts longer.

Q. Which is the more expensive initially? A. We think the Manganese steel is cheaper in the long run.

Q. But which has the greater initial cost? A. The Manganese steel, but as I said before, in the long run we find it a great deal cheaper.

Q. Do you use it for any other purpose than in the crusher jaws? A. Yes, sir; we use it in the screens and wheels, sproket wheels and chains.

No cross-examination.

FREDERICK W. SCHMIDT, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. In Somerset Co.

Q. What is your business? A. Stone crushing.

Q. Where do you carry on that business of stone crushing? A. At Millington, Paterson, Bound Brook—any other places, do you want?

Q. Do you work at crushing stone in any other places? A. At Snake Hill.

Q. Anywhere else? A. Buffalo.

Q. With what concern are you connected? A. Morris County Crushed Stone Co.

Q. And what is the business of that concern? A. Crushing stone.

Q. For what purpose? A. For concrete, macadam and road ~~metal~~ material.

Q. What kind of rock do you crush? A. Trap rock in New Jersey, flint rock in New York State.

Q. Have you used different kinds of steel in your crushing machines? A. For large plates we have used the Taylor Iron and Steel Co. Man-

ganese steel, we have also used the Johnson Co.'s steel, and Chrome steel, as well as ordinary chilled steel plates.

Q. Which material do you find to be the best? A. Manganese steel.

Q. From where did you obtain it? A. The Taylor Iron and Steel Co.

Q. How long have you been using it? A. I think it was in 1895 we used the first set.

Q. The first set of what? A. Jaw plates.

Q. What did you use before that? A. Chilled and Chrome steel.

Q. When was it you used the Johnson & Co.'s steel? A. Oh, I should judge it was about 1900.

Q. In what respects have you found the Taylor Iron and Steel Co.'s steel superior for that purpose in your crushing machinery? A. It always wore considerably longer by far than any other steel that we have ever used. The initial cost is a little large, but the cost in the end is very much smaller than the cost of other steels.

Q. What steel are you using now? A. We use the Taylor Iron and Steel Co.'s steel for large plates all throughout.

Q. What was this Johnson & Co.'s steel, what kind of steel did they make? A. It was something that they tried to make to imitate the Manganese steel. I don't know what they called it, it was, I think, just Johnson & Co.'s steel, made, I believe, in Spuyten Duyvil, we have used this steel for other purposes, that is, other than the large plates for gears and gearing and in screen plates——

Q. Which steel do you refer to now? A. The Taylor Iron and Steel Co.'s steel.

Q. With what result? A. With very much more economy in the long run.

Cross-examination by Mr. Goode.

Q. How much of this Johnson & Co.'s steel did you use? A. I have used, I think, three sets of large plates.

Q. When did you get those three sets of large plates? A. I don't know as to the date, but I should judge it is about five years ago, and off and on from that time—I guess the last set I got was about two years ago.

Q. How did these Johnson's & Co. steel large plates wear—did they wear or crack or wear out? A. They wore out.

Q. How long did you use them? A. They lasted, I think, in one instance they lasted a season, that is the first set we got, and the next set lasted about a month or two months, and the third set was not much better.

Q. What representation did you have as to that steel from the Johnson & Co.'s people, as to its being Manganese steel? A. Well, I don't know that they said that it was Manganese steel, but they claimed it was a steel made to imitate or take the place of Manganese steel, I think it was, by some process they had of hardening a steel, whether it was Manganese steel they called it or not, I don't know, I haven't any idea at all now.

Q. But they said it was to imitate Manganese steel? A. They said it was to take the place of Manganese steel, or to imitate it, I don't just exactly remember what it was they did say, but it was intended to take the place of Manganese steel.

Q. But they did not represent it as Manganese steel, did they? A. I think not; no, sir; I think not.

J. Trowbridge Bailey, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. In New York.

Q. Have you had any experience in the dredging line? A. Yes, sir; some.

Q. Have you in that business, or while engaged in that business, used in the machinery any different kinds of steels? A. Yes, sir.

Q. Have you used any Taylor Iron and Steel Co.'s Manganese steel for bucket lips? A. Yes, sir.

Q. Have you used any other steels for such purposes? A. Yes, sir; we have used the so-called Manard steel.

Q. Where did that come from? A. The Pennsylvania Steel Co., I believe.

Q. What was the comparative result in the two steels, that is, in the wear? A. The facts of the case are, I had a bucket line which I equipped largely with Manard steel—that bucket line was a bucket line with twenty-five lips four inches by five-eighths of an inch, and at the time we could not get any steel from the Taylor Iron and Steel Co., because they said they were held under a strict rule preventing them from furnishing any steel to outside people, and so we cast around making applications to several other firms makers of cast iron and steel, and finally we settled on the Manard steel, and we asked them to send us a test piece. Well, they sent us a test piece of about six inches long, one inch wide, and about a quarter of an inch thick, which we put to a test for ductility, which test proved perfectly satisfactory, and we then ordered a set of lips for this bucket line of twenty-

five lips that I have told you of. We ordered that of the Manard steel and we also ordered two of nickel steel, and we ran with them all told about seven months. The first four months we broke eighteen bucket lips that were made of the Manard steel, and they broke in from one to five different places, and we sent the whole business back to the Pennsylvania Steel Co., and they were unable to tell us what the matter was. They thought at first that perhaps the hot rivets had something to do with the depreciation of the bucket lips or of the steel, but we tried them again with cold rivets, and it made no difference, we tried them every way that we could think of, and we finally had to give them up. By that time we were enabled under an arrangement with the Taylor Iron and Steel Co.'s people to get steel from them, and we had to order renewals of these lips, and so we ordered them from the Taylor Iron and Steel Co. people. We put four of these on and they only operated for four months, after that we shut down. During that four months we had no breakage at all from the time we put them on until we shut down, but we broke altogether twenty-eight bucket lips that were made of the Manard steel, that is in the same time, this four months. This Manard steel was so brittle that it broke very easily, it was so brittle that we could put them on an anvil and break them just like a piece of glass, they would break into four or five pieces——

Q. They lacked toughness? A. Yes, sir; they lacked toughness, now they were very hard, and if they had been subject to merely abrasive action or to pressure without a thrust, they would have lasted just as long as any other lips, but they would not stand the thrust.

Cross-examination by Mr. Goode.

Q. How long ago was it you got the steel from the Pennsylvania Steel Co.? A. It was in November, 1904.

Q. Do you know how long the Pennsylvania Steel Co. had been engaged in the manufacture of that steel at that time? A. No, sir; I do not.

Q. You don't know it to be a fact that they have just commenced? A. No, sir; I do not know that all I know is that we were in a quandary what to do to get this steel, we were in a quandary to know where to get the Manganese steel——

Q. You say you only used the lips on the buckets you got from the Taylor Iron and Steel Co. people for three months? A. From three months to three and a half months.

Q. And you had been using the Manard steel for six months before that? A. No; although we were in business for a year or over a year, owing to the shut down that we had to have for the purpose of making repairs, we were only actually operating seven months during that year.

Q. And all the Manard steel bucket lips broke? A. I cannot tell you that, what I said was that we simply broke twenty-eight bucket lips that were made of this Manard steel, but whether it was the same bucket lips that broke again, or whether it was numerically the whole lot I cannot say, what I did say was that there was twenty-eight of the bucket lips that broke.

Q. You don't know whether they were the same lot of bucket lips that lasted throughout the whole period? A. No, sir; I do not say that, and I don't think so.

Q. And you only used four of the Taylor Iron and Steel Co.'s bucket lips? A. Yes, sir; we only used four of the bucket lips that we got from the Taylor Iron and Steel Co., because, as I told you

before, we closed down after running about three and a half months——

Q. And you used about twenty-eight altogether, that you got from the Pennsylvania Steel Co.? A. Oh, no; we used more than twenty-eight, we renewed the whole entire line, and three more besides, but out of the whole lot there were twenty-eight of them that broke, now some of them may have broken two or three times, I cannot say that it was the whole twenty-eight that broke.

Q. Your machinery was equipped with twenty-seven bucket lips, as I understood you? A. Twenty-five I said; we are equipped with bucket lips made of the Manard steel, and the rest of them with the Nickel steel.

Q. And you call a Manard steel a Manganese steel, do you? A. Oh, yes; they told us in their letters when we were about to order them, that it was a Manganese steel, and they gave us in a general way the percentage of Manganese there was in the steel, but I do not recall that now.

Q. The trouble was that these bucket lips were brittle, is that it? A. Yes, sir; that was the trouble, the bucket lips were brittle, they would break just like a piece of glass, if you put them on the anvil they would break into four or five pieces, they admitted to us the character of the steel, but they could not—interrupted.

Q. But they could not at the same time correct the brittle characteristics of it? A. No, sir; they could not account for it they said.

Q. Did I understand you to say that the Nickel steel lips would be just as good as the Manganese steel lips? A. That would be impossible for me to say, I don't know about that, and I did not say that they would be.

Q. I thought you said that they would be just as good as Manganese steel, that is, the Nickel steel

lips would be just as good as the Manganese steel for other purposes, would they? A. They might for other purposes, but they were not as good as Manganese steel for the bucket lips.

(*Mr. Lindabury.*)

Q. Did you ever have any used in Nickel steel bucket lips? A. Well, now, you cannot break Nickel steel, it is very tought, you cannot break it, and we have used them, and they stand up just as well as Manganese steel for some purposes.

HENRY M. HOWE, being recalled in behalf of the complainant, his direct-examination continued:

Examined by Mr. Hardin.

Q. I understood you to say that you wanted to make some corrections in your testimony, as taken on the 12th of November, instant—take the stenographer's record and tell us what they are? The answer to the question "What was done at the plant?" is all wrong.

(*Mr. Lindabury.*)

Q. You may explain the error? A. The whole plant was enclosed with a high fence, but the part where the conversion of the cast iron into steel, the preparation of the physic, the melting of the cast iron, and those operations take place, was enclosed behind a high brick wall.

(*Mr. Hardin.*)

Q. I think we were discussing at the time of adjournment, the difficulties surrounding the making of Manganese steel castings,—will you explain how the hardness of the Manganese steel, and its low

conductivity can culminate in increasing the difficulty of manufacture? A. I tried to explain that the low conductivity of Manganese steel increased very greatly the difficulty of manufacture; its tendency to tear apart in cooling, and to be left in a state of injurious stress. This same thing is further brought about, this liability to injury through breaking or through becoming full of harmful stress, is brought about by the fact that the steel has to be cooled, extremely suddenly, by the use of water. So that the steel is extremely liable to break or be broken, or to be harmed, or injured by internal stress for both these reasons, first its low conductivity; and, second, the necessity for cooling it suddenly, by quenching it in water.

Now, in common steel castings, there is a similar liability—similar in kind though very much less, incomparably less in degree. But in common steel castings, this tendency can be counteracted by a very simple expedient, which I will now explain.

This stress and rupture occur because of the difference in the thickness of different parts of the casting. Now in making a casting of common steel, for a purpose which requires that one part should be very much thicker than the other parts, this tendency to injury may be prevented, or very greatly lessened, by making the parts which ought to be thinner than the others, actually of about the same thickness, and then after the casting is made cutting them down to the thinness which the finished piece requires. That is to say, the cause of this difficulty in casting is, that some parts of the piece must be thicker than others. In making a casting of common steel, you can avoid that difficulty, by making the parts which finally are going to be thin, when the object is going to be used, making them initially thick, so that while they are being cast and while cooling, the different parts cool and

contract at substantially the same rate, so that rupture and stress are not liable to occur. Then after you have made your casting, cutting down the thickness of the parts which are required to be thin, and thereby getting them thin, and in a proper shape, for the actual use for which the casting is going to be put.

Q. Where is that cutting done? A. That cutting is done in the machine shop.

Now, in the case of Manganese steel we cannot make use of this device, because the Manganese steel is so hard that we cannot machine it, we cannot cut it with machine tools, and reduce the parts initially thick and make them thin, so that if a casting requires that some parts must be thick and some parts must be thin, then, when we make that casting, when we are casting it from the molten metal, we must initially make the thick parts thick, and the thin parts thin—we cannot make the ~~thick~~ thin parts thick and then cut them down as required. That is to say in the case of Manganese steel, the qualities of the material and the treatment which it requires, make it extremely subject to breakage and stress, and at the same time, the fact that it cannot be machined, prevents us from making use of the common expedients which we make use of in the casting of other steel castings to prevent this injury.

Q. Have you been intimately associated at Highbridge with the working out of the problems to which you have referred in the making of Manganese steel castings? A. Yes, sir, for and during the first years, when introducing the process and for many years afterwards, I was in constant consultation, and made it a rule to spend two days out of every fortnight at the works, planning how we would overcome these difficulties. But in later years I have not been in such close consultation——

Q. What was your connection at Highbridge with the quality of the product? A. As I stated in my last answer, the first years, for many years, when we first started the process, I kept very close track of it, and of analyses and tests, all analyses and tests were sent to me. But for a good many years now I have not been in such close touch, until the present year. The present year I again undertook to look after the question of quality of material very carefully, and we have in the past months, been working up methods of improving the quality of the material, and I have been in charge of these methods, we have not yet got to our final—not got to the end——

Q. You would not want us to understand, however, that you were not frequently at the works during all the time since 1891 or 1892, when this manufacture began? A. I try to be there now, about once a month, and I have been there during all these years, at intervals of every few months, and I would go through the works very carefully——

Q. Have you a personal familiarity with the conduct of the Bessemer process? A. Yes, sir, I have done the work of conducting the Bessemer process, that is, what is called "blowing the heats," determining when to end the heats, very carefully, and I have performed all these operations connected with the Bessemer process with my own hand.

Q. You have conducted that process yourself? A. Yes sir.

Q. You might explain that process and also give us the different varieties of that process if there are any? A. The Bessemer process is a process for converting cast iron into steel. The difference essentially between cast iron and steel is that cast iron contains a great deal more carbon, and usually often more silicon, and often more Manganese than

the steel contains. And the Bessemer process consists esentially in oxidizing and removing the excess of carbon and of silicon and Manganese, if they are present in excess, by blowing a blast of air through. The difficulty in this, as in other steel making processes, is to determine when the process has gone far enough, because there is a heavy money loss in carrying it further than is necessary, as well as of injury to the material. This matter of deciding when to terminate the operation, or when to end the blow, is very delicate. The person who does it, the blower, has to rely upon certain very slight indications in the character of the flame, which escapes from the mouth of the converter or the vessel in which the operation takes place. Judging from this slight appearance he ends the process and without making any test to know that he has ended it at the right time, he proceeds to make his final necessary additions, and to cause the molten metal to be cast into moulds, so that a great deal of skill is required, skill and knowledge is required to do this correctly, because it must be done right, there is no way of dosing it afterwards. There are several different varieties of the Bessemer process——

Q. Doctor, before you go into that, in order that we may understand it, can you give us, or ~~forth~~ the evidence that has already been taken, or may be taken in this cause, the names given to the various places and vessels, in which the iron or steel is treated—what is the first place of deposit of the original material in the Bessemer process? A. We generally operate on pig iron, that is melted in a cupola furnace——

Q. And from there where does it go? A. From there it is run generally into a ladle.

Q. What is it called—"receiving ladle?" A. You can call it a receiving ladle, we generally call it a ladle.

Q. What is it generally called? A. An iron ladle—I say an "iron ladle" as distinguished from a "steel ladle."

From there it is put into a converter, which is a sort of retort lined with brick, and in that converter it is converted into steel by burning out the carbon and the silicon by means of a blast of air——

(*Mr. Lindabury.*)

Q. I think you might explain further how that blast of air is injected into the mass—it is very interesting, and I would like you to go a little further into that—I don't understand it and I don't know whether the Court understands it or not—tell us how the blast is introduced into the converter? A. It is a blast of cold air—it is something like this—(witness at this point draws a diagram in the form of a champagne bottle, indicating holes at the bottom and showing a portion of the bottle to be filled with a certain proportion of the material.)

Suppose that you had a large bottle, like a champagne bottle, and you had in this bottle enough water so that when the champagne bottle was lying on its side tilted a little like this (indicating) a considerable quantity of water would lie in the hollow or belly between the mouth of the bottle and the bottom of the bottle; and suppose that in the bottom of the bottle you bored a number of holes. You have got the bottle lying on its side, for instance, with a number of holes bored in its bottom, and some water lying in the belly or the shoulders of the bottle (indicating). Now you slip a rubber cap over the botton of the bottle and blow air into it, between the cap and the bottom of the bottle, and that air passes in through these holes into the bottle (indicating).

The water would look something like that (indi-

cating). These holes are here, and the air is blown in there (indicating) through these holes. Now when you start blowing this air in through these holes, you tip the bottle up so (indicating), and throw the water into these holes, so that the air passes through that water. Now, if it were not for this air going through these holes, with very great pressure, the water would come through these holes——

Q. What is the objection to filling the bottle half full? A. It would be blown, all of it, would be blown out of the mouth of the bottle—you do not fill it more than five per cent, I don't think.

Q. Now when that airs gets in there what does it do? A. That air burns the carbon.

Q. The carbon gets up some heat, does it not? A. The carbon gets up some heat but the chief heat is generated by the silicon and the Manganese.

(*Mr. Hardin.*)

Q. You have told us that the blast goes in through the bottom of the converter, how is it introduced so as to reach the bottom? A. It is introduced through these holes, which are called, "tuyeres" introduced under very great pressure, so as to prevent the molten iron running back through these holes.

Q. How is the converter supported? A. It is hung on trunnions like a gun and the blast goes through one trunnion, and down through a pipe which leads to a box at the bottom of the converter. This leaves the metal in the condition of blown metal, as it is called, that is, iron which has been deprived of its carbon and silicon more or less completely.

Q. And of some of its Manganese? A. And of its Manganese, if it had it, more or less completely, and it is not then, in general, in a condition suitable for

any commercial purpose, and it has to be brought to that condition by adding suitable physic, which varies with the use to which it is to be put.

Q. Now after it has been brought to the suitable condition to which you have referred there, through what medium does it reach the moulds? A. It is then poured from the converter into a steel ladle, or casting ladle, and this casting ladle is carried next to the moulds, and from that ladle, it is conveyed, in a variety of different and convenient ways, into the moulds.

Q. So that in the ordinary sequence of this work, we would have it proceed in this way—we have the cupola, the iron ladle, then the converter, and then the steel ladle? A. Yes sir,

Q. And then the moulds. A. Yes, sir, and then the moulds.

Q. Are there different varieties of this Bessemer process? A. Yes, sir, there are several different varieties. In the first place, there is what is known as the basic Bessemer process, by which it is possible to remove phosphorus as well as carbon, silicon and Manganese. And then the acid process, which is the one used altogether in this country, which removes carbon, silicon and Manganese, but cannot remove any phosphorus. These two processes are carried on in different kinds of converters, under different conditions, different indications have to be relied on for terminating the process.

Q. Are there different varieties of the acid process? A. There are several different varieties of the acid process. There is the usual process by which the great bulk of the steel rails of the world are made. There is the Swedish process which differs from that which I have described, in a very important way, and is very much more difficult to

carry on, and there is probably very few people in this country, who can carry out that process.

There is the tropenas process, which also differs in its indications.

And there is the Hadfield process, which differs in its indications. And a person who is competent to conduct one of these processes, is not thereby competent to conduct any of the others. That is to say, you have to rely upon different indications in every one of these different varieties of the Bessemer process, to know when to end it, also to know how to regulate the temperature and otherwise to conduct it properly.

Q. When was the Bessemer processes introduced? A. I think it was in 1856 when it was introduced. It was for a very considerable time feared that it would be impracticable to carry on the process at all, because of the difficulties of knowing when it terminated, until they finally found that by keeping the ~~combustion~~ carburation of the iron within certain limits, and proceeding in a certain way, they were able to end the process at the right point——

(*Mr. Lindabury.*)

Q. Who discovered that process? A. Mr. Bessemer afterwards "Sir Henry Bessemer, of England."

(*Mr. Hardin.*)

Q. Do I understand you to say that familiarity with one of these varieties of the Bessemer processes, would or would not qualify an operator to conduct either one of the others? A. No, sir, you could not tell from the way one is worked how to work the other, the indications are so entirely different, and they are always pretty delicate.

Q. You told us the other day that you acquired a

knowledge of this Hadfield at the works at Sheffield, England? A. Yes, sir.

Q. Was any secrecy observed or any pledge required of you, before you were taught that process? A. Yes, sir, all of us who were admitted to the works or who were in any way told about the processes had to sign a pledge of secrecy with a heavy penalty attached.

Q. After you had been abroad, and received this instruction in the Hadfield system, you were also connected with the instruction of the workmen at Highbridge, were you not? A. We all came back, having learned all that we possibly could, by observation, and by the examination of Mr. Hadfield's records, and we all did all that we could to instruct everybody that needed instruction.

Q. Under what conditions, at Highbridge, with reference to secrecy? A. The secrecy which I have referred to already was maintained from the very beginning. Before we did anything else we put up this brick wall which I have spoken of, a high brick wall for the purpose of excluding from the converting department, from the steel making department, everybody except those it was necessary to have there. This steel making department has, from the beginning, and is now, cut off from view, of the rest of the works, so that the moulders and the other workmen cannot see what is going on there. It is true, that they can see the top of the converter, but that is all of the converter that they can see, and they cannot see the operations round and about the converter, they are hidden from their view by this high brick wall, which was made high for that particular purpose, for shutting off the view of moulders and all the men in the foundry from the steel making department.

Q. How high is that wall? A. Nine or ten feet I should judge.

Q. You have told us about the construction of the building, etc.; now, further, with reference to the question of secrecy, were any pledges exacted from the superintendent and the others who were instructed in the work at Highbridge? A. These same pledges of secrecy we were to get from everybody who necessarily would receive so much information as to make it worth while.

Q. That is provided in the contract, is it not, with Mr. Hadfield? A. I should have to look at the contract to make sure of that.

Q. You did undertake to get those pledges, did you? A. I undertook to get the pledges, and it was part of our agreement, now whether it was formulated in the contract or not, I do not at this moment remember, but it was required by Mr. Hadfield, in all his arrangements with his other licensees, it was required that the secrets should be protected in this way, it was not optional with them at all.

Q. Do you remember the time of the expiration of the original Hadfield contract—if you do not recollect it from memory? I will hand you Exhibit C 8, which I believe is the first contract (handing paper to witness)? A. 1902, according to my recollection—yes, January 1, 1902, the contract was drawn by me and is signed by me as Mr. Hadfield's agent.

Q. Are you familiar with the Hadfield patents referred to in that contract? A. Yes, sir.

Q. Do you remember when those patents expired? A. 1898 is my recollection, but I will just make sure (referring to memorandum), there were two in 1898, and the third was in 1902.

Q. You stated a moment ago that you drafted this contract—was there any release in the clauses referring to the expiration of the secrecy pledges in 1902—to the expiration of the patent? A. Absolutely none, the patent expired some time before

the secrecy clause, the dating of the secrecy clause was to cover the length of the contract, which was about as long as we thought we could get the Taylor Iron and Steel Co. to agree to pay royalties.

Q. Was there any other reason why 1902 was selected? A. There was an additional reason, that Mr. Hadfield's agreement with his other licensees, compelled him to keep these matters secret.

Q. Until when? A. Until 1902.

Q. How to go back to the subject I started to take up a moment ago—what kinds of castings have you been manufacturing at Highbridge, since the introduction of the Hadfield system in 1892? A. Castings of Manganese steel of two chief classes, castings of carbon steel of four chief classes, castings of chromium steel and of nickel steel, and of chromium and nickel jointly, and also steel cast shells, of different compositions and for different purposes, some only for exploding, some for target practice, and some for armor-piercing—all of this required different properties and different composition.

Q. Have all of these classes of castings to which you have referred been manufactured under the Hadfield processes and under the development of the Hadfield processes that you have worked out at Highbridge? A. Yes, sir.

Q. You spoke of "shells"—have you manufactured shells in large quantities there? A. In very great quantities of shells.

Q. And sold them to the United States Government? A. Yes, sir, in very great quantities we have sold them to the United States Government.

Q. And were those shells all cast steel? A. Those shells were all cast steel shells.

Q. Do you know whether or not cast steel shells have been successfully manufactured in this country by any other concerns? A. Very few, if any.

The I. G. Johnson Co., of Spuyten Duyvil, were very successful steel founders who made some solid shot, which is distinguished from shell, which of course are hollow, a very large shell having a very large chamber, and the shot are solid or nearly so, and the I. G. Johnson Co., of Spuyten Duyvil, made some shot, which I believe are castings—I don't believe anyone else did—and they were considered I believe to be castings—but we made shells and we considered ourselves practically the only makers of cast shells, all the other makers being makers of forged shells.

Q. These shells were made under the Hadfield processes, were they not? A. All the steel castings ever made there have been all made under the Hadfield processes.

Q. What was the difference of the cast shell from that of the forged shell? A. The cast shell was very much cheaper in the first place than the forged shell could possibly be. At that time the forged shell has to be, in the first place, cast, and in the second place forged, and in the third place, bored out—that is to say the large chamber which has to hold the bursting charge of the shell has to be bored out of the solid, after the shell has been cast, and forged, so that the forging is a very difficult process. Of late years, the art of forging has progressed, so that now there is not so much ~~difficulty~~ economy in casting; then it was a very great feat to be able to make a cast shell that did not undergo the apparently very great improvement, which forging causes to make a cast shell that would stand an explosion in the gun, without its being broken. We did of course very much more than that. We made these shells which were only castings, which not only would stand the terrible explosion in the gun, but also would carry a charge of explosives through

a steel plate, at which they were fired, that is the armor plate of a vessel——

Q. Do you remember how thick? A. It is so long ago that I cannot say, but my recollection is, I remember one case where the shell went through twenty-four inches of iron plate.

Q. Of armored plate? A. Iron, armored plate, twenty-four inches thick—but it is so long ago, that I do not now remember whether it was one calibre or a calibre and a half of iron steel plate—I do not remember now.

The second ~~objection~~ advantage was, in the superiority which the cast shell was supposed to have in this way. We were supposed to make them just about ductile and coherent enough to stand the shock of firing in the gun and of piercing the armor plate, and at the same time to leave in them a considerable degree of brittleness so that when the high explosive within the shell finally exploded, it would tear the shell into a great many pieces, which would fly about inside of a vessel, and I am sorry to say kill a great many of our fellow human beings, and probably sink the ship. Whereas, a forged shell was supposed to be so much more ductile that when it burst, because of the bursting of the explosive within it, it simply opened like a copper boiler, and let the gases escape without its bursting and flying about and destroying our fellow creatures.

Q. Do you know whether Mr. Hadfield was engaged in the making of cast steel shells also? A. He is, and has been making a great many of them, and I believe is still supplying the English government with cast steel shells.

Q. Do you know whether other manufacturers have been able to make them—you have already told us of the I. G. Johnson in this country? A. I do not think anyone has gone into it in any way like the skill that Mr. Hadfield has, although I

have not kept track of it for several years, but he is the one that has made a great many cast steel shells for the British government and other governments, and he has been very skilful and successful in it.

Q. Did the Krupp people make any shells? A. I cannot tell you whether the Krupp people made any cast steel shells or not. I do not know and I rather doubt if he has. I did not say that the Krupp people used the Hadfield processes in making his guns. I do not think they did, but I think he used the processes in making his steel castings. These shells that we made we sold to the United States government during the recent Spanish war —we sold them also to the U. S. government at the time of the Chilian anticipated war or expected war.

Q. That was prior to the Spanish war, was it not? A. Yes, sir.

Q. Were those shells made of Manganese steel? A. No, sir; those shells were made of other varieties of steel, not of Manganese steel.

Q. Now was there any special care taken in the preserving of the secrets as to the methods used in the manufacture of these cast steel shells? A. That was kept as secret as was possible, I think that not more than three men at Highbridge were ever admitted into the plant where the treatment of the shells took place. One of these men was Mr. Brinton, and the other was Mr. Nicholls and I forget the name of the third—there was a third man and it was confined to those three.

Q. To what part of the manufacture of those shells did the secret process relate? A. To the composition of the shell. That is to say, its chemical composition as determined by the physic that was added. The method of casting the shell, that is of preparing the mould and casting it; the

method of cleaning the shell, as we call it, mechanically, after it was cast which was a great deal more of an operation than at first seems likely; and fourth, and which is the most vital of all, the method of heat treating the shell, so as to give it its armor piercing, or other properties. It would seem at first as if cleaning a shell was a pretty simple operation. But when you recollect that that shell contains high explosives, and is fired from a gun with an enormous shock, and that the least roughness in the inside of the shell where the high explosives are will probably explode the explosive inside the gun, and ruin the gun, and perhaps sink the ship which holds the gun, you will see that it is a pretty important thing to get that shell very smooth inside, and the job of doing it through a small hole at the base of the shell, which is all you have to do it through, just a small hole in the base of the shell, you will perceive that it is a very delicate piece of dentistry.

Q. Do you know of any patents covering this manufacture of cast shells that you have told us about? A. Mr. Hadfield took out a patent on a shell which was partly forged. I do not now remember any one concerning a cast shell alone.

Q. The Hadfield patents that are referred to in the contracts between Mr. Hadfield and the Taylor Iron and Steel Co. all bear on Manganese steel, do they not? A. They bear on Manganese steel, and that original contract excluded shells, that is, we were not allowed under that original contract to manufacture shells.

Q. There was, as I recall it, a special "shell license" originally negotiated? A. There was a special shell license originally negotiated; yes, sir.

Q. I show you Exhibit C11, that is the document which negotiated the shell license, is it not? A.

New Jersey State Library

Yes, sir, that is the document; it is dated in January, 1892.

Q. In the manufacture of Manganese steel at Highbridge, at what points in the manufacture do you observe special secrecy, commencing now at the beginning and going down to its finish? A. Why, in the conversion of the cast iron into steel we observe special secrecy; in the pouring of the steel into the moulds is not pretty generally observed by the moulders; the treatment of the steel after it has been removed from its moulds we endeavor to keep secret, and in the changes which we made within the last year we have taken special steps to keep that strictly secret.

Q. You are speaking now of the opportunity of your own workmen seeing the work? A. Yes, sir, that is we have endeavored as far as possible to keep the moulders and the others who might have business in that portion of the works from seeing the methods adopted in doing the work.

Q. Now, again, with regard to the world at large, not only the men employed in the works, I will ask my question so as to apply to the world at large; in the manufacture of the Manganese steel at Highbridge, what points in that manufacture do you observe special secrecy—commence at the beginning and give the whole thing down to its finish—what special secrecy is observed? A. From the time the pig iron enters the cupola until the cold casting comes out into the machine shop to be ground.

Q. Do you observe secrecy with reference to the initial mixture? A. Yes, sir.

Q. In what respect? A. Well, what its chemical composition is.

Q. Is secrecy observed as to the methods of melting in the cupola? A. Yes, sir.

Q. With reference to what special matter in the melting in the cupola, what special care do you ex-

ercise in the efforts to maintain secrecy, as to that? A. Well, in regard to the temperature, and there are several matters there in our procedure which I believe to be wholly original, that is to say, not employed anywhere else, except in the Hadfield system.

Q. Suppose you begin at the beginning and give us those points, with respect to those points especially which you observe secrecy in, because you believe them to be original, of your own—of course now without disclosing the secrets? A. Well, in regard to the initial composition of the charge, as charged into the cupola. There is a peculiarity in the chemical composition which I believe to be exclusively our own. There is a place in Europe where they unintentionally, and much to their regret, have a similar condition, which is forced upon them. It is a condition which is similar in kind though not in degree. This condition to which I have referred is one we have selected, and I think it is substantially therefore unique. There are other conditions which are extremely unusual there, I won't say they are unique, but they are unusual.

Q. In regard to the initial mixture? Yes, sir, in regard to the initial mixture.

Q. As to composition? A. As to its composition. And then as regards the management of the cupola, there is a special procedure there which I think is exclusively ours.

(*Mr. Lindabury.*)

Q. To what does it relate; you can tell us to what it relates, without disclosing the secret? A. It relates to the composition which the molten cast iron, pig iron, is going to have, after it has come out of the cupola process.

Q. And that is controlled or affected by the treatment in the cupola, to some extent? A. By

the way in which we conduct the cupola processes we obtain a composition which we could not otherwise get with the same materials—the same raw materials.

(*Mr. Hardin.*)

Q. That method you believe to be exclusive with you? A. It is very uncommon at any rate, if it is not exclusive.

COURT—I would like to know what the witness means by "very uncommon."

(*Mr. Lindabury.*)

Q. Is it employed anywhere else that you know of? A. I never heard of its being used in connection with the cupola, of course I cannot say that it has not been, but I never heard of it.

Q. The question was anyhow, what are the processes which you kept secret, or undertook to keep secret? A. I understood the question to be, what are the points to which—(interrupted)——

Q. To which you observe special secrecy? A. Well, we observe special secrecy, as I have already said, with reference to all. Now, between the time when the iron leaves the cupola furnace and the time when it is poured into the converter there, there is a step which, so far as I know, is original. In the converting process, the way in which we regulate the temperature I believe is original, exclusive. There are other methods which approximate to it, but which are not identical with it, and differ from it in important respects.

Q. Where is it you said there were something you did which you considered unique, in the ladle before it goes into the converter, or afterwards—I think it was between the cupola and the converter —am I right about that, or was it after the con-

verter? A. Between the cupola and the converter there is a stage which is certainly very uncommon, whether it is really unique or not I do not know, but it is certainly not common practice, and if it is done anywhere, it is done only very rarely.

Q. Does that consist of the addition of other materials between the two, that process which you speak of as unique? A. May I refer to a memorandum to refresh my memory on that point?

Q. Certainly you may. A. The indications by which the end of the process is recognized, those I believe are not used anywhere else.

Q. Is that the converter process? A. Yes, sir, that is in the converter process. I think those are exclusively ours, and as I said, the method of regulating the temperature, I believe, is exclusively ours, differing in important respects from the most nearly resembling processes.

Now, I have mentioned four things which seem to me to be exclusively ours. (1) The materials used in the charge that goes into the cupola; (2) the method of melting in the cupola; (3) the manner of regulating the temperature——

Q. Where? A. In the converter—that is a matter of very great importance, the regulation of the temperature in the converter is of vital importance; and (4) the indications by which the end of the converter process is recognized.

Now then when you come to the founding or moulding or manipulation of the castings themselves, of course the art of founding moulds is an old one, and we have there adopted the old common principles, but we have had to make new departures in ~~blowing~~ moulding, thanks to this very refractory material.

Q. The refractory material being Manganese steel? A. Yes, sir, the refractory material being the Manganese steel. That is we have here essen-

tially novel and exclusive applications of principles, which in themselves are old. For instance, in what is called the patern making, that is deciding what shape we should give to the castings, and how the rate of cooling of the different parts of the castings should be regulated, there we have had to devise new methods. So that the casting shall be of such a shape, that, in the first place, it would be suited to the peculiar properties of the material itself; and in the second place, that it shall be suited to the actual needs of the article, as it is going to be used in service, without having to be cut away in the machine shop.

Then with regard to the use of what are called "chills." That is to say, putting pieces of cold iron into certain parts of the mould, and making the rest of the mould of sand, so that those parts against the cold iron shall cool more quickly than those portions of the casting that are against the sand. That is an old art, but that old art as applicable to the manufacture of Manganese steel required a new set of rules and consultations, as to how we should devise those rules, and this was a very important part of our study for years at Highbridge, and is so still.

Then the time of the removal from the moulds; that is a new application of old principles. The castings must be removed from the moulds as soon as they conveniently can be properly handled, but the material of which the heat conductivity or the rate of cooling is so different from the heat conductivity of other material, and has to be treated in a special way, that is not a thing that you can evolve from your inmost consciousness.

Q. Have you worked it out according to rule at Highbridge? A. Yes, sir, we have worked it out according to rule so as to enable us to know how long they should be left in the moulds. In the

same way the rate of heating of the castings after they have left the mould, it is a new application of an old principle, but the application itself is very difficult, and has to be worked out with very great care and great observation and has to be reduced to rules, and that is not a thing that can be evolved from one's inmost consciousness; so that I should say that in regard to the preparation of the molten steel, there were four important points which seem to be strictly exclusive, and in regard to the treatment of the steel, after it has been made, there are four other points, which it seems to me, our knowldge is exclusive.

Q. Are these various matters to which you have referred all capable of being reduced to a rule? A. Yes, sir, they are all capable of being reduced to rules and all have been so reduced.

Q. How about the treatment of the shells, was that also capable reduction to a rule? A. Yes, sir; in many respects. In the first place, as regards the composition of the metal, the way of preparing the moulds, and the heat treatment, those of course have to vary with the use to which the shell is to be put. There are several classes of shells. The bursting shells and armor-piercing shells also has to be modified to a certain extent with regard to the size of the shell. A very large shell has to be treated in its own special way, and also according to the specifications imposed by the U. S. Government.

Q. You have said nothing in your description with reference to the physics—do you or not preserve secrecy with reference to the composition of the physics? A. Yes, sir; very strict secrecy is observed with reference to the composition of the physics, that is one of the ways in which we give the steel its proper composition for making these shells.

Q. Now, from a combination of all these matters that you have referred to, what has the Taylor Iron and Steel Co. secured in its castings? A. It makes very high grade of castings, and makes them with great economy.

Q. And with reference to Manganese steel castings, what special physical properties does it secure? A. Uniform hardness and ~~conductivity~~ ductility, or what it more commonly called "toughness." This is a combination which is very difficult to get. Manganese steel and Nickel steel are apparently the only known substances which have the combinations of hardness and ~~conductivity~~ ductility.

(*Mr. Lindabury.*)

Q. Nickel steel and Manganese steel? A. Yes, sir; Nickel steel and Manganese steel are the only well known substances which have the combination of hardness and ~~conductivity~~ ductility, in fact, which are at the same time tough and hard.

(*Mr. Hardin.*)

Q. You have improved on the original Hadfield processes as taught to you in 1892, have you not? A. Very greatly indeed. Mr. Hadfield came over on a visit, after an absence of some years, and was very much astonished to find that we were able to produce out of Manganese steel, castings of so many different shapes, he said he did not think that it would be possible to make such castings out of Manganese steel.

(*Mr. Lindabury.*)

Q. The contracts provide for an interchange of discoveries or improvements, do they not? A. Our arrangements do, but whether it is included in the contract or not, I cannot be sure at this length of time.

Q. Could a blower skilled in the common Bessemer processes, or in any modification of the Bessemer process, conduct the Hadfield modification of it without instruction? A. No, sir; we find it in actual practice that a man coming there could not conduct this operation successfully except after instructions covering a considerable period. And the same is true with regard to the pattern makers and moulders. The pattern maker coming there could not make patterns for that material. Or a draftsman could not design the patterns for Manganese steel from his knowledge of how to design patterns for common steel.

Q. Well, for Bessemer steel? A. For Bessemer steel or for common steel of commerce, for steel other than Manganese steel.

Q. Could a furnace man or annealing or foundry workmen skilled in annealing common steel castings, would he know how to make Manganese steel castings without special instruction? A. No, sir; he could not.

Q. I meant to cover castings other than Manganese steel? A. My answer meant that too. A knowledge of how to anneal or treat castings other than Manganese steel would not qualify a man to treat castings of Manganese steel, it would be very easy to lead him in the wrong direction.

Q. From the chemical analysis of a plate or steel casting can you acquire knowledge of the methods pursued to give it its physical properties? A. In the case of Manganese steel?

Q. Yes? A. No, sir.

Q. Or as to other steels? A. You can sometimes in the case of other steels make a pretty shrewd guess as to what has been done to them, but it is only in the nature of a guess, and Manganese steel you could not even make that guess, as far as I know.

Q. May a chemical analysis of two different castings completed be practically the same, and yet the castings different in physical properties? A. Yes, sir; they may differ radically, one may be very good and the other worthless.

Q. Due to what—due to their treatment in manufacture? A. Yes, sir; due to their treatment in manufacture.

(*Mr. Hardin.*)

Q. Some of the ingredients found in the initial material, or introduced in the process are missing in a final chemical analysis of the finished product? A. Yes, sir.

Q. They disappear in the process? A. Yes, sir; they disappear in the process, some are completely eliminated, and some are reduced in quantity.

Q. Does that mean that the absent materials have had no part in the development of the completed product? A. No, sir; it does not mean anything of the kind. They may have played an absolutely essential part, and actually leave no trace behind that can be detected by a chemical analysis.

Q. Now, are you familiar with the publications with reference to Manganese steel? A. Yes.

Q. Have you given special attention to the study of Manganese steel? A. Yes; and made a great many experiments with it.

Q. Do you know of any publications, or is it, say from all the publications taken together, and the information which they contain, that one skilled in the art of steel making would be unable to make Manganese steel castings of high quality from the information disclosed by the publications alone? A. No, sir; I don't think he would make them either of high quality or poor quality.

(*Mr. Lindabury.*)

Q. Well, of such quality as the Taylor Iron and Steel Co.'s makes? A. I don't think they could make them of such quality as the Taylor Iron and Steel Co.'s makes, I know they could not carry on the successful manufacture of castings of Manganese steel of a low grade either from the books or published papers.

Q. You told us the other day that you were familiar with the efforts to make Manganese steel prior to the introduction by the Taylor Iron and Steel Co.; give us a little more defienitely in relation to that—prior now I mean to the introduction of the manufacture of Manganese steel castings at Highbridge; you told us, I think, the other day that the first successful commercial manufacture was at Highbridge? A. When I became Mr. Hadfield's agent Mr. Hadfield had already licensed some concerns to make Manganese steel in this country, but he had not taught them the use of his process or licensed them to use those processes.

Q. Were those licenses under his system of making castings or under his patents? A. They were not under his system of making castings but only under his patents.

Q. And those patents relating to Manganese steel only? A. Yes, sir; those patents related to Manganese steel only. These attempts I think were all unsuccessful; that is to say the licensees all abandoned their licenses. There were provisions in each license requiring that a minimum quantity should be made, and in no case did the licensees comply with the requirements of the licenses in that respect, and my recollection is that none of them substantially made Manganese steel successfully.

Q. How many makers of Manganese steel were there in this or any other country at the time the

Taylor Iron and Steel Co. began to make it in 1892? A. The only successful ones I think were Mr. Hadfield and his licensees, the Gruson Company, afterwards absorbed by the Krupps.

Q. At the time these licenses were procured to work under the Hadfield systems, was the manufacture of Manganese steel castings of greater or less importance compared with other steel castings? A. It was of slight importance.

(*Mr. Hardin.*)

Q. And has it grown to be of great importance? A. Of very much greater importance; yes, sir.

Q. Now, is the process a large part of the business in the Taylor Iron and Steel Co.? A. A chief part of the business of the Taylor Iron and Steel Company.

(*Mr. Lindabury.*)

Q. What percentage of the product during the first years was manufactured under the Hadfield processes? A. Well, all of the steel castings were made under the Hadfield processes.

Q. What percentage of the total output of the Taylor Iron and Steel Co. works was under the Hadfield process? A. A very small percentage at first.

Q. Well, five or ten per cent.? A. Well, I will say five per cent., but that is a very rough guess.

Q. Now, what was the percentage during the last five years? A. Oh, nearly all.

Q. Nearly all of the product manufactured under the Hadfield process? A. It is nearly all made now under the Hadfield processes.

Q. That is very indefinite, will you say ninety-five per cent. or eighty per cent. or seventy per cent.—what do you mean by nearly all? A. I should think at the present time we are making

ninety-five per cent. of the product under the Hadfield process.

(*Mr. Hardin.*)

Q. That includes both Manganese steel and other steels? A. Yes, sir; both Manganese steels and other steels, it is practically the whole business now.

Q. In the course of your experience there with Manganese steel, you are now able to make many different castings of Manganese steel that originally you could not make? A. Yes, sir.

Q. Are you familiar with the contracts or the series of contracts made by Mr. Hadfield with your company from 1891 down to date, and which have been put in evidence? A. I have been familiar with them; yes, sir.

Q. And with the patents there referred to in these papers? A. Yes, sir.

Q. From the contents of these documents, or from the contents of the patents referred to therein, could one skilled in the art of steel making produce the castings as you produce them at Highbridge, without special instruction? A. No, sir.

Q. The Hadfield processes are not so disclosed, so that one reading those patents could operate the processes without special instruction in the processes? A. No, sir; they are not disclosed in the papers at all.

Q. Nor in the patents? A. Nor in the patents or elsewhere.

Cross-examination by Mr. Corbin.

Q. You have referred to your experience in the actual making of steel; where was that—Joliet you mention, I think, as one place? A. Joliet, Ill., and South Boston, Mass.

Q. Now, what was the concern at Joliet, Ill.? A. The Joliet Iron and Steel Co., I think, and at North Chicago.

Q. How long were you engaged at Joliet, Ill.? A. I was engaged there I think about a year in the construction of the works, the works had not started when I left there.

Q. You did not manufacture steel there? A. No, sir; I did not manufacture steel there, I was engaged there in the construction of the works.

Q. Where next did you go after leaving Joliet? A. I was for a short while at the Bessemer Steel Works at Troy.

Q. That was the works that Griswold started a few years ago? A. Yes, sir.

Q. When were you there? A. I was there about a year from October, 1871.

Q. In what capacity? A. As a learner.

Q. What was your employment? A. Learning how to make steel; I did everything there was to do.

Q. As a foundryman? A. As a learner.

Q. I did not suppose they hired men as learners? A. They did not hire me.

Q. You did not get wages? A. No, sir.

Q. You were just there to watch? A. I was not there to watch, I was there to do.

Q. Well, what did you do? A. I did all the operations, I ran the cupola, melting furnace, I conducted the blowing operation, perhaps more of that than anything else, I lined the ladles, I hammered the steel with the steam hammer, those were the principal things connected with the steel that I did.

Q. That was an ordinary Bessemer steel works, was it not? A. Yes, sir.

Q. Now, you were there about a year? A. Yes, sir; about a year.

Q. And you were not there on wages? A. No, sir.

Q. Now, where did you go to from there? A. To Joliet.

Q. You went back to Joliet? A. No, sir; I was first to Troy, and then I went to Joliet.

Q. Let us get this from the beginning—when were you in South Boston, Mass.? A. In the summer of 1870.

Q. In what capacity? A. As a learner.

Q. How long were you there? A. About two months.

Q. What were those works? A. The Open Hearth Steel Works.

Q. Conducted by whom? A. The Bay State Iron Co.

Q. And you witnessed there the operations of making steel by the Open Hearth process? A. Yes, sir; I carried on the operation there of making steel by the Open Hearth process.

Q. What do you mean by "carried on"? A. I took an active part in the manipulations of the furnace, in the preparation of the moulds, and the casting of the steel.

Q. And from there where did you go? A. The next works that I went to, that was when I was at school in the summer vacation—now the next thing of any importance that I did was when I went to the Troy works.

Q. Was that after—— A. I spent a few months at the Norway Iron Works, in South Boston, Mass., where they were making iron, but the next thing of any importance that I did was at the Troy works.

Q. And from Troy you went to Joliet, Ill.? A. Yes, sir; from Troy I went to Joliet, Ill.

Q. That was to assist in the erection of the works? A. I went to assist in the erection of the

works, but I went intending to remain as superintendent of the works; I was appointed as superintendent of the works, but as the works were building, I spent a large part of my time at the North Chicago Rolling Mills where they were making steel by the Bessemer process; I went there to get greater familiarity with the process.

Q. And during that year you were at Joliet, Ill., you spent some time you say in the North Chicago Rolling Mills? A. In the Bessemer Steel Works at the North Chicago Rolling Mill.

Q. And when you left Joliet, where did you go next? A. I think I was next retained by the president of the Erie Railway Co. to make an investigation into the manufacture of so-called "Steel Capped rails" for the railway.

Q. That was your next occupation? A. Yes, sir.

Q. And where did you conduct that work? A. At Elmira in New York State.

Q. And in some works of the company? A. They were the works of the Elmira Co., I forget the name, but I think it was the Elmira Rolling Mills, or Elmira Steel Co., or something like that, I think it was known.

Q. How long were you there? A. Six or eight months or something like that.

Q. That was some investigation of what? A. The making of steel capped rails for the Erie Railroad, and the inspection of rails.

Q. Just before they introduced all steel rails, was it not? A. It was before they introduced all steel mills on the Erie Railroad to any extent.

Q. And where did you go from there? A. I went from there to the Blair Iron and Steel Co., in Pittsburg, Pa.

Q. And what was your employment there? A. I was superintendent.

Q. How long were you there? A. About a year

Q. Was that Bessemer steel making? A. Open-hearth steel making.

Q. And that is a somewhat different process? A. A different process.

Q. They do not use the converter? A. No, sir.

Q. What year was that? A. 1873 and 1874, or 1874; now whether it lapped over into 1873 or 1875 I cannot now say, but I think it must have been 1873 and 1874.

Q. And where did you go next? A. I think next after that, I think I traveled in Europe for a year after that.

Q. And where then? A. I went to Chili, to carry on some experiments in copper smelting in Chili.

Q. And then when did you next become connected with the steel making in this country again? A. I was connected with that concern in making copper for five years I believe.

Q. When did you next become connected with steel making in this country, that is after you got back from Chili, what did you do next? A. Well, when I came back from Chili I was with the same concern building copper works in this country and Canada for five years.

(*Mr. Lindabury.*)

Q. Is that another five years? A. No, sir; five years all told.

(*Mr. Corbin.*)

Q. After that what next? A. After that I carried on copper smelting operations near Arizona, for about a year.

Q. And what next? A. Next I became a consulting metallurgist.

Q. Where? A. At Boston, Mass.

Q. How long did you continue there? A. Until

1897, until I became professor of metallurgy in Columbia University.

Q. While you were consulting metallurgist in Boston, Mass., was it that you conceived the plan of introducing the Hadfield processes into this country—that was in 1892 or what year was it? A. It was in 1883 I went to Boston. While I was in Europe as a juror at the Paris Exposition Mr. Hadfield invited me to visit him at Sheffield, at his house in Sheffield, and I visited him there——

Q. When was that? A. That was in 1890, that is I made a long journey after the Paris Exposition, and at Mr. Hadfield's invitation I visited him at his house in Sheffield, Eng., and it was then that he proposed to me that I should take up his agency in this country.

Q. Now at that time he had a manufactory at Sheffield? A. Yes.

Q. He was making Manganese steel under his patent in processes? A. Yes, sir, Manganese steel and also other kinds of steel.

Q. Was he the only maker in Sheffield of Manganese steel? A. I believe so.

Q. Was not Allen a larger maker of steel than he was? A. Not then.

Q. Has he become so since? A. He has become a large maker of steel, how large I do not know.

Q. The most extensive maker of steel in Sheffield, is he not? A. I don't think so, but I do not know.

Q. Then your experience in the actual manufacture of steel was by the Bessemer process, and was in Chicago, as you have stated? A. In Troy and in Chicago.

Q. Your last experience was in Chicago? A. Yes, sir.

Q. That was in 1873 or 1874? A. Yes, sir, about that, but I have been in the habit of visit-

ing the Bessemer works all over the world from then until now.

Q. Now up to 1897 your residence was in Boston, was it not? A. From 1883 to 1897.

Q. And when you began this work at Highbridge what year was that? A. 1892 I think.

Q. Was that the time when you began to manufacture Manganese steel? A. I cannot tell you within a few months when we began without looking it up, it was about that time, I think.

Q. Do you know when Mr. Binton came there, do you remember what year it was? A. It was some little time after that.

Q. About 1895? A. I should think about 1895, yes, sir.

Q. Up to that time had you made much Manganese steel? A. Yes, sir.

Q. How much? A. As much as we could sell.

Q. Well, had it become a particularly profitable manufacture, up to that time? A. No, sir, it had not become particularly profitable—I think that we——

Q. You had not yet got it successfully on the market, had you? A. Well, it was a slow developing thing from the beginning. We had to learn how to make the material and then we had to adapt the people to using it; it was a substance wholly different from anything that had ever been introduced into the market before, and, as I say, we had to adapt the people to using it, and you know the difficulty there is always in introducing a new thing of that kind, particularly if it is a new material, new and different in all respects from what they have been accustomed to.

Q. When you came to Highbridge, did you remain there—did you take up your abode there? A. No, sir, I only remained there over night.

Q. You came from Boston to go there? A. Yes, sir.

Q. And you stayed over night there? A. Yes, sir.

Q. And then you would go back to Boston? A. Yes, I went back to Boston—I would come to Highbridge and remain over night and then go back the next day, or when we were busiest, I would stay in New York, and go up to Highbridge from there.

Q. After you came to New York in 1897, and had occasion to visit Highbridge, how long would you remain at Highbridge? A. From morning until night.

Q. Did you go up there on the train? A. Yes, sir.

Q. And then you would go back on the same day? A. Yes, sir, I would go back the same afternoon.

Q. Now, how often would you go into the foundry? A. Well, almost every time when I went up there I would go into the foundry, especially at first when we had great difficulties to overcome.

Q. Well, since 1896, when Mr. Nichols was there, how often would you go into the foundry? A. Well, less then of course.

Q. Well, do you think you went in there as often as once a year? A. Oh, yes, sir.

Q. And how long would you remain in there? A. Oh, a few hours.

Q. Would you go in there two or three times a year, do you think? A. I should think so; yes, sir, something of that kind, something like that I should say.

Q. Did you go into the office when you went there usually? A. Yes, sir.

Q. And would you go into the chemist's department? A. Yes, sir.

Q. Was it not that place where you usually went—into those places rather than into the foundry? A. From 1896 on

Q. Yes. A. Yes, sir; I think I went rather more into the office than into the foundry, although I was in the foundry a good deal.

Q. Don't you think there were periods when you did not go into the foundry more than once or twice during the year? A. I should doubt that. I doubt that any such long intervals as that occurred.

Q. And when you were there, was not your observation only casual? A. Not on the essential points of the practice; I would inquire very particularly as to what they were doing, and the essential matters.

Q. From whom did you make your inquiries? A. Mr. Brinton generally.

Q. And not from Mr. Nichols? A. No, sir.

Q. Did you ever have any conversation with him about these methods? A. Well, I don't remember ever having spoken with him.

Q. During the year 1905, do you remember being there at the establishment? A. That is last year?

Q. Yes? A. Why, it was the latter part of last year I believe that I resumed the practice of going there often, or more often I should say, about——

Q. Do you know who the employees were that were in charge of the operations of the foundry? A. I did not know them by name.

Q. Did you not know who the foreman was? A. Mr. Brinton.

Q. Mr. Brinton was the superintendent? A. Yes, sir, he was the superintendent.

Q. Do you know who was the foreman? A. I knew that Mr. Nichols was there.

Q. But you said you did not know that you ever had any conversation with him? A. I don't remember distinctly any conversation with him, although I think it is altogether likely that I have spoken to him.

Q. Do you know what his office was? A. He was next under Mr. Brinton.

Q. Did you know who the foreman was in charge of the foundry? A. Why, my understanding was that Mr. Nichols was in charge of the foundry, next under Mr. Brinton.

Q. Yes, but did you know who the foreman was —was that Mr. Nichols' title? A. No, sir, I don't know.

Q. You don't know whether anyone held the title of foreman in the foundry, do you? A. No, sir, I don't know who it was held the title of foreman in the foundry.

Q. You don't know who was the foreman? A. Well, Mr. Nichols was in fact the foreman under Mr. Brinton. Mr. Brinton I looked to as the superintendent of the department, and Mr. Nichols was the foreman under him.

Q. And if there was another foreman, you did not know who it was? A. No, sir.

Q. Did you know who was in charge of the melting operations, directly in charge of the men engaged in the melting operations? A. The head moulder.

Q. Do you know who that was? A. I never knew his name, it was a man that I very often saw there, and whom I talked to quite frequently, but I never knew his name.

Q. You knew who the chemist was? A. Yes, sir.

Q. You were in frequent communication with him? A. Yes, sir.

Q. And that was the department which particularly interested you, the chemist's department? A. Not any more than the foundry, I should say; no, sir.

Q. Were you accustomed to examine his formulas? A. Yes, sir, I was; I used to receive a record of every charge of steel that was made, and I very often examined those records.

Q. And communicated with him in regard to it? A. When I was at Highbridge.

Q. Now, after you became interested—I understand you were interested from the first in the business of the Taylor Iron and Steel Co. at Highbridge, that is from the beginning of this Hadfield process? A. I was a stockholder in the Taylor Iron and Steel Co. from the time of its organization.

Q. And you had been a stockholder before—that is before the Hadfield process was introduced there, had you? A. The Taylor Iron and Steel Co. was reorganized for the purpose of taking up the Hadfield process, and I was a charter member of that company.

Q. And you went into it with the expectation of introducing the Hadfield process at Highbridge? A. Yes, sir.

(Cross-examination suspended.)

MATTHEW V. MCKEON, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Quaker Town, Pa.

Q. What is your occupation? A. Superintendent of a stone crushing plant.

Q. What plant? A. The General Crushed Stone Company's, Rock Hill.

Q. Rock Hill near Philadelphia? A. Yes, sir, on the Reading line, in Bucks County, if you want that.

Q. That is the company which Mr. John W. Rice is the vice-president of? A. Yes.

Q. Have you had under your observation, or any use in the Rock Hill plant in the crushing ma-

chinery there, different kinds of Manganese steel? A. Yes, sir.

Q. When? A. In 1904.

Q. What kind of Manganese steel have you used there? A. We used some made by the Isaac G. Johnson people and also by the Taylor Iron and Steel Co.

Q. Were the materials in use under your observation? A. Yes, sir.

(*Court.*)

Q. Where is the I. G. Johnson Co.'s plant? A. I believe it is in New York City.

Q. At Spuyten Duyvil, is it not? A. Yes, sir, at Spuyten Duyvil, I believe that is the place.

(*Mr. Hardin.*)

Q. What can you tell us as to the comparative wear of the two different kinds of steel? A. Well, the plates we got from the Johnson Co.'s people in 1904 lasted about two weeks.

Q. And were they replaced? A. Yes, sir.

Q. And the second set, were they any better? A. Yes, sir, they were better.

Q. How long did they wear? A. About five or six months, or something like that.

Q. Does the Taylor Iron and Steel Co.'s steel wear better than the I. G. Johnson's steel? A. Yes, sir.

Q. Which are you using now? A. The Taylor Iron and Steel Co.'s steel.

Q. How long have you been using the Taylor Iron and Steel Co.? A. What is in present use?

Q. How long have you been using the Taylor Iron and Steel Co.? A. We have been using the Taylor Iron and Steel Co. since 1903 in that plant.

Cross-examination by Mr. Goode.

Q. For what purpose did you use these castings you got from the I. G. Johnson Co.? A. For crushing stone.

Q. What part of the machinery did the castings go in? A. The jaw.

Q. How many castings did you get from the I. G. Johnson Co.? A. Four.

Q. How long did the first set last? A. Two weeks.

Q. And what was the cause of your disuse of it? A. They were too soft.

Q. In what way—did they crack? A. No, sir, they wore out.

Q. They did not break at all? A. No, sir.

Q. Was that the result of abrasion, or friction? A. They were too soft, they would not stand the hardness of the stone, the metal was too soft for the stone.

Q. Do you mean it cracked on account of its softness? A. No, sir, it wore out.

Q. It wore out by friction? A. By friction or whatever else you might call it; it would wear away in the crushing of the stone, I don't know whether you call it friction or what.

Q. How long did the second set last? A. About four months.

Q. What was the cause of that wearing out? A. Its softness.

Q. The second set lasted four or five times as long as the first set then? A. Yes, sir.

Q. Was there any difference in the castings apparently? A. No, sir, not any that I could see.

Q. Did they look all the same? A. Yes, sir, as far as I could see.

Q. Do you know where the Isaac G. Johnson works are? A. I understood that they were in New York City, some place.

Q. Did you know that these castings were the Isaac G. Johnson castings? A. Yes.

Q. How did you know that? A. We could tell by the bill we got that showed where they came from, and if I am not mistaken, they were marked, although I am not sure of that.

Q. You are not sure that the castings were marked? A. No, sir.

Q. And you say they did not crack? A. No, sir.

Q. Just the friction wore the castings out, and then they replaced them? A. Yes, sir.

Q. Did you ever have any experience with any other steel than that of the I. G. Johnson Manganese steel? A. The Taylor Iron and Steel Company's.

Q. None other? A. Not that I know of, that was Manganese steel, no, sir.

Q. Did you know that these castings that you got from the Johnson Co. were Manganese steel? A. They were suppossed to be Manganese steel, we were told that they were Manganese steel, when we put them in the crusher.

Q. That is your impression only? A. Oh, yes, I cannot swear to it.

Q. Do you know of any other company making Manganese steel other than the Johnson Co. and the Taylor Iron and Steel Co.? A. No, sir.

(*Mr. Lindabury.*)

Q. Were these bought for the Manganese steel? A. Yes, sir.

Cross-examination by Mr. Goode.

Q. How do you know—did you see the order given for them? A. Yes, I got a copy of the order, and it called for Manganese steel plates.

Q. You saw the order? A. Yes, sir.

Q. Have you a copy of the order with you? A. No, sir, I haven't got a copy of the order with me.

Q. Do you know what sort of steel it was you got from the Taylor Iron and Steel Co.? A. Manganese steel.

Q. Has it always been called Manganese steel? A. Yes, sir, to my knowledge and belief, it has, all that I ever saw.

Q. All that you ever saw has been Manganese steel? A. Yes, sir, from the Taylor Iron and Steel Co. for the crushing plant, that is.

Q. Did you ever use any nickel steel? A. No, sir.

Q. Or any Chrome steel? A. No, sir, not that I ever knew of.

Q. How long have you been with the Crushed Stone Co.? A. Seven years.

Q. And how long have you been superintendent of that company? A. Four years.

Q. You have been in charge of the Rock Hill crushing works all that time? A. Yes, sir, in the last four years.

Q. And you know of all the castings that have been used there? A. Yes, sir.

Redirect by Mr. Hardin.

Q. You were asked some questions on cross-examination, about the use of other material than the Johnson Co.'s and the Taylor Iron and Steel Co.'ssteel; have you used anything else down there at Rock Hill? A. Cast iron.

Q. When did you use cast iron? A. In 1903.

Q. How did that wear in comparison with the steels—did it last? A. No, sir, there was no comparison with the Taylor Iron and Steel Co.'s steel.

Q. Are you able to tell us how long the Taylor Iron and Steel Co. steel jaws you used have worn? A. We put a set of the Taylor Iron and Steel Co.'s

steel jaws in our crusher last November, and they are still in there.

Q. That is a year ago? A. Yes, sir.

Q. And has the crusher been running all the time? A. Yes, sir.

Q. And working on what? A. Well, crushing stone.

Q. How much do you crush, about? A. Well, we are crushing about two hundred tons of stone a day, in other words, about seventeen thousand tons a year.

Q. Is that the same wear t owhich the Spuyten Duyvil steel was subjected, that is the Johnson Co.'s steel was subjected to? A. Yes, sir, just the same.

HENRY M. HOWE, recalled for further cross-examination.

Cross-examination resumed by Mr. Corbin.

Q. Mr. Howe, since the beginning of this manufacture of Manganese steel at Highbridge, have you witnessed the manufacture of such steel in other works? A. Of Manganese steel?

Q. Yes? A. No, sir, except the Hadfield works, only at the Hadfield works.

Q. Has the manufacture of Manganese steel been kept up without interruption in quality or quantity during the last year and a half? A. Yes, sir.

Q. The absence of Mr. Nichols from the business did not prevent its being carried on with the same success? A. No, sir.

Q. He was not then essential to the business? A. No, sir.

Q. At the time of the introduction of the shell manufacture that was when—was it in 1898—that was expressly reserved from the privilege

granted by the original Hadfield assignment, I think? A. What is the question?

Q. At the time of the introduction of the shell manufacture, that was in 1898, was it not, when you got the privilege of making the shells? A. I haven't got that in my memory.

COURT—I understood the witness to say that they made shells for the threatened Chilian war, which was before 1898.

WITNESS—I think then, your Honor, I may be wrong about that; I think, perhaps, we got some of them from the Hadfield Co. for that.

(*Mr. Corbin.*)

Q. Well, the original license expressly excluded shells, did it not? A. That is my recollection, yes, sir.

Q. And the subsequent grant permitted them to be made? A. Yes, sir.

Q. There were no additional instructions given in connection with the manufacture of the shells, were there? A. Oh, yes, sir.

Q. Did you send somebody over? A. I don't remember about that, I don't really remember how that was now.

Q. There is nothing in the agreement that provides for any additional instructions, that is the agreement here produced? A. That I do not remember.

Q. You simply had a license to do what you had not been permitted to do under the former license? A. And what we did not know how to do.

Q. You have produced here a written agreement, licensing you to make these shells? A. Yes, sir.

Q. Now, there is no agreement there to furnish

you with any additional information—did you go to England to learn how to do that? A. No, sir; I did not go.

Q. Was anyone sent here, to your own knowledge, by Mr. Hadfield? A. I think I shall have to look the document up to remember about that; it is at a time I was equally occupied with other matters, that time that I negotiated the shell contract; I do not now remember how we got the information.

MR. LINDABURY—Look at this contract, it is dated November, 1898?

A. I may say this in explanation, that at the time when I went with the other representatives of the Taylor Iron and Steel Co., to Sheffield, to be shown the process of making steel, and of making manganese steel, that I was the only one who was permitted to see the making of the shells; that all the others were excluded from witnessing the making of the shells.

(*Mr. Corbin.*)

Q. That was when? A. That was in 1891 or 1892, I forget the year exactly. Mr. Hadfield permitted me to see the making of the shells with the idea that we should license some other persons, not the Taylor Iron and Steel Co., for the making of the shells, and the others who were at Sheffield, England, with me, for the purpose of being taught as to the manufacture of steel, they were not permitted to witness the manufacture of the shells.

Q. Mr. Hadfield took out a number of patents in relation to that, didn't he? A. He took out several patents.

Q. Some relating to shells? A. He took out one I remember.

Q. From that time down, almost to the present date, he was patenting processes, was he not? A. I don't think so.

Q. You don't know of them if he did? A. Well, I took out all his patents.

Q. You don't think he continued to take out patents down to the year 1895? A. He did not take out any patents regarding processes in that time, if I remember aright; he took out a patent for making shells, a special kind of shells we never made that kind of shell at Highbridge though.

Q. What kind of shells do you think he patented? A. A partly forged shell, as well as I remember.

Q. You made simply cast shells? A. Yes, sir; we simply made cast shells.

(*Mr. Lindabury.*)

Q. You remember discussing with Mr. Hadfield whether or not these processes of his should be patented—the process, I mean now?

MR. CORBIN—I object to that question, on the ground that it is incompetent.

MR. LINDABURY—They offer it to show that he discussed this matter from time to time with Mr. Hadfield, as to whether or not these processes should be patented.

COURT—He may testify to the fact that he discussed the matter with Mr. Hadfield, and he may state what he discussed, although he certainly could not tell what the conversation was.

A. Yes.

(*Mr. Lindabury.*)

Q. Was any conclusion arrived at between you and him, as to whether the processes themselves should be patented?

MR. CORBIN—I object to the question as incompetent.

COURT—I will allow the witness to answer yes or no to that question.

A. We did arrive at a conclusion.

(*Mr. Lindabury.*)

Q. What was the conclusion, whether they should or should not be patented?

MR. CORBIN—I object to the question as incompetent for the reasons heretofore given.

Question allowed.

A. That they should not.

The further cross-examination of this witness suspended.

NEWTON B. SMALLEY, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. North Plainfield.

Q. In Somerset Co., N. J.? Yes, sir.

Q. You are mayor of your town? A. Yes, sir; it is a borough.

Q. What is your business? A. I am in the stone crushing business.

Q. Whereabouts? A. On the Watchung Mountain Road, back of Plainfield.

Q. What kind of stone crushing do you do there? A. We crush trap rock; I have a sample of it with me, if you wish to see it.

Q. How long have you been doing that work? A. Fifteen years.

Q. What machine are you using—you use a machine? A. Yes; we use the Farrelly Foundry Crushers, Ansonia, Conn.

Q. You mean crushers made by the Farrelly Foundry? A. Yes, sir; the Farrelly Foundry of Ansonia, Conn.

Q. Are these crushers using large plates in them? A. Yes, sir.

Q. Do they come in direct contact with the stone? A. Yes, sir.

Q. Have you used different kind of material in those crushers for the making of the jaws? A. Yes, sir; we have used several kinds for the first five years, that is.

Q. What kind have you used? A. Chilled iron, chilled steel and different makes of steel, that I bought of the Farrelly Foundry people, and also I bought some of Steele & Condict of Jersey City, also the Chrome Steel Works of Brooklyn and Hoaglands of Rockaway, N. J., and I don't know but that I have used steels of others, but I used all that I could find, in the hope that I might get some that was good.

Q. What have you used lately? A. Since that time, I have used the Manganese steel of the Taylor Iron and Steel Co.

Q. Have you used any other so-called Manganese steel? A. Any other kind?

Q. Yes? A. No, sir; I never used any other kind but the Manganese steel of Highbridge.

Q. What is your experience in the use of the Tay-

lor Iron and Steel Co. Manganese steel in comparison with the other chilled iron and steels that you formerly used? A. If you will allow me to tell it in my own way, it might take a minute or two, but I think it would be better; up to ten years ago, I think it was about ten years ago, a representative of the Taylor Iron and Steel Co. came to me, to my crusher, and he wanted to sell me a pair of plates for my crusher—I was running then one crusher, I am running two crushers now—and I said to him, "No; I do not want to buy any new large plates, I am entirely disgusted——

MR. GOODE—I object to that as immaterial and incompetent.

Objection sustained.

(*Court.*)

Q. You cannot state what was said by anyone else? A. Well, he came to me and he wanted to sell me a set of Manganese steel large plates, and he told me——

MR. GOODE—I object again for the same reasons.

COURT—You cannot state what anyone else told you.

(*Mr. Hardin.*)

Q. Did you get any? A. Well, I ordered a set of Manganese steel, on his representation, and I can say that they are the only three sets that we ever had.

Q. Did you put them into use? A. I did.

Q. And have you bought others since? A. Of the same kind? Yes.

Q. You say you have two machines out there; how are they equipped at the present time? A. With the Manganese steel of the Taylor Iron and Steel Co.

Q. And they have been so equipped ever since this time that you say their representative came to you, and urged you to buy a set of plates? A. Yes, sir; every minute since.

Q. How did they compare as to wear with the other earlier steels and irons that you tried? A. There was hardly any comparison at all, because they outdid the others so that it is hard to compare them; you cannot compare them at all.

Q. Did they stand the work? A. They certainly did.

Q. Which kind of material has the greater initial cost? A. Oh, Manganese steel.

Q. And which is the cheaper in the long run? A. The Manganese steel.

No cross-examination.

JOHN Z. HATFIELD, a witness produced in behalf of the complainant, being duly sworn according to law on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Scotch Plains, Union Co., N. J.

Q. What is your business? A. Stone crushing

Q. On your own account or in association with some company? A. Hatfield & Weldon.

Q. How long have you been engaged in that business? A. Well, right where I am now, for twelve years on the 1st of January next.

Q. And what kind of rock are you crushing? A. Trap rock.

Q. For road purposes? A. Yes, sir; for road purposes, making concrete, &c.

Q. Do you use a machine in your plant? A. Yes, sir.

Q. Crushing machinery? A. Large crushers.

Q. Where did you get your crushers? A. From the Farrelly and Morrison Foundry of Ansonia, Conn. L. C. Bacon was the agent, we bought it from him.

Q. How many crushers do you run? A. Two.

Q. Have you used different materials for the large plates on your crushing machinery? A. I have; yes, sir.

Q. What did you use at earlier times? A. I did use chilled iron.

Q. Did you abandon that? A. I haven't used any chilled iron for some time, possibly seven or eight years—eight years, I think.

Q. What have you used since that time? A. We have used steel principally, Manganese steel.

Q. What other materials than Manganese steel have you used? A. Well; we used the Ansonia steel plates and the last crusher we bought from Mr. Bacon, I cannot say exactly what that was, but he represented it to me——

MR. GOODE—I object.

COURT—You cannot tell what representations he made.

(*Mr. Hardin.*)

Q. You bought a machine equipped with jaw plates? A. Equipped with—I cannot say what they are, but he represented it to me that it was such and such a make.

Q. Who is Mr. Bacon? A. L. C. Bacon, he handles the output of the Farrelly Foundry.

Q. And this machinery that you were buying

from the Farrelly people, was machinery for crushing stone, on the market? A. Yes, sir.

Q. And he equipped it with large plates? A. Yes, sir; he equipped it with large plates; you can buy a machine with or without the plates, but I wanted the Manganese steel plates, and therefore he said that they would be Manganese steel; that is what he represented them to be.

Q. Now, when was this? A. That I bought these crushers?

Q. Yes? A. That was in April, 1905.

Q. Had you before that been using the Taylor Iron and Steel Co.'s Manganese steel? A. We had, yes, sir.

Q. With what result? A. Well, the result was that I wanted Manganese steel plates in my crushers, and I wanted the Taylor Iron and Steel Co.'s plates.

Q. How did the Taylor Iron and Steel Co.'s Manganese steel compare in wear with the earlier chilled iron and steels that you used? A. Well, there was so much difference that I would hardly know how to compare it; I would rather fit one set of Manganese steel, that is, Taylor Iron and Steel Co.'s Manganese steel, than six sets of chilled iron at any time.

Q. Now, this machinery that you bought from Bacon—— A. The last one?

Q. Yes, a year or two ago—you said that you bought them equipped with large plates? A. Yes, sir; I did.

Q. And you ordered it to be of Manganese steel? A. He gave me to understand that it was Manganese steel——

MR. GOODE—I object to the answer, what he gave the party to understand, as not evidence.

Objection sustained.

(*Mr. Hardin.*)

Q. What happened to this machinery in the matter of wear? A. The plates that were in it did not give satisfaction.

Q. Did they wear out rapidly, or otherwise? A. They wore out pretty rapidly, yes, sir.

MR. GOODE—I object to that; I think it is immaterial and incompetent.

COURT—He is doing the best he can; he bought the machinery and he says that it did not last long.

(*Mr. Lindabury.*)

Q. Did you know whether it was the Taylor Iron and Steel Co.'s plates, that you got, or not? A. We saw the corrugation was not like the corrugation of the Taylor Iron and Steel Co.'s plates—I can explain that if you want me to, but I can only tell it by saying what someone else said to me.

(*Mr. Hardin.*)

Q. Do you know or can you tell us—of course, you did not make any chemical analysis, but can you tell us what kind of steel these plates were on the Bacon machine? A. No, sir; I cannot; I can only tell you from my practical experience, with the plates, that is all.

Q. Tell us about your practical experience with the plates then—first tell us what became of them? A. They did not last.

Q. Well, what happened to them? A. They wore out, and so then I fell back—I sent for the Taylor Iron and Steel Co.'s people to send a representative down and measure that machine, so as to make plates for it. Those plates that I had only lasted a few months, and the Taylor Iron and Steel Co.

plates ought to last, I thought, six months at least, and they have lasted longer than that.

Q. When you sent for the representative of the Taylor Iron and Steel Co. to come and measure the machine for a set of plates, did they come, and did you get the Taylor Iron and Steel Co.'s plates put in the machine? A. Yes, sir; those plates that I bought a year ago last May—we put them in on the 17th of May—and we renewed them in part, that is, we put in a new swinging jaw on September 1st, and a new stationary jaw on September 25th.

Q. And you renewed them with the Taylor Iron and Steel Co. steel? A. Yes, sir; we had to have the Taylor Iron and Steel Co.'s steel, and we have had them before that to last as long as thirteen months, and this last lot that we got, they lasted eight months——

Q. And the comparison you make is on this Bacon machine, with the plates that you got from the Taylor Iron and Steel Co., their Manganese steel is used under the same condition of working as the others were? A. These crushers run right side by side, day by day, and so far we have never had to shut one down but we had to shut the other down.

Q. Practically a continuous performance then? A. Yes, sir; practically whenever one is working the other is working.

No cross-examination.

Henry M. Howe, recalled for further cross-examination.

Cross-examination resumed by Mr. Corbin.

Q. You have stated that you have not witnessed the making of manganese steel since you became

interested in its manufacture at High Bridge. Have you witnessed the other processes for the manufacture of other steel, and, if so, where? A. Yes, sir, in a great many places in this country and Europe.

Q. That is, you have visited those places, where they were carrying on that manufacture? A. Of Manganese steel?

Q. Of other steels? A. Yes, sir, all over this country and Europe.

Q. And have you taken part in the process of manufacture, or have you simply visited the places? A. I have only visited the places.

Q. You have not been responsible for the operating of the process of manufacture? A. No, sir.

Q. You have had that general knowledge of processes which arises from being familiar with the literature of the business, and from associating with those who are engaged in the manufacture, I suppose? A. Yes, sir, and also from my own experiments, as a manufacturer, and from the fact that I am experimenting all the time in my own laboratory, in the manufacture of metals.

Q. I was considering more particularly in knowing what others have discovered in the way of processes or methods there, would be largely through publications on the subject? A. In large part and also in a very large part from visiting the steel-making works.

Q. And from information there given you? A. Yes, sir, from information there given me, and facts there seen.

Q. Now, the first step in the steel foundry is the selection of the materials, is it not, for the cupola? A. Yes, sir, if a cupola is used.

Q. Now, the cupola, as used in an establishment like the Taylor Iron and Steel Co. Works, would contain how many tons? A. I should have to

figure that out; I cannot tell you offhand; I should have to figure it out.

Q. I am not asking you for an exact figure, but approximately, in order to give us an idea of the way the work is carried on—the cupola, in ordinary use, would it be a matter of 100 tons or ten tons, or a smaller or a larger amount,—well, how much is it usually? A. Cupolas vary very much in size; there are some cupolas which might contain 50 tons at a time, I should think; a large number of tons, not a fraction of a ton, but a great many tons.

Q. Well, the capacity of the cupola would usually be considerably larger than the working capacity of the converter, would it not? A. Usually.

Q. What are the cupolas made of, steel or iron? A. They are made of a shell of steel usually lined with fire brick.

Q. And 30 or 40 feet high? A. Yes, sir; well, that is including the chimney.

Q. And do they have tuyeres? A. Yes, sir.

Q. Then, the combustion is made there by forcing in air under pressure? A. The combustion is made by forcing in the air under pressure, yes, sir.

Q. Under a hot blast or a cold blast? A. A cold blast generally.

Q. But sometimes a hot blast? A. Very rarely.

Q. That would be an unnecessary expense, in most cases, would it not? A. It is not so much an unnecessary expense, as it is a complication less simple. A blast has been hot, but very little has been gained by it——

Q. Now, then, you have this cupola in which the iron is melted—do you have any other cupola or retort for the melting of iron? A. Do you mean at Highbridge?

Q. Yes, or elsewhere—is it not customary to have two different cupolas? A. At many places they

will have two and more cupolas, so that while one is being repaired the other cupola may be used.

Q. Is it not customary to have a small cupola or retort for preparing what you call the physics? A. No, sir, I don't think it is.

Q. Do you not do that at Highbridge? A. I decline to answer unless so instructed; I think that is one of the secrets of the process.

Q. I ask you if you do not use a small cupola, or retort, for preparing what we call the physics?

MR. LINDABURY—I object to the question on the ground that that is one of the secrets of the process there, this use of a secondary or small cupola for the purpose of preparing the physics.

WITNESS—I consider that my pledge of secrecy to Mr. Hadfield, would prevent me from saying how we melt the physics, unless I am compelled to answer.

COURT—The question is, "do you have such a thing?

(*Court.*)

Q. Do I understand you to say that you never used a small cupola, anywhere, elsewhere than in your own plant? A. Well, in making railsteel, they use a cupola which is smaller than the cupola used for melting the pig iron; they use that for melting the physics, for melting the spiegeleisen as it is called.

MR. LINDABURY—As I look at it, your Honor, and I hope Prof. Howe will correct me if I am mistaken, the mere fact, as I conceive it, that they have a small cupola there, which may be used or may

not be used, does not seem to me of much account. But whether they use it or when they use it, and for what account they use it, is I thing of the essence of the process——

COURT—That is not the question here.

MR. CORBIN—The case of the complainants requires them to support two propositions in order to enjoin or to require the preservation of the trade secret.

First, it must appear that there was a valid contract to keep that trade secret, a secret. Now that contract is disputed here. That I do not think can be adjudged against us until it is finally heard, and to rule that out now would be to decide that issue against us in advance.

But even if the contract were admitted by us, as in many of the cases it is, the additional issue here is, whether the processes here are such secrets as are contemplated in those cases. We have denied it; we have denied that there is a trade secret, and therefore I think it is incumbent on the complainant to prove that there is a trade secret; and how can you prove it, other than by the statement of what that secret is? We have denied that the processes in use here are trade secrets. Now the complainant comes, and, instead of going on and setting forth what it is that he alleges to be a trade secret, and asking the court to protect him in that trade secret or from the publication of it, the complainant seeks to substitute in-

stead the opinion of a witness, and calls a witness who undoubtedly to some degree is competent to give an opinion on the subject, and who says that such and such things are trade secrets. Now, if your Honor please, it appears to me, that we have the right to know what we have to meet here, and we have the right to find out, by cross-examination, what these processes are that they claim to be trade secrets, with some degree of particularity, in order that we may present proofs to show that these are not trade secrets at all, but are, in fact, well known to the trade, and that they are in general use in the trade. I cannot do that, without following the usual methods of cross-examination. When I attempt to do that, then we are met with the situation which seems to put it upon us to disclose what has been done in detail to show that it is not a secret. We can keep secret what has been done there, very much closely if we knew the precise points that the complainant claims are his secrets. I say we can do that very much better if we are placed in the possession of what the secrets are, very much better than if we are left in the position of revealing the details of the secrets. Of course, you can say anything is a secret; you can say that coming in at the north door instead of coming in at the south door is a trade secret; you can take the most commonplace things, and call them trade secrets—(interrupted)—

COURT—Does not that go after all to the extent and order of their proof? If they rely upon that evidence, then it may that they do not make out a case.

MR. CORBIN—Of course we are not going to admit that they have made out a case, but at the same time, when they come in with opinion evidence, I think, your Honor, we have the right to cross-examine as to the facts upon which that opinion is founded.

COURT—I have examined this case since the last hearing, and I am very much more strongly disposed now than I was then, to limit the examination to the point that they do not disclose these secrets. Now, I may be wrong about this. At any rate, so far as I have been able to ascertain, it is an unsettled question, and I think it is time that it should be settled somewhere, and we may as well have it settled here. Here is a man trying to protect a trade secret, who is endeavoring not to be compelled to expose it in order to protect it. To expose this trade secret amounts to depriving this man of a remedy. Now, whether the complainant in limiting their testimony as they do, make out a proof of secrecy, that is entirely another question. You may call your witnesses and prove that there is no secret, and in doing that you may divulge all that has been discovered, and all that they claim is this trade secret. Yet you say that you cannot do that, you say you may have put yourself in a position that

you cannot do that. Here is this man who made a contract to serve these people for a number of years, and in making that contract he agreed not to divulge these secrets. Now, having made that contract, you deliberately violate it. This man walks out of this employment, and takes away with him these secrets, secrets that you have discovered while in the employ of this company. Then this proceeding is taken and the only way that you have of protecting yourself, according to your theory, is to compel the complainant to divulge what it is that the complainant seeks to protect. Now I cannot think that that is right. And certainly what is not right cannot be equity. I will overrule all questions which tend to the disclosure of the secret processes employed in that factory.

Mr. Corbin—That begs the whole question. We do not admit that these processes are secret.

Court—I will do the best I can for you. I know you do not admit it, but as the case stands now, it is declared that there are secret processes, not only by the complainant, but it is admitted by the principal defendant himself, this man who, after having worked there for six or seven years, after having entered into a solemn contract not to divulge these secrets, I say this man deliberately walks out of that employment, violates his contract and the only way the complainant has in this proceeding

of protecting himself, according to your theory, is that the complainant shall divulge those secrets, which he is here trying to protect. I shall hold, as I said before, that the complainant is not compelled to disclose the secret processes employed in that factory, and shall overrule all questions which tend to such disclosure. I shall so hold, and if I am wrong about it, then the defendants have the advantage of a clear-cut ruling.

(*Mr. Corbin.*)

Q. Is it not known to you, to be a usage in steel plants, to prepare what you call the physics in a separate cupola or crucible? A. In a separate piece of apparatus, yes, sir.

Q. That is for the sake of having the physics raised to a fluid state, for the purpose of mingling with the metal, when taken from the converter? A. For the purpose of having the physic in a hot condition.

Q. Would you regard a practice like that as a trade secret? A. It depends on how it is done.

Q. I am asking you whether that practice, as I have described it, would be regarded by you as a trade secret? A. It might be so done as not to be a trade secret, and it might be so done as to be a trade secret.

Q. Would the fact that it was done at all be, in your view, a trade secret, the fact that such melting was done for the purpose of that mixture be, in your judgment, a trade secret? A. No, sir.

Q. Well, then, would the fact that the Taylor Iron and Steel Co. so melted their physics separately, for the purposes of such mixture, be, in your

judgment, a trade secret? A. No, sir, I don't say that it would.

Q. Then I renew the question—do the Taylor Iron and Steel Co. melt what are called the physics separately, for the purpose of such mixture? A. Yes, they do.

Q. Going back, now, to the use of the cupola—the materials which are put in the cupola are generally put in by the direction of the chemist of the establishment, are they not? A. Yes, sir, acting under the orders of the superintendent or metallurgist.

Q. The chemist determines what particular goods or materials will make the desired product—that is what particular materials will make the desired product—the chemist determines that? A. No, sir; I look at it the other way, that the superintendent or metallurgist would say, what the mixture must be which is to be used, the initial mixture or primary mixture, and the chemist then selects such iron as would make that mixture.

Q. That is it, and to afford a certain percentage of carbon, Manganese and silicon that would tend to give the results desired? A. And phosphorus and sulphur.

Q. And the ascertainment of what materials in stock would give these results, and what combination of materials is a matter for the chemist to determine, is it not? A. It is sometimes left to the chemist, often left to the chemist.

Q. Then in the cupola, how long is it necessary, before the material in the cupola can be drawn off ordinarily; how many hours does the heat last?

MR. LINDABURY—I object to that question, if that is intended to ask as to the products at Highbridge—is it, Mr. Corbin?

MR. CORBIN—You will have to take my questions as they are, I cannot help counsel out.

MR. LINDABURY—Then I object to the question, if it refers to the practice at Highbridge.

COURT—I cannot understand what you mean by "ordinarily," whether that is the ordinary practice at all places, or ordinarily at Highbridge.

MR. LINDABURY—I ask that the witness be instructed not to answer, as to the practice at Highbridge.

COURT—You may answer that question, so far as it does not disclose the methods pursued at Highbridge where they differ from the methods in general use.

A. Now, there are two questions there, and I don't know which one I am to answer.

(*Mr. Corbin.*)

Q. Answer them both, and tell us which one you are answering? A. Will you repeat the question, please?

Q. Then in the cupola, how long is it necessary, before the material in the cupola can be drawn off ordinarily; how many hours does the heat last?

MR. LINDABURY—I object to that because there are two questions.

COURT—There are two questions there, Mr. Corbin—you had better divide your question.

(*Mr. Corbin.*)

Q. Take the question first—how long is the material in the cupola before it can be drawn off? A. Why the heat may be drawn off perhaps in twenty minutes after putting on the blast, after starting to blow the air in there the tuyeres——

Q. Ordinarily, is it not very much longer—is it not a matter of ten or twelve hours? A. Oh, no, sir.

Q. After you have got a sufficient quantity of molten metal in the cupola, then the next step is to transfer it by the ladle into the converter, I think you have said? A. I did not say that, excuse me.

Q. Well, is not that the fact? A. No, sir.

(*Mr. Corbin.*)

Q. Do you regard the process of using a ladle to transfer molten metal from the cupola to the converter as a trade secret? A. No, sir.

Q. Now, do you use a ladle to transfer molten metal from the cupola to the converter? A. Yes, sir.

Q. In the ordinary practice, is it a custom to take all the metal out of the cupola, or to keep the furnace going by putting in additional material for melting, so as not to have to fire up again?

Mr. Lindabury—Speaking of practices outside of Highbridge, of course?

A. Not the whole of the metal is usually drawn off at one time.

(*Mr. Corbin.*)

Q. The cupola furnace is kept going, is it not, by putting in new material or further material for

retorting, and drawing off the molten metal as required into the converter, or part of it? A. Part of the molten metal is drawn off to put in the converter.

Q. That would be an economical way ordinarily of conducting the cupola, would it not—it would be wasteful to allow the fire to go down and then have to start it up anew again, would it not? A. Yes, sir.

Q. So that, ordinarily, the operation would be carried on continuously from day to day, by putting in fresh material, and continuing the fire? A. From hour to hour, and often, in cases, from day to day.

Q. Now, then, in the process of operating the cupola, there are times when the fire gets going too hot, and it is desirable to check it somewhat? A. That is, you mean to say, you may be melting too fast.

Q. You may think the fire is getting too hot, and you may desire to check it? A. I don't think that describes it very clearly.

Q. Do you not sometimes, in order to check the heating, use methods to put in fresh material, for the purpose of checking the excessive heat? A. I never heard of that being done.

Q. Would not the metal be injured by being overheated in the cupola as well as in the converter? A. I don't think it is liable to; no, sir.

Q. You think not? A. No, sir.

Q. You would simply it in, in order to get the benefit of that heat, to melt the raw material with, if you put more—but there must be times when the fire gets too low, are there not, and it is desirable to increase it? A. There ought not to be a time in a properly managed cupola when the fire gets too low.

Q. You manage it so as to prevent its getting too

low, do you? A. I don't think there is any tendency to get too low.

Q. Do you mean the fire never goes out? A. Not until the cupola is drawn out.

Q. Do you mean to say that it is never desirable to increase the combustion in the cupola?

MR. LINDABURY—Do you mean without adding new material to melt?

MR. CORBIN—One thing at a time—let him answer that first.

A. If it was found that the iron was coming out of the cupola too cold, why, the next succeeding charges would have a large proportion of fuel added to them.

(*Mr. Corbin.*)

Q. That is, you would blow in a greater pressure of air and increase the combustion in that way? A. The usual way would be to add a larger proportion of fuel with the following charges.

Q. Fuel in what form? A. Either coke or anthracite coal, whichever was in use.

Q. Well, they sometimes put in silicon, or some metal that contains silicon in large proportion, do they not? A. I never heard of its being done for that purpose.

Q. You never heard of putting anything containing silicon into the cupola?

MR. LINDABURY—Outside of the practices at Highbridge, of course?

A. No, sir; I don't think I ever heard of that.

(*Mr. Corbin.*)

Q. Or into the converter? A. That is a different question.

Q. Is it not a very frequent thing to do, to put in some mixture containing silicon, for the sake of increasing the combustion in the converter? A. There is a process for adding silicon at the end of the blow, at the end of the operation, for the purpose of raising the temperature.

Q. Well, don't you know that there is a process known to the trade of adding metal containing silicon, for the purpose of increasing the heat in the converter, when it is getting too low? A. At the end of the process, when the process is over, I say, there is a process for adding ferro-silicon at that time.

Q. Haven't you ever heard of adding it before, for the purpose of increasing the heat? A. No, sir; I never heard of it.

Q. Then, if there is any such secret process as that, it is not known to you? A. I understand that you are all the time talking about operations outside of Highbridge?

Q. I am not excepting anything; you must make your own exceptions, because I cannot tell what you see fit to call secrets; I have no knowledge on the subject at all—my question is, "Then, if there is any such secret process as that, it is not known to you?"

COURT—I do not see why he cannot answer that question—as to secret processes in use elsewhere—you may answer that question so far as it does not disclose any secret method pursued or observed at Highbridge.

A. I don't know of any process, secret or public, of adding ferro-silicon to a Bessemer converter, before the end of the blow, outside of the process——

(*Mr. Corbin.*)

Q. Would you regard a process of adding some metal containing silicon, for the purpose of keeping up or increasing the heat in the converter, as a trade secret?

MR. LINDABURY—I object to that question; there is no basis upon which that question can be asked. If they have that process at Highbridge, which is what my friend wants to find out, then we object to its being disclosed. But if they have not got that process there, and they haven't it anywhere else, so far as this witness knows, then, of course, it will lead to the conclusion that they must have it at Highbridge—I object to the question as calling for the secret which we are trying to avoid disclosing.

A. I am not including anything done under the Hadfield processes.

(*Mr. Corbin.*)

Q. I will repeat my question—would you regard a process of adding some metal containing silicon, for the purpose of keeping up or increasing the heat in the converter, as a trade secret?

MR. LINDABURY—I make the same objection—there is no basis for that question in any of the testimony that has been given by this witness, and I object to it further on the ground that it is not cross-examination on anything that this witness has testified to. This witness has testified that he knows of no such practice outside of Highbridge, that he never

heard of any such practice outside of Highbridge. Now, if that be so, counsel in asking if there be such a practice as that anywhere else would he regard that as a trade secret? Of course, that would depend entirely upon whether it was in existence somewhere and whether it was regarded and kept as a trade secret and practically whether or not that method of doing the thing was pursued at Highbridge, and whether it is there regarded as a trade secret—that is what it would come to. Now, this witness has given you the facts, and I think he has gone as far as he ought to be asked to go when he says that he never knew of anything of that kind anywhere in the world, outside of Highbridge.

COURT—This witness has testified that he knows of no such practice—eliminating for the purposes of this cause the foundry at Highbridge. If he knows of no such practice, how can he say whether it is a trade secret or not? Now, there may be some man who might have that practice, and he might be keeping it as a trade secret—this witness does not know anything about that. I will overrule that question.

(*Mr. Corbin.*)

Q. Is there any doubt in your mind, as a scientific fact, that the use in the converter of metal containing silicon would tend to increase the heat of the material?

MR. LINDABURY—I object to the question. In the first place, I object because it is

not a cross-examination of anything that this witness has testified to. This witness has not been put on the stand as an expert on this question at all.

Question allowed.

A. It does not seem to me obvious, or clear, that the addition of iron containing silicon, at any and every stage of the process, would necessarily raise the temperature of the process.

(*Mr. Corbin.*)

Q. In the stock of a well-equipped steel foundry, is not iron, with the varying percentages of silicon, one of the desirable elements; is it not customary to have pig iron with the varying degree of silicons in it? A. Yes, in Bessemer steel works.

Q. And in making up the mixtures, the existence of that percentage of silicon is a material thing to be considered, is it not? A. Yes, sir.

Q. And it is recognized that that silicon is a heat-producing element, is it not? A. Yes, sir.

Q. In the same stock, is it not customary to have pig iron with the varying degrees of Manganese? A. Not generally.

Q. Don't you think that, as a rule, the pig iron used in the making of steel does contain a percentage of Manganese? A. It very often does.

Q. You could hardly make steel successfully without Manganese, could you? A. Oh, yes, sir; it is wholly unnecessary that the pig iron should contain any Manganese.

Q. If you do not have it in the pig iron, you would have to introduce it in the process, would you not? A. Yes, sir.

Q. So that Manganese must be there in some form—so as a matter of fact, and as a matter of

practice, is it not proper to get a pig iron containing a certain percentage of Manganese and do you not take that into consideration in making up your mixtures? A. It is not necessary that there should be any Manganese present. It is important that there should not be an excessive quantity of Manganese present, and if, therefore, you have, for any reason, found it necessary to buy a certain amount of pig iron that had more Manganese in it than was desirable, then you would have to dilute that, and you would have to have a similar quantity of pig iron with less or no Manganese in it.

Q. In making steel the presence of Manganese in the pig iron, the presence of it facilitates the process. I suppose it facilitates the combination of the carbon with the steel—carbon combines with the steel in the presence of the Manganese better than it would without it, is not that the philosophy of it? A. There are a good many questions there. I will have to take them one at a time.

Q. The question may be read in such portions as you may wish—in making steel the presence of Manganese in pig iron, the presence of it facilitates the process. I suppose it facilitates the combination of the carbon with the steel—carbon combines with the steel, in the presence of the Manganese, better than it would without it—is not that the philosophy of it? A. It seems to me that there are three or four questions there. Ask me the first portion of that question.

Q. The first portion of the question read as follows: "In making steel, the presence of Manganese in pig iron, the presence of it facilitates the process?" A. I will answer that part of the question first, as to whether the presence of Manganese in pig iron facilitates the Bessemer process of making steel. I do not think that the absence of Manganese is any obstacle to making steel by the

Bessemer process, nor that the presence of a small quantity of Manganese materially facilitates the process. Now, what is the next question?

Q. "I suppose it facilitates the combination of the carbon with the steel—carbon combines with the steel in the presence of the Manganese better than it would without it—is not that the philosophy of it?" A. As regards the combination of the carbon with the steel, I think that it all would combine with the steel whether Manganese was there or not.

Q. Well, in making ordinary steel, when the Manganese and the carbon are driven out in the converter, is not Manganese as well as carbon put into the ladle, when the steel is poured into it, for the purpose of making ordinary steel? A. Yes, sir.

Q. So, then, Manganese is put in for some purpose? A. Yes, sir.

Q. And that purpose is to make a proper combination with the carbon, is it not? A. I do not understand it so, sir.

Q. Is it not desirable to have as little Manganese in ordinary steel as practicable—if you can get rid of all that Manganese, and get the carbon properly combined with the iron, would it not be a better product than if you mixed Manganese with it for ordinary steel? A. The addition of the Manganese is important and valuable, for other reasons than causing a combination of the carbon with the iron, if that answers your question.

Q. I notice Mr. Hadfield, in one of his statements, thinks that the existence of Manganese in ordinary steel is undesirable, and thinks carbide of Manganese is an objectionable compound—have you never noticed that principle in Mr. Hadfield's researches as stated—of course, you might not agree with him in that? A. It does not seem to

me that that represents Mr. Hadfield's views at all correctly.

MR. LINDABURY—At that point I think we had better get Mr. Hanfield's views from the papers themselves, and settle that question right here.

Adjourned to Monday, December 3, 1906, at Newark, N. J., at 10 A. M.

DECEMBER 3, 1906.

HARRY M. STEWART, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. In Medford, Mass.

Q. What is your occupation? A. Civil Engineer and Road Master of the Boston Elevated Railroads.

Q. How long have you been connected with the Boston Elevated Railroad system? A. Since 1893.

Q. Have you had under your supervision, as road master of the Boston Elevated system, any tests relating to steel rails? A. Yes, sir, quite extensive tests.

Q. This Boston Elevated Railroad system is quite an extensive system, is it not? A. It is, but I have charge only of the elevated system.

Q. How many miles have you charge of? A. Eighteen miles, I should think.

Q. How many miles altogether does this system consist of? A. I cannot tell you, several hundred, altogether.

Q. Where were those tests that you have referred to conducted? A. On the elevated division.

Q. Under actual operation conditions of the road? A. Yes, sir.

Q. When did they begin? A. Shortly after the road was put in operation.

Q. And how long were they continued? A. They are being continued to-day.

Q. Have you tried different kinds of rails? A. We have.

Q. How many different kinds of rails have you tried? A. We have tried several,—well we have tried everything made by the Bessemer process, we have tried two different of open half steel, we have tried Manganese steel and we have tried nickel steel.

Q. And all these tests were conducted under conditions of actual operation of the road? A. They were.

Q. Which steel have you found to be the best? A. The Manganese steel.

Q. And where was that Manganese steel made that you now refer to? A. The Taylor Iron and Steel Co.—I obtained it through Messrs. William Wharton, Jr., & Co., Incorporated.

Q. Now, where is the greatest wear on the road in your system? A. Altogether on the curves.

Q. And for what special purposes have you tested this Manganese steel on the curves and switches? A. We have tested this Manganese steel on the curves and on the frogs, and I have had one switch which is under test now.

Q. Have you used these other makes of rails, that you have referred to, for the same purposes? A. Yes, sir, on the curves.

Q. Have you got any records of the comparative wear of these different rails? A. We have very

elaborate records, we have kept them for our own protection.

Q. Have you any of these records with you? A. Yes, sir.

MR. CORBIN—There will not be any question made that Manganese steel is a very valuable product, that is not going to be contested, but I object to going into this line of evidence on the ground that it is immaterial—as I say, we are not going to dispute that Manganese steel is a very valuable product.

COURT—I will allow the question on the ground that if there is no other Manganese steel manufactured except that which is made at the Taylor Iron and Steel Co. works, certainly they must have some way of making what some one else is unable to make them, because you have already admitted that it is a valuable product and, of course, other people would make it, if they could; I think it has some bearing on the issues, and I will admit it.

(*Mr. Hardin.*)

Q. I show you a tabulation, and I ask you what it is? A. This is a tabulation, made for the purpose of a report I was required to make in June, 1905, showing the average life of various kinds of rails, on various curves, having a radii from eighty-two feet to fifteen hundred feet.

Q. Does that show the comparative result? A. Yes, sir, it shows the comparative result of both the inside and the outside rails on those curves, both for soft steel which is the ordinary iron rail, the Bessemer steel made by the Pennsylvania Steel

Co., the nickel steel made by the Carnegie Steel Co., and the Manganese steel.

Q. Where was the test made of the Manganese steel? A. On the curves at Park Street station, on the elevated railroad division.

Q. What was the wear? Can you give us an idea of the amount of traffic? A. Well, to-day, our traffic is something like 1,700 cars, or sixty-two thousand three hundred and forty-two tons a day.

Q. Under that wear, how did the Manganese steel compare, in enduring qualities, with the other steels you have mentioned? A. The Manganese steel is very much better indeed, very much.

Q. Have you made any diagrams, illustrating the comparative wear of the different rails, from the figures on that sheet, and from other figures? A. Yes, sir.

Q. Are these the diagrams to which you have referred (handing witness paper)? A. Yes, sir, they are.

Q. What do the figures on that sheet illustrate? A. The figure No. 1 shows the average wear of ordinary rail as it was in 1902, when the traffic was very much lighter than it is now.

Q. What do you mean by "ordinary rail"? A. Bessemer steel, which you would ordinarily go out to the market to buy, take the market specification for it.

Q. Made by what concerns? A. Any of the rail-making companies—this particular rail was made by the Pennsylvania Steel Co.

Q. And was that a rolled rail? A. Yes, sir.

Q. Do you know whether the Manganese steel rail, that you have referred to, was cast or rolled? A. Cast.

Q. How many days' wear does it represent? A. It shows forty-four days' wear, with the wear of

of the rail, .065 of a foot. These other sketches show——

Q. Take the Manganese steel? A. This Manganese steel rail was laid on April 26th, 1902—this section was taken a year after—the number of days of 365, and the wear of the rail was .008 of a foot.

Q. And the other was .065 in forty-four days? A. Yes, sir.

Q. What does figure three show? A. Figure three shows 476 days' service, on the Manganese steel rail, and it shows a wear of .011.

Q. Now, what does figure four show? A. Figure four shows 594 days' service, with a wear of .013.

Q. What steel was that? A. That is Manganese steel.

Q. What does figure five show? A. Figure five shows 853 days' service, and .015 of a foot wear.

Q. What does figure six show? A. Figure six shows a section of Manganese steel showing 1,028 days' service, with .017 of a foot wear.

Q. What does figure seven show? A. Figure seven shows a section of Manganese steel with 1,116 days' service .02 of a foot wear.

Q. What does figure eight show? A. Figure eight shows the section of Manganese steel with 1,276 days' service, and .025 of a foot wear.

Q. In these figures to which you have referred; in each case, the top line of the figure shows the original size of the rail, does it not? A. Yes, sir.

Q. And the lower line shows the line of wear? A. Yes, sir.

Q. Is that rail still in service, from which these measurements were taken? A. Yes, sir.

Q. Have you made any recent examination of that same rail? A. Yes.

Q. How lately? On November 24, 1906.

Q. How many days' wear has that rail had now? A. This section shows 1,673 days' service, four

years, six months and twenty-eight days, with a wear of .032 feet.

Q. Is the rail still in service? A. Yes, sir.

Q. Not worn out? A. Not worn out, no, sir.

(*Mr. Lindabury.*)

Q. That is only about one-half as much as the ordinary rails wear in the forty-four days? A. About half, I think.

(*Mr. Hardin.*)

Q. Have you any figures to illustrate the wear of nickel steel rails? A. Yes, sir, I have a sketch showing one-tenth.

Q. Are you able to give us the comparative wear of nickel steel, from the figures to which you have referred? A. The comparative wear of nickel steel and special Cambria steel.

Q. The special Cambria steel is the steel referred to by you as "Hard steel"? A. Yes, sir.

Q. Why did you give it that name? A. As hard steel? Well, it was particularly hard; it wore about three times as long as any steel we could get outside of a Manganese steel.

Q. How was that steel selected? A. Well, we noticed in our ordinary wear of the rails, that some rails wore much better than others, and we picked out the rails that wore the best, and analyzed them, and the Cambria Steel Co. offered to make us a rail which would give us as good service, and they did so; they made a rail, from a very high carbon, a Bessemer steel rail, and we put it in and it wore nearly three times as well as any of the rails that we have had or put out, except, as I have said before, the Manganese steel. Since then we have tried to get the Cambria steel, twice we have made the effort to get the Cambria steel, but they have

not been able to duplicate it; the last steel they gave us was no better than the ordinary rail that you could buy in the market.

Q. Give the comparison you referred to, between the nickel and the hard steel you mentioned? A. Well, for a test, I placed a nickel rail (one made by the Carnegie Steel Co.) between two of these Cambria steel rails, having a central rail yard of one hundred feet; now, I did that in July of 1903, and I took sections in September, 1903, on the three rails. The first Cambria rail showed a wear of .007 of a foot; the nickel steel rail showed a wear of .018 of a foot; and the other Cambria rail showed a wear of .010 of a foot.

In December of 1903, the first Cambria rail showed a wear of .013 of a foot; the nickel steel rail showed a wear of .037 of a foot; and the other steel rail showed a wear of .018 of a foot.

In February 10th, 1904, I had to take the rails out, because the difference was so abrupt; at that time the first Cambria Steel Co.'s steel rail showed a wear of .015 of a foot; the nickel steel rail showed a wear of .044 of a foot; and the other Cambria steel rail showed a wear of .022.

Q. The Cambria Co.'s hard steel rail showed a better wear than the nickel rail, did it? A. Yes, sir.

(*Mr. Lindabury.*)

Q. The nickel steel rail wore about as much as the Cambria hard steel, did it not? A. Yes, sir, just about three times as much.

(*Mr. Hardin.*)

Q. Have you on this tabulation of yours, the soft steel, the hard steel, the nickel steel and the Manganese steel all shown? A. Yes, sir; I have no

actual tests, between the nickel steel and the Manganese steel on the same curve, nor of the hard steel and the Manganese steel on the same curve, but I have records of the wear on practically curves of the same radii.

Q. And with the same amount of use? A. Well, not the same amount of use, because they did not last so long.

Q. I mean with the same traffic? A. Yes, sir, with the same traffic.

Q. Under substantially the same conditions? A. Yes, sir. Now, on this Haverly and Causeway Street curve, the radii of one hundred feet, the soft rail wore out or lasted about twice as long as on the curve at Park Street, where the Manganese steel rail was tried.

Q. By the soft rail, you mean the ordinary Bessemer steel rail of commerce, that you would buy in the market anywhere? A. Yes, sir.

Q. Go on? A. The nickel steel rail lasted on this curve about six months nineteen days, and would have lasted about three months and ten days on the Park Street curve, or about one hundred days altogether.

Q. How long did the soft steel rail last there? A. It lasted on the average about forty-four days, while this would have lasted about one hundred days; and the Manganese steel to-day——

Q. And the Cambria Steel Co.'s steel rail lasted how long? A. Take another curve, of practically the same radius, of eighty-seven feet, while this Park Street curve was at a radius of eighty-two feet, at the next station, and under almost precisely the same conditions, the Balston Street station, with a radius of eighty-seven feet, the Cambria Steel Company's steel rail lasted there about 544 days.

Q. How long did the Manganese steel rail last

under the same conditions? A. The Manganese steel rail lasted, under precisely the same conditions, 1,673 days.

(*Mr. Lindabury.*)

Q. That is a fair comparison with the Manganese steel rail figures you gave a while ago? A. Yes, sir.

Q. So that the figures you gave us under actual operations of these four kinds of steel, or of the steels you have referred to, would be the ordinary steel, forty-four days? A. Yes, sir.

Q. The nickel steel, one hundred days? A. Yes, sir.

Q. And the Cambria hard steel—how much did you say that was? A. Well, this radius is eighty-seven feet, it is not so long a curve, and the rail lasted considerably longer there, and by comparing these figures with the other figures, it figures out in proportion—well, it lasted 544 days on the Balston Street station curve, and, under the same conditions, it would have lasted only 208 days on the Park Street station curve.

Q. So that that makes the Cambria hard steel rail last 208 days as compared with the forty-four days and the one hundred days, as mentioned by you for the other steel? A. Yes, sir.

Q. Now, how about Manganese steel? A. Well, to date, it has lasted 1,673 days and is not worn out yet.

(*Mr. Corbin.*)

Q. You mean that that is a calculation—you have not had it in use that number of days, have you? A. Yes, it has been in use that number of days, and it is still in the track.

COURT—I understand that all these tests are made from the actual use of the rail.

(*Mr. Corbin.*)

Q. You do not mean actual calendar days, do you? A. Yes, sir, it was put in on April 26th, 1902.

(*Mr. Hardin.*)

Q. And still there under wear? A. Yes, sir.

(*Mr. Corbin.*)

Q. I thought you went there only in 1903? A. I did, but the records are all in my office.

(*Mr. Hardin.*)

Q. Are you acquainted with the operating cost? A. Yes, sir.

Q. Which is the most expensive initially? A. The Managnese steel.

Q. How much more expensive is the Manganese steel initially than these other steels you have mentioned? A. Very much more.

Q. Well, how does it compare with the ordinary steel? A. The rails we are buying to-day costs $32 a ton or something like thirty-eight cents a foot. This Manganese steel that we have in the track cost us $5 a running foot, and we have just ordered about forty-eight hundred feet of Manganese steel rail, which will cost us on the average $6.70 per running foot.

Q. But it is cheaper in the long run to buy the steel at the higher price? A. It is very much cheaper in the long run to buy the Manganese steel at the higher price, than to buy the other steels, it is very much cheaper in material alone, say nothing about the renewal labor cost.

MR. HARDIN—I offer in evidence these statements that have been testified to by the witness.

First I offer the tabulation.

Marked Exhibit C 17.

Next I offer the sheet of diagrams showing the comparative wear of the commercial steel rail, and the Manganese steel referred to by the witness.

Marked Exhibit C 18.

Next I offer in evidence the drawings, showing the sections of wear of the steel rails, of the ordinary steel and the Manganese steel.

Marked Exhibit C 19.

Next I offer in evidence a blue-print showing the diagrams of the wear of the hard steel, and the nickel, as referred to by the witness.

Marked Exhibit C 20.

Cross-examination by Mr. Corbin.

Q. How many feet of Manganese steel rails was in use when you went there? A. About 660 feet besides the crossing frogs and ordinary frogs.

Q. And your figures have been given on the rails on the curves? A. On the curves only.

Q. You have not calculated the wear on the frogs? A. I have figures here on the frogs.

Q. The figures you have given? A. No, sir; there

was nothing about the frogs in the figures I have given.

Q. After that, did you buy more Manganese steel? A. Not early, because we hoped we would be able to make use of the hard rails of the Cambria Steel Co.

Q. Then there have been no more Manganese steel rails ordered until recently? A. About three months ago.

Q. Do you know what the specifications for these rails you have had in use were? A. Yes, sir.

Q. What percentage of carbon and Manganese there was? A. Yes, sir.

Q. What was it? A. The specifications under which the rails were rolled is as follows: "Carbon .60 to .70. Manganese .90 to .110."

Q. What percentage would that be? A. .90 to 1.20, silicon .10 to .20, sulphur under .10, phosphorus under .10.

Q. These figures for sulphur and phosphates you put into specifications for any kind of rail, would you not—you would not allow the phosphorus and the sulphur to go above one per cent. would you? A. No, sir.

Q. What were you giving the specification of? A. The Cambria steel.

Q. I asked you for the Manganese steel? A. I know nothing about the composition of the Manganese steel.

Q. You do not know what the chemical constituents of the Manganese steel were? A. No, sir; I only have a rough idea on the Manganese steel.

Q. Now, have you given us, or how have you determined the contents of the order you have just given for the Manganese steel rails? A. On the Manganese steel?

Q. Yes. A. I have simply ordered it as Manganese steel.

Q. Of the same quality as before? A. Yes, sir.

Q. You have not specified the percentages? A. No, sir.

Q. You know of course that Manganese steel might vary in their percentages of Manganese and carbon? A. Yes, sir.

Q. Or in any other alloy? A. Yes, sir.

Q. And you have not specified? A. No, sir.

Q. And you are getting another experimental order of forty-eight hundred tons? A. Forty-eight hundred running feet, not tons.

MR. LINDABURY—And he didn't say that it was an experimental order either.

WITNESS—No, it is not an experimental order.

(*Mr. Corbin.*)

Q. Did the Cambria Steel Co. furnish the nickel steel? A. No, sir; the Carnegie Steel Co.

Q. That is from Pittsburg, the Homestead works? A. Yes, sir.

Redirect by Mr. Hardin.

Q. You said you did not specify the ingredients of the Manganese steel? A. No, sir; I did not specify the ingredients.

Q. Why didn't you? A. Why because I didn't know anything about the manufacture of Manganese steel, and of course I could not specify as to the ingredients of the thing I knew nothing about.

Q. You simply knew that under comparative wear, the results were as you have given us? A. That is all, that satisfied us.

Q. Was this last order that you speak of in any sense an experimental order? A. No, sir; not that amount at that price, no sir, there was nothing experimental about that order.

Q. I neglected to ask you about the comparison on the frogs—is this table which I now show you, a table of the comparative wear of frogs? A. Yes, sir.

Q. Of what steel? A. Manganese steel and the ordinary rail frogs.

Q. Made by whom? A. Any switch or frog making company that we buy of.

Q. Do you buy them in the market generally—sometimes buy of one make, and sometimes of another? A. Yes, sir, we buy them in the market on bids from various people.

Q. What is the result of the comparison of the oridnary frog in the market with the Manganese steel frog? A. We have one particular frog that was put in the track in June of 1903, as an experiment, it was made of Manganese steel. Now, where the ordinary frogs wore out on the average in about five months and nine days, this frog made of Manganese steel, is still in the track and still in service, after three years six months and twelve days, and is good for some considerable time yet, I cannot say how long, and on the strength of the wearing of that frog, we have purchased some thirty-three other frogs of the same material, Manganese steel, and put them into use in our most exposed places for wear.

Q. You have purchased them from whom? A. The Taylor Iron and Steel Co., through William Wharton, Jr., & Co., Incorp.

Further cross-examination by Mr. Corbin.

Q. The wear on a rail at one point and on a frog at one point, would not always be the same as that of a frog or a rail at another point, on the route? A. They have about the same traffic, but it all depends, or rather it depends a good deal on the radii of the curve, but all junction points and where we

get the most severe wear we use the Manganese steel frogs.

Q. Now, comparing two rails or two frogs of the same material, one would last better than another, would they not? A. Yes, sir.

Q. For reasons that you would not be able to determine? A. Undoubtedly, yes, sir.

MR. HARDIN—I offer in evidence this comparative tabulation on the life of frogs and switches of rolled rail *vs.* Manganese rail.

Marked Exhibit C 21.

JOHN M. SHERRERD, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. Where do you live? A. Easton, Pa.

Q. How old are you? A. Forty-seven years of age.

Q. What is your business? A. General sales agent of the Taylor Iron and Steel Co.

Q. How long have you occupied that position? A. About five years.

Q. How long have you been employed in the Taylor Iron and Steel Co.? A. Nearly twelve years.

Q. What were your duties before you became general sales agent? A. I was on the road part of the time and part of the time in the office, but generally connected with the sales department.

Q. You mean to say that you had other duties, or that you were connected with the sales department? A. I mean to say that my duties varied a little bit from time to time.

Q. As general sales agent, what did you do? A. I looked after our agents in the field, and endeavored to secure business for the company.

Q. You aided them in marketing their products? A. Through their canvassers, or through their other concerns, who have made it their business to sell completed machines——

Q. How many canvassers had you? A. We have six altogether.

Q. And where is your market? A. From one end of the United States to the other.

Q. Of what does your product principally consist now? A. Well, it consists of Manganese steel and special steel castings.

Q. And what percentage is the Manganese steel? A. I have no figures to show that, I did not keep track of it.

Q. An estimate will do? A. Oh, I suppose about half of it.

Q. What is your next largest product? A. Besides Manganese steel?

Q. Yes. A. Special steel as well as special steel castings.

Q. Such as nickel and chrome steel? A. Yes, sir; occasionally.

Q. And others? A. Yes, sir.

Q. Does that comprise the other fifty per cent? A. Yes, sir; practicaly, we make some steel tired wheels.

Q. Now, for what are your steels made and used? A. The Manganese steel are used wherever there is very much abrasive wear. The special steel is used where strength is required in addition to the abrasion and wear.

Q. And what are the other steels used for? A. Aside from the soft steel and bolt work and track work, we supply various crushing machine parts to the crushing machine trade particularly, and more or less connected with the mining industry, particularly the mining for gold by means of gold dredges.

Q. Is it a part of your business to ascertain the various users of such steels as you make, particularly the Manganese steel? A. Yes, sir.

Q. The users are those engaged in crushing what? A. In crushing hard materials.

Q. And who else? A. And it is used around in the dredges used particularly in gold mining, and occasionally it is used in the harbor dredges, that is the continuous bucket dredges.

Q. We will take the crushers—do you know what percentage of the persons engaged in crushing of the character to need hard surfaces, that is, for the crushing of the hard material—what percentage of those use your steel? A. Well, I never made a computation——

Q. Do you know approximately? A. I should say about three-fourths.

Q. Three-fourths of the men engaged in that business in the United States? A. Yes, sir, that is for the crushing of hard material, not soft rock.

Q. What is your product, the Manganese steel, noted for? A. Its hardness and toughness.

Q. And that is why it is used in these crushing machines? A. Yes, sir, when crushing hard material.

Q. Now, in some of these dredges, some times a soft implement does—now, have you classified that? A. I do not understand you.

Q. Well, what kind of dredgers use your material? A. The continuous bucket dredges, as they are called, they are ladder dredges with a string of buckets, and the buckets do the digging, and these dredges are engaged in the digging of gravel containing gold, and they are also used in ordinary harbor work, digging the hard pan, sand and clay, &c.

Q. What percentage of those people doing that

kind of work do you supply with this steel, if you know?

MR. CORBIN—I object to the question as immaterial.

COURT—If he knows—I will allow the question.

A. I think that probably ninety-five per cent. of the gold dredges of this country use our material.

(*Mr. Lindabury.*)

Q. For what do they use your material? A. They use it in digging line, as we call it.

Q. In what part of the machinery? A. In the digging line.

Q. For that purpose, you say you supply ninety-five per cent. of the material you manufacture? A. Yes, sir; I suppose we do, that is, ninety-five per cent. of the dredges are using more or less of our material.

Q. Do you have any competition practically in this kind of work?

MR. CORBIN—I object to the question—how can he tell what competition there is.

COURT—I will take it.

A. We have cheaper material offered from time to time.

(*Mr. Lindabury.*)

Q. Do you have any competition on the part of people offering Manganese steel? A. Yes, sir; occasionally.

Q. Who? A. Well, I have run across it in an occasional instance, a little here and a little there.

Q. Manufactured by whom? A. The Johnson Company's people of Spuyten Duyvil and they have offered Manganese steel. The Pennsylvania Steel Co. have also offered a Manganese steel under the name of the Manard steel. And I believe the Lorraine Steel Co. of Ohio, they have offered some.

Q. Any one else? A. The American Brake Shoe and Foundry Co.

Q. This defendant? A. Yes, sir.

Q. Any one else? A. The Columbia Iron Works, at Portland, Oregon, the American Steel Foundry Company's, they have all offered a little.

Q. Have you ever met with any competition anywhere, up to this time, from the Pennsylvania Steel Co. and if so, where? A. I cannot say that I have ever seen any of the Pennsylvania Steel Co. Manard steel in use, though I have heard of its being offered in several places, particularly in the coal regions, the anthracite coal regions, in connection with some dredging work, and I believe with some rail work.

Q. Do you bid for constructive work of any kind? A. No, sir. Well now, I will qualify that a little bit. In building our plate screens, some structural material goes into it, that is incidental to the screen.

Q. Do you manufacture under contract or make to order, I mean? A. Yes, sir; we manufacture under contract or we make to order, that is, certain portions of machinery to certain sizes, but we do not make complete machinery.

Q. Have you lost any orders through competition by any other makers of Manganese steel? A. Oh, I presume we have.

Q. Do you know of any, if you do name them? A. Yes, sir; I know of one particular order—well I don't know that we ever bid on it, although I know that it was intended to give it to us in the first place, and they did not give it to us.

Q. Where was that? A. The Federal Lead Co. of Missouri, they put in some large crushers, and I understood afterwards that the Manganese steel was furnished by the Johnson Co. of Spuyten Duyvil.

Q. How long ago was that? A. That must have been last December, or the early part of the present year.

Q. Go on, what others? A. The Atlas Car and Foundry Co. in Cleveland, O., I happened to find out about that.

Q. Did you get that bid? A. I think it went to the American Brake Shoe and Foundry Co., as near as I can make out.

(*Court.*)

Q. What do you mean by "as near as you can make out"? A. I simply was told that.

COURT—That is not competent.

(*Mr. Lindabury.*)

Q. Do you know the prices at which these other steels are sold, this other so-called Manganese steel? A. I have been told the prices in certain instances.

Q. Do you know the prices in any instances at which they are offered to the users? A. Yes, sir.

MR. CORBIN—That calls for hearsay evidence again. Objection sustained.

(*Mr. Lindabury.*)

Q. Do you know of any places where the Johnson Company's steel has been used other than what you have mentioned a while ago? A. I cannot name the owners of the crushers, but there were two or three

plants in New England whom I understand had some of the Johnson Company's material.

Q. Do you know the names? A. No, sir; I do not know the names.

Q. Now, about the American Brake Shoe and Foundry Co., how long have they been making Manganese steel?

MR. CORBIN—I object to that as calling for hearsay evidence—he cannot possibly know.

Question withdraw.

(*Mr. Lindabury.*)

Q. Do you know how long the defendant company has been offering what they call Manganese steel?

MR. CORBIN—I make the same objection.

COURT—If he knows, he can answer.

A. I only know when I ran into it at first——

(*Mr. Lindabury.*)

Q. When did you first run into it? A. I think about a year and a half ago.

Q. And where did you run into it? A. In connection with the Austin Manufacturing Co.

Q. And where is that? A. It is in one of these suburbs of Chicago, one of those little towns, just out of Chicago.

Q. Do you know of any places where the Pennsylvania Steel Co. Manard steel has been used? A. Yes, sir.

Q. Where? A. I have met with it in Scranton, Pa., in the anthracite coal region there, and I have

met with it in connection with one of the large customers in the manufacture of crushers, one of the largest customers we have, who are engaged in the manufacture of crushers——

Q. And who are they? A. The Allis-Chalmers Co.

Q. Are they customers of yours? A. Yes, sir; they are one of our largest customers, they are the largest manufacturers I suppose of crushing machines, and one of our largest customers.

Q. How long have they been customers of yours? A. They and the various companies that they were made up from, that is Fraser and Chalmers, and the Gates Iron Works, they have been customers of ours since 1895.

Q. Are they using the Pennsylvania Steel Co. Manard steel so far as you know? A. So far as I know they are not using the Pennsylvania Steel Co.'s steel.

Q. Have you an exclusive contract now with Allis-Chalmers Co.? A. We have.

Q. What about this Baltimore concern you spoke of? A. The Maryland Steel Works at Steelton?

Q. Yes? A. At Sparrow's Point I mean?

Q. Is that a large concern? A. Yes, sir; one of the largest in the country.

Q. Do they ever use the Manard steel? A. I don't know of my own knowledge.

Q. Do you know whether that company is owned by the Pennsylvania Steel Co.? A. Only by hearsay.

COURT—Then we don't want that.

(*Mr. Lindabury.*)

Q. Whose steel are they using now? A. I know they are using some of our steel.

Q. How long have they been using your steel? A. I cannot say positively, a year or two.

Q. You spoke of the Ferro Foundry & Machine Co.? A. Yes.

Q. Did you say they are users of the Johnson steel? A. They have been, but they are now users of our steel.

Q. How long have they been using your steel? A. Since last May.

Q. Do you know the Sturtevant Steel Co. of Boston, Mass.? A. Yes, sir.

Q. The Sturtevant Crushing Company? A. The Sturtevant Milling Co., I think it is.

Q. Do you know whether they use any Pennsylvania Steel Company's steel or not? A. Yes, sir.

Q. Whose steel are they using now? A. The Taylor Iron and Steel Co.

Q. How long have they been using that steel? A. Since early in the summer.

Q. Do you know of anyone using the Johnson's Company steel any more? A. No, sir.

Q. Do you know of anyone using the defendant company's steel any more? A. No, sir.

Cross-examination by Mr. Corbin.

Q. Do you know what steels are imported? A. Any particular steel?

Q. Do you know what steels are miported? A. I know there are a large variety of tool steels and machinery steels that are imported.

Q. Do you know of any Manganese steel being imported? A. Yes, sir.

Q. Manganese steel is largely made abroad, is it not? A. I believe so.

HENRY M. HOWE, a witness produced in behalf of the complainant, being recalled for further cross-examination, saith:

Cross-examined by Mr. Corbin.

Q. In testifying as to secret processes, do you regard any of the processes as secret which have

been disclosed in patents or in trade works, published works? A. Old features which are so disclosed are no longer secrets.

Q. In the manuafacture in a well-equipped Bessemer steel plant, is it not the custom to have a laboratory and a chemist? A. Yes, sir.

Q. And the laboratory work is a very important part of the process, is it not? A. Yes; it is an important part of the process.

Q. Does not the chemist select the various materials, pig iron, steel scrap, and coke and limestone, for the cupola? A. As I have already stated, that is not my understanding of good practice; that is, according to my understanding, the business of the metallurgist, but he may delegate part of his work to the chemist, if he so chooses.

Q. Then you think he does not investigate and report as to the materials that should enter into the compound? A. The chemist determines the chemical composition of the materials bought and made.

Q. And that chemical composition is necessary to be known in order to select the proper materials, is it not, to obtain good results? A. Yes, sir.

Q. And are not also the alloys necessary to bring the blown metal to the specifications required in the converter selected in the same manner? A. I did not say those were selected by the chemists.

Q. I did not ask you whether they were selected by the chemist or not, but are they not selected with regard to their analysis? A. Yes, sir; they are.

Q. In the selection of pig iron for the Bessemer process is it not necessary to secure iron of an equally low percentage in phosphorus and sulphur? A. In the acid Bessemer process; yes, sir.

Q. And is not this iron also selected and used with regard to its silicon contents? A. Yes, sir.

Q. And where the steel is required to be of the best quality you would use special iron of low phosphorus and low sulphur, would you not? A. Yes, sir; by the acid Bessemer process.

Q. Well, is it not a fact, that in the ordinary trade ordinary Bessemer iron is mixed with the best selected stock, and this mixture made high enough in silicon to admit of a high percentage of steel scrap or shop scrap? A. In Bessemer works which have no other way of using up their own scrap except to treat it by the Bessemer process, then as that scrap will dilute the pig iron which is used, it would be necessary to put in that pig iron more silicon than would otherwise be necessary to make up for that dilution.

Q. When the pig iron is received at the Bessemer Steel Works, is it not the practice to analyse the samples of the irons, and arrange it according to quality in piles, so as to have a uniform quality in each pile? A. So as to have a uniform composition in each pile?

Q. Yes; then is it not the same practice that is followed in a well-organized steel foundry, as to coke and limestone and steel scrap? A. In a general way.

Q. And also with regard to the alloys, ferro-chromium, nickel, ferro-silicon and wash metal? A. Yes, sir; if those materials are in use in the process.

Q. Now, when you have determined by a consideration of the analyses and the character of the materials of the mixture, then these constituents are assembled and charged into the cupola, are they not? A. In general, the part of the steel scrap, however, would not be charged in the cupola, but would be thrown into the converter.

Q. Now, there is in use a separate cupola called the physic cupola, or recarburization cupola, in the Bessemer foundries? A. There is a cupola which is called the spiegel or spiegeleisen cupola, but it is not called the physic cupola or recarburization cupola.

Q. Some text books call it that, do they not? A. I think it would be an unusual expression.

Q. The purpose is to employ alloys called recarburization? A. The purpose is to melt spiegeleisen.

Q. Spiegeleisen is a mixture containing manganese and carbon? A. Yes, sir; within certain limits.

Q. Carbon is quite high compared with carbon and manganese? A. Yes, sir.

Q. And ferro-manganese is another alloy where the manganese is of much higher percentage of the total, usually about eighty per cent.? A. About eighty per cent.

Q. You would get in a given quantity of ferro-manganese or spiegel, you would get about four times as much carbon in the spiegel as you would in the ferro-manganese, would you not? A. You would get somewhere about four times as much by unit of manganese introduced.

Q. Well, these two substances, the spiegel and the ferro-manganese, are sources of carbon and manganese in the product, these are important elements in the processes, are they not? A. The carbon and the manganese are important elements in the processes?

Q. The carbon and manganese are both important elements, are they not? A. Yes, sir; both carbon and manganese are important elements in the processes.

Q. And they are usually obtained from these two materials, spiegel and ferro-manganese, in the

process of manufacture? A. In the acid Bessemer process they are generally obtained in those two ways.

Q. Is it not a fact that the physic is governed by the calculations based on the specifications presented by the trade specifications as to the analysis of the product? A. That is one thing.

Q. That is to say, you must prepare the physic with a view to produce the percentages called for in the product, must you not? A. That would be one thing to take into account.

Q. Is it not a fact that the metals that may be used in the physic cupola are ferro-silicon, or iron, or wash metal, as the requirements of the product may demand? A. As I have already said, I have not known of such practice of melting physic in a cupola. I understand through my testimony I have not at all made any reference to what is done in the Hadfield process, but my understanding of my testimony is, that I have testified all through as to what is done in other steel works, not what is necessary to be done or is done under the Hadfield process, or patents, or what is done at Highbridge.

Q. You have not known of the practice of melting in the physic cupola, iron, ferro-silicon or wash metal, in order to produce the required mixture? A. No, sir; I never have.

Q. Is it not a practice to tap out what I have called the physic cupola, the necessary amount of physic mixed there to recorburize the blowers? A. No, sir; I have just said that I do not know of any physic ever being in the cupola at all, and I do not know how they can tap out a thing that has never been in the cupola.

Q. Do you mean to say that you do not know of the practice of melting in the physic cupola, iron ferro-silicon or wash metal, or the practice of

tapping out of that physic cupola the necessary amount of physic thus mixed to recarburize the heats or blows? A. That is what I said, that they melt spiegel in the cupola, but I never knew of their melting the physic in a cupola or of their tapping out of the physic cupola the necessary amount of physic mixed there to recarburize the heats or the blows.

Q. And you had not known of the practice of their melting anything except spiegel? A. No, sir.

Q. And if there is such a practice, it is not known to you? A. No, sir.

Q. And if such a practice is described in standard works, you have not observed it? A. No, sir.

Q. And you say that spiegel is used in the physic in the cupola for recarburization of the blowers? A. For adding manganese and recarburizing.

Q. That would be manganese and carbon, would it not? A. Yes, sir.

Q. Now, a crucible furnace is a part of a well-equipped Bessemer plant, is it not? A. No, sir.

Q. Are they not known in Bessemer plants? A. No, sir; they are very rare.

Q. They are sometimes used? A. I once knew one to be used as an experiment, but the experiment was not continued, and I have never known of it since.

Q. A crucible furnace is a number of pits built so as to accommodate a number of crucibles, is it not? A. That is one form of crucible furnace.

Q. Is it not the practice that ferro-manganese is melted or heated in the crucible rather than in a cupola in order to save loss? A. I never knew of it being melted or heated in a crucible.

Q. Or heated in a crucible? A. Nor heated in a crucible, as I have said.

Q. You never heard of ferro-manganese being melted or heated in a crucible in order to save excessive oxidation? A. That is what I said.

Q. Is it not a fact that it is impracticable to melt ferro-manganese physic or alloys in a cupola on account of excess-oxidation? A. That is generally thought to be the case.

Q. Then is there any other way to melt it except by putting it in the crucible, unless you put it into the converter direct if you want to melt it apart from the converter? A. Well, it is not melted at all.

Q. Well heated? A. Well heated in a reverberatory furnace.

Q. Does it not become fluid? A. No, sir.

Q. It does not become fluid? A. No, sir; I never saw it used fluid.

Q. Ferro-manganese? A. No, sir; except in certain experiments, twenty or thirty years ago.

Q. You mean it would not be fluid if entirely separate by itself? A. It is as hard as a rock.

Q. If you mixed iron with it then it becomes fluid, does it not? A. Yes, sir; as sugar melts in your tea.

Q. Then if you want to melt it in a crucible you would put iron with it? A. You would not want to melt it in a crucible, it is not part of the process.

Q. Is it not a fact that the practice in a well-equipped Bessemer foundry is, that the physics for each heat are prepared by the chemist and weighed for use in the crucible furnace and cupola? A. I have already said, as far as I have seen, physic is always heated in a reverberatory furnace for the Bessemer process, and is charged solid; I do not include spiegeleisen under physic, and in general physic is not used in the Bessemer process, or in a large proportion of cases it is not used.

Q. That is in your experience? A. Yes, sir. It

is used in certain cases, but in a large proportion of cases they do not use physic in spiegeleisen.

Q. When you have had a day's run in the cupola is it not often necessary to repair the cupola? A. Yes, sir.

Q. And after it has been repaired, the first thing to do, is it not, is to close the bottom of the cupola and put sand in the bottom? A. Yes.

Q. And then you put in a layer of wood—that is put in place, and then a charge of coke upon this, and then some limestone—is that the practice? A. Limestone is added at times.

Q. Well, coke and a layer of wood, and on the top of that coke a small percentage of limestone is used? A. It is often used; yes, sir.

Q. Then you are prepared to start the fire, are you not? A. Yes, sir.

Q. And then after the coke becomes heated then more coke is added until it extends above the tuyeres? A. Yes, sir; coke becomes heated first, and then more coke is added until it comes above the tuyeres.

Q. And then you are ready to introduce the first charge of pig iron or scrap, are you not, to melt? A. Yes, sir.

Q. That is the metal? A. Yes, sir.

Q. And then you put in more coke and limestone for fluxing off the ashes of the coke and other impurities? A. Well, the cupola furnace is charged continuously with alternate layers of iron and coke and sufficient limestone to flux off the impurities.

Q. And then you introduce the blast of oxygen during the process? A. A blast of air.

Q. And that generates great heat and reduces the metal to a fluid state? A. It melts the metal.

Q. And then when it is melted it is tapped off

at once or promptly? A. When enough is accumulated.

Q. It is not desirable to leave it there, it is liable to pick up sulphur if you leave it there? A. Well, there is a certain tendency to pick up impurities if it is left there too long.

Q. Is not this method substantially observed in melting this material, in what I have called the "physic cupola"? A. I have said repeatedly that I do not know of a "physic cupola."

Q. Well, the "spiegel," if you like that better? A. The method of melting spiegel is substantially like that.

Q. Now, then, the heated metal is run into an iron ladle, is it not? A. Yes, sir; it is in many cases run into an iron ladle.

Q. And is not that iron ladle in good practice arranged so that the quantity of the charge may be weighed before the converter blow? A. Yes, sir.

Q. Now, then, the converter is ordinarily placed in a horizontal condition so as to receive the charge, is it not? A. Yes, sir.

Q. And then the common method is to insert a trough into the opening of the converter and empty the molten pig iron from the ladle through a trough into the converter? A. Yes, sir; that is often done.

Q. Then the material run into the converter, I think you have testified, is no more than it ought to fill the belly of the converter without reaching the tuyeres at the bottom? A. Yes, sir.

Q. What is this side-blow plan—does the blast of air enter near the foot of the converter, or do they sometimes have the tuyeres instead of having them at the foot of the converter, they have them at the side of the converter? A. Yes, sir.

Q. Where is that point? A. Near the lower part of the converter.

Q. Instead of coming in at the bottom it comes in at the side of the converter, near the bottom of it? A. Yes, sir.

Q. And the flame is driven into the forward part of the converter? A. Yes, sir.

Q. Now, having charged the converter, then the blast of air is started through the tuyeres before the converter is rotated back to a vertical position, is it not? A. Yes, sir.

Q. And when it is converted, immediately the combustion begins?

MR. LINDABURY—That is, you mean reverted, not converted?

(*Mr. Corbin.*)

Q. Yes; when it is rotated back to a vertical position, then the combustion begins? A. Yes, sir.

Q. Now this combustion generates a heat which oxidizes the carbon, the silicon and the manganese in the metal? A. Yes, sir.

Q. Does it act on the sulphur and phosphorus? A. Very slightly.

Q. So that you do not get rid of the sulphur and the phosphorus? A. Practically not.

Q. And if that is undesirable then you must start with purer material? A. Yes, sir.

Q. Now, after these elements are burned out the converter is again rotated and turned down to mix the contents with certain alloys, is not that the practice? A. After the carbon, the silicon and manganese have been burned out spiegeleisen or ferro-manganese is put in usually.

Q. The first process is to rotate the converter? A. Turn it down so that the blast can be cut off without danger of the metal running back into the tuyeres.

Q. Is it not a fact that silicon contents of the

charge is regulated by the chemist, or under the advice of the chemist, before it is charged into the cupola, with a view to have the heat temperature come into the converter from the cupola as near to the perfect point as possible? A. I do not look at it that that is the function of the chemist, it is the function of the metallurgist I think.

Q. It is a thing to be done, is it not? A. Yes; it is a thing to be done.

Q. And of course the silicon contents would have to be ascertained by the chemist? A. Yes.

Q. Well, now suppose the heat blows under or over the temperature desired for the work laid out, then it is necessary to take some action, is it not, to correct that condition? A. Yes, sir.

Q. And the steel blower is governed by the appearance of the flame in order to determine that? A. Yes, sir.

Q. Sometimes it is treated by scrapping the charge, as the phrase is used? A. Putting in cold scrap steel.

Q. Now, if the heat blows cold does not that mean that there is a lack of silicon contents in the mixture of the charge? A. It may mean that or it may mean that the converter was too cold to start with.

Q. But is it not a condition which may be corrected by adding silicon? A. By increasing the amount of silicon in the next charge or by heating the vessel hotter.

Q. I understood you, on your last cross-examination, to question whether the silicon was a heat producer, but in your direct-examination I understood you to say that silicon and manganese were heat producers? A. That is what I said—so they are, I did not intend to question that.

Q. Then may the heat be increased by adding ferro-silicon?

MR. LINDABURY—I object to the question if it is intended to ask this witness what scientifically may be done, because that necessarily involves, if he answers it, a description of what they do at Highbridge.

COURT—I understand the witness as testifying to conditions independent of what they do at Highbridge—I will take the answer.

A. The heat may be increased by increasing the quantity of silicon in the next following charge, the heat of the next following charge may be increased by giving that charge more silicon.

(*Mr. Corbin.*)

Q. I am dealing with it while in the converter—suppose you wanted to increase the temperature, cannot you add ferro-silicon into the converter? A. I never knew it to be done, except in the Walrand process, in which silicon is added at the end of the blow.

Q. Is it not done by adding ferro-manganese sometimes? A. I have never known ferro-manganese to be added for the purpose of raising the temperature.

Q. I do not quite understand what you mean by referring to the "next charge," you could not raise the temperature of any particular blow by anything you can do in the next charge—explain that, please? A. If a charge is too cold it is not the practice to try to make that particular charge hotter by adding the silicon, but the next particular charge would have the silicon, or whatever was necessary to be added, added to it——

Q. What would be the method of increasing the

temperature if the temperature was too low? A. Blowing the charge on its side.

Q. By a side blow? A. Yes, sir; by a side blow.

Q. That is rotating the converter? A. Turning the converter slightly, so that the blast will burn a large quantity of the iron itself, in addition to burning the silicon and the carbon which the iron contains, and the burning of that iron generates a great deal of heat.

Q. Well, then, the only difference would be that some air was passing over the surface of the iron, instead of passing through it? A. Passing through a smaller depth of the iron. If you want me to explain the philosophy of it, I can, but the fact is, that we turn the converter on its side, and at last oxidizes a great quantity of the iron, and that generates a great deal of heat.

Q. And that is one of the methods adopted when the heat is running too low, is it? A. Yes, sir.

Q. And you think it is not the practice in Bessemer furnaces to bring up the heat by adding ferro-silicon or ferro-manganese? A. That is what I said.

Q. Except in the following charge? A. Except in the following charge.

Q. From the information you had of the contents of the materials, you might do it in the next charge in order to obtain the proper result? A. Yes, sir.

Q. Now, then, these methods are well known, are they not, that I have mentioned, and that you have replied to? A. The method of cooling by the addition of steel scrap and heating by means of the side blow, are well known.

Q. Well, the other methods which you have recognized as being valuable are all methods in ordinary use, are they not? A. I do not think I have mentioned any methods.

Q. Well, I have mentioned them and you have said "yes" to them? A. I don't remember any others.

Q. I will not go through them again, the testimony will speak for itself—now in a particularly hot blast, too high in temperature—does not that mean that the charge is either too high in silicon, or too high in silicon and Manganese combined in the original charge? A. Yes, sir; or else your converter was unnaturally hot when you started to blow, or the metal had made it too hot.

Q. And the steel blower would recognize this by the appearance of the flame, would he not? A. Yes, sir.

Q. Now, in order to correct this, and prevent extreme oxidation, he might use steel scrap, wash metal, or pig iron of low silicon contents, cannot be—this when the flame is too high? A. I have never known wash metal to be used, I do not think I have ever known pig iron to be used, the regular thing to be used is steel scrap.

Q. Steel scrap you have known used—— A. I have not finished my answer.

Q. Go on then. A. Steel scrap is used for lowering the temperature, I do not understand that steel scrap is used to prevent the oxidizing, execessive oxidizing, such as your question implies.

Q. Well, are not wash metal and pig iron of low silicon contents valuable for the same purpose? A. I never knew them to be used, so far as I remember.

Q. In view of their chemical contents, would they not be evidently valuable for the same purpose?

MR. LINDABURY—I object to the question on the ground that it is not cross-examination.

COURT—What does that refer to?

(*Mr. Corbin.*)

Q. Pig iron and wash metal.

MR. LINDABURY—I make the same objection to that.

Objection sustained.

(*Mr. Corbin.*)

Q. Now, the close of the process in the converter, is usually indicated to the blower by the drop of the flame, is it not? A. Yes, sir.

Q. And that indicates that the silicon, the Manganese and the carbon have been oxidized? A. It indicates that the carbon has ceased to burn.

Q. And ordinarily have not the silicon and Manganese been oxidized by that time? A. As the process is generally conducted the silicon and the Manganese have generally been oxidized by that time.

Q. They should be, it would be an injury to the product if too much silicon and Manganese remained there—you would have an inferior product, would you not? A. If too much silicon remained, you would have an inferior product.

Q. Now, after the blow, then, the converter is rotated into a horizontal position, and the blast shut off, is it not? A. Yes, sir.

Q. And then the metal is ready for the alloys necessary for the finished product? A. Yes, sir, it is ready for the spiegeleisen or the ferro-manganese.

Q. Well, whatever alloys are necessary? A. Yes, sir.

Q. Supposing you were making nickel steel, that would be the time to put it in, would it not? A. I suppose so.

Q. Now, then, in the case of an ordinary heat of steel——A. I think that answer was really a wrong answer to make. I should have said that I never have known a nickel steel made in a converter by the Bessemer process.

Q. I am describing the steel processes generally—you say spiegel is put in, that is to say, the spiegel as a means of introducing the carbon, you mean, I suppose? A. Yes, sir.

Q. And whatever the physic, whatever is to be put in, would naturally be put in at that point, would it not? A. Well, I cannot say so.

Q. Is not the physic introduced with the molten metal into the ladle, as the next step? A. The molten metal and spiegel are next poured into the ladle.

Q. I am not asking you about spiegel alone; I am asking you about physic, about which you have already testified? A. The spiegeleisen and the ferro-manganese may be introduced into the converter before the spiegel is poured into the ladle, or they may be introduced while the steel is pouring into the ladle.

Q. And is not the physic often weighed into the ladle—take the ferro-manganese, for example; is not that weighed into the ladle? A. Yes, sir, weighed in a solid state.

Q. And while in a melted state? A. I have never known it to be done.

Q. Is not that process, the process described in the Hadfield patents?

MR. LINDABURY—I object to the question this witness has answered, and, as I understood, has answered as to the general practice of those outside of those who use the Hadfield process.

Question withdrawn.

Q. Is it not a familiar method, and one described by Mr. Hadfield in his patent, that the ferro-manganese, is first carefully melted or treated in a reverberatory or other suitable furnace, before adding it to the molten iron or steel into which it is poured, in a melted or highly heated state or the molten iron or steel is added, to the melted or highly heated ferro-manganese?

MR. LINDABURY—I object to the question in so far as it calls for the statement of the Hadfield patent—the Hadfield patent speaks for itself.

COURT—What is the point, Mr. Corbin? He will have to take that paper in his hand to see if you have read it correctly.

MR. CORBIN—I have asked him more than that, I am asking him if that was not a well-known practice.

MR. LINDABURY—If the last half of that question stands as the firts half of the question, then I would not object to it.

MR. CORBIN—I am asking the whole question and I want it answered in that way.

MR. LINDABURY—Then I object to it as it is asking for the contents of a paper—the paper can speak for itself.

COURT—I will overrule the question on the ground that you are calling for the recollections of the witness, of a written paper, which you have in your hand and which is not in evidence.

MR. CORBIN—I have no objection to his having that paper in his hand.

MR. LINDABURY—No, he cannot have that paper in his hand, it is not in evidence.

COURT—Now, reading that statement, he asks you whether that is not a common practice, anywhere—I do not see why that is not competent, you may answer that question.

A. One of the ways Mr. Hadfield described his common practice?

(*Court.*)

Q. The matter that was read to you? A. The matter as read describes two different practices, one of which is common practice and the other is not.

(*Mr. Corbin.*)

Q. Well, is it not a well known practice?

COURT—He has answered that, he says that one is a common practice and the other is not common practice.

(*Mr. Corbin.*)

Q. I now ask him if it is not a well known method, before I asked him if it was a common practice?

COURT—I will allow that question—he can say yes or no to that question. He is simply asked whether the methods described in that patent as read to him are not well known. You may answer that question.

A. Well, one of the methods is well known and the other is not. I don't know of its being com-

mon, except in so far as it is disclosed in the patent.

(*Mr. Corbin.*)

Q. Then you do not regard methods as well known which are disclosed in the Hadfield patent? A. I think that is an interpretation of the thing I do not feel competent to make.

MR. LINDABURY—I think the witness ought not to be required to answer that, and I object to the question.

Question overruled.

(*Mr. Corbin.*)

Q. Is it not a well known practice, to weigh the physic into the ladle, and to pour a known quantity of blow metal into the ladle with the physic? A. It is well known practice to weigh the solid Manganese and otherwise to proceed as you have said.

Q. What do you understand Mr. Hadfield means when he talks about ferro-manganese being carefully melted—do you say you cannot melt it?

MR. LINDABURY—I object to that question as not cross-examination.

Objection sustained.

(*Mr. Corbin.*)

Q. Is it not a practice well known in the trade to place a weighed quantity of physic in the ladle, and pour from the converter into it, a known quantity of melted metal? A. It is common practice to throw solid ferro-manganese into the ladle, after part of the steel has run in, and while the steel is running in.

Q. Then you have the constituents of a quantity of the physic, and the quantity of molten metal both known, and these two quantities are mingled in the ladle? A. No, sir, you have the quantity of the Manganese known and the quantity of the metal is estimated.

Q. Estimated by weight prior to conversion, is it not? A. Yes, sir, estimated by weight, prior to conversion.

Q. And the result of this inter mixture in the ladle is that the steel is made containing the percentages of carbon or Manganese or other alloy, required by the specifications, is it not? A. That is what it is, if the process is carried out successfully.

Q. Is not the method of making Manganese or nickel or chrome steel substantially the same, except that the physic is taken from the crucible furnace instead of a cupola?

MR. LINDABURY—I object to the question. I do not understand that the witness has testified to any knowledge of the processes used in making Manganese steel except as such processes are carried out at Highbridge.

MR. CORBIN—He professes to know the methods adopted in England and elsewhere.

Question allowed.

MR. LINDABURY—Understand that this is to be answered without reference to anything that is done at Highbridge.

A. I have no knowledge of the manufacture of Manganese steel and no knowledge of the manu-

facture of Manganese, nickel or chrome steel, by the Bessemer processes.

(*Mr. Corbin.*)

Q. Then you cannot say whether it is or not the practice? A. No, sir.

Q. Where a soft steel is required, the amount of carbon put into the ladle would be comparatively small and where it was a hard steel, it would be comparatively large? A. The amount of carbon would be larger in hard steel than in the case of a soft steel.

Q. For Manganese steel, the proper amount of eighty per cent. of ferro-manganese is put into the ladle, as described in the Hadfield patent?

MR. LINDABURY—I object to the question if he wants to know whether or not that is the proper formula for making the Manganese steel to-day.

COURT—I will overrule the question because it appears here in the patent—the patent is here and can speak for itself, and it may be put in evidence.

(*Mr. Corbin.*)

Q. Is not this practice well known—"All of the heat after weighing or a determined quantity thereof, divided out by weight, known, incorporated with the necessary quantity by weight of molten eighty per cent. or other suitable ferro-Manganese, according to the percentage required in the products of Manganese steel, pouring either material into the other, as may be most convenient, or both together into a third ladle, or other vessel,"——

MR. LINDABURY—I object to the question, the witness has already testified that he knows of no other process of making Manganese steel except that employed at Highbridge.

Question overruled.

(*Mr. Corbin.*)

Q. Is it not the practice to prepare the physic and to mingle the physic in a weighed quantity in a ladle with the steel from the converter, as a practice for all classes of steel alloys?

MR. LINDABURY—I object to the question so far as it may call for the practice employed at Highbridge.

COURT—He may answer that question so far as he knows outside of Highbridge.

A. I don't know of any practice for making Mangaese steel or other alloys steel by the Bessemer process.

(*Mr. Corbin.*)

Q. Then if these are the practices, it is outside of the range of your knowleged, is it? A. Yes, sir.

Q. You have described such a proces in a published book of yours, have you not? A. No, sir.

Q. You think you have not? A. No, sir, I think not. You are asking now about the process of making alloys steel which includes nickel steel, chrome steel and Manganese steel, but does not include the common or carbon steel.

Q. Then you are not familiar with the ways of making nickel steel or chrome steel? A. Not by the Bessemer process. If they are made at all by

the Bessemer process, as the manufacture is in general secret, and closely guarded, for these alloy steels, there is no general knowledge about the subject, and it would be generally considered very impertinent, to inquire anywhere as to how they made their alloy steel, I never should think of asking such a question of any one.

Q. Now, after the steel is dumped into the steel ladle, in combination with the physic, is not the next process to clean the slag or cinders from the top of the mass? A. Why, no, sir. If there is more slag than the ladle will contain on top of the steel, then that slag flows over, but that is not a necessary part of the process. Very often it does not flow over, at any rate a large amount often remains there, in common practice.

Q. Is it not a well known practice to introduce aluminum into the steel ladle in order to create a quiet disposition of the bath of metal? A. Aluminum is sometimes added, yes, sir.

Q. Does the aluminum disappear in the process of manufacture? A. Yes, sir, usually.

Q. In making the calculation of the quantity of Manganese, is there not a certain percentage of oxidation or loss in the metal, which you must allow for? A. There is a loss which you must allow for.

Q. And the required products, the standard of the required products, is from one to one and a quarter per cent. of carbon and twelve to fourteen per cent. of Manganese, is it not? A. In that neighborhood, yes, sir.

Q. Now then, you have written a work on the metallurgy of steel? A. Yes, sir.

Q. Recently published? A. Recently published.

Q. Yes, sir, the last edition recently published? A. The last edition I think was published in 1890,

that is to say, the last time any revision was made of it.

Q. 1904, it is marked? A. I am afraid that is a trick of the trade, there has been no revision of that book since 1890.

Q. Whatever was published in this book was well known some years ago, was it not? A. Oh, yes, sir.

(*Mr. Corbin.*)

Q. Is not this a statement familiar to the steel trade—"Manganese steel is made by mixing molten iron di-carburized by the open-hearth or Bessemer process, with Ferro-Manganese in a ladle. It is less desirable to mix them in crucibles because these are cut by the Manganiferous slag. The steel usually contains about five-tenths per cent. less Manganese than the Ferro-Manganese added would imply, were there no loss," that is something familiar to the trade, is it not? A. I suppose that was known at the time, as my opinion.

Q. Now when the steel is prepared in the ladle, the next step is to transfer it into the foundry, is it not, and distribute the steel from the ladle into the various points in the shop? A. Yes, sir.

Q. It is the ordinary casting method at all steel casting plants, to distribute from the ladle into the moulds, is it not? A. What they do in steel casting plants ordinarly I do not know, because visitors are not admitted.

Q. You have referred to a liability of the Manganese castings to crack, because of the unequal stress arising from its being a poor conductor of heat; is it not a fact, that because of this tendency to crack, the practice is to make Manganese castings of a limited thickness?

Mr. Lindabury—I object to the question—since this witness says that he knows

of no practice of making Manganese steel castings except at Highbridge.

COURT—My rcollection is that he testified that they had to make them thick or thin according to the form of the casting required when finished. I will allow the question.

A. Yes, sir.

(*Mr. Corbin.*)

Q. The limit is about four inches, is it not?

MR. LINDABURY—I object to that question—that is just exactly what we expected was coming, he is inquiring as to their practice at Highbridge, and we object to it for that reason.

MR. CORBIN—Suppose we do not go to Highbridge—we will take the Hadfield patent.

COURT—Well, we don't have to talk about that, because the patent speaks for itself.

Question overruled.

(*Mr. Corbin.*)

Q. Is not a casting of anything above two inches regarded as a thick casting of Manganese steel, requiring great care in the annealing or heating? A. I don't know what would be considered a thick casting by any maker of Manganese steel other than the Hadfield people or the Highbridge practice.

Q. I am talking now about the limitations of the maufacture arising out of the nature of the mate-

rial, and I ask you whether Mr. Hadfield does not declare his product as practically limited to four inches of thickness?

MR. LINDABURY—I object to that for the reasons heretofore given.

COURT—If it is in the Hadfield patent and that is in evidence, why take up the time to ask this witness about it. I shall sustain the objection.

MR. CORBIN—Your Honor overrules my inquiry as to what the limited thickness is?

COURT—Yes, and as to what is contained in the patent, because that you have before you.

(*Mr. Corbin.*)

Q. Is it not the fact that the slow heating of a casting, in the annealing furnace, is practiced to avoid cracking the steel before it has reached such a temperature as will insure that it will not crack? A. That would be a natural practice, that would be a natural and reasonable practice.

Q. Is not the temperature at which the steel is no longer in danger of being cracked about the same as the temperature at the point of recalescence? A. I do not know, sir.

Q. In Mr. Brinton's patent the upper point mentioned is about 1,250° F.—is not that about the point of recalescence?

MR. LINDABURY—I object to that question on the ground that the patent will speak for itself.

COURT—I do not understand that he is asking about any particular method, he is

asking about some particular person's statement—I will allow that question.

A. That is rather below recalescence.

Q. How much below, about seven degrees; recalescence would be about 1,270° F., would it not? A. I have to figure this all out—I have all this in my head, in degrees of Centigrade, and every time you ask me about the degrees of Fahrenheit, I have to figure before I can tell you.

Q. You think it is a trifle below? A. I think it is considerably below.

Q. You have not made the calculation, have you? A. I have not made the calculation, but without making that calculation I can say that it is considerably below.

Q. How much below—what would be the point of recalescence as you have observed it? A. About 120° below the recalescence point.

Q. You would make the point of recalescence about 1,370° F.? A. About 690° Centigrade.

Q. You have stated that Manganese steel has a very high temperature—at what temperature does it become fluid?

MR. LINDABURY—I object to the question as not being cross-examination, and also on the further ground that this question as to the manipulation of Manganese steel, and all these questions are applicable to what is done at Highbridge.

Question allowed.

A. I do not remember.

Q. How does it compare with carbon steel containing, for example, twenty-five per cent. of car-

bon? A. There is no such steel containing twenty-five per cent. of carbon, it should be, I think, .025 percentage.

Q. Perhaps I have that wrong—would it not require a higher temperature to make a carbon steel fluid than the Manganese steel? A. Carbon of twenty-five one-hundredths of one per cent. of carbon I should think had a higher melting point than Manganese steel, but I do not think I said that Manganese steel had a high melting point, for steel.

Q. You said twenty-five one-hundredths, that would be a very low grade of steel, very soft, almost iron, would it not? A. It would not be iron, because the difference between iron and steel does not depend on the amount of carbon they contain, it would be a low carbon steel casting.

Q. Take a high carbon steel would it not require a higher percentage of carbon, than you have spoken of? A. I do not think so.

Q. Does not Manganese steel have greater fluidity than most other steels? A. I don't think so. It was, I think, at one time reported by an incorrect determination, that Manganese steel had a very low melting point. That statement has deceived a great many people, myself included, until I found out otherwise. We were deceived by that statement, until our eyes were opened, because that statement was made in a report made by a very high and eminent authority, but it was afterwards found that that was a mistake.

Q. Would it not run into moulds at a lower temperature than other steels? A. I do not think so.

Q. Is it not easily made very hot, more easily than any other steels? A. I do not see how there could be such a difference as that.

Q. Then these are matters that you are not pre-

pared to speak as to positively? A. You can make steel just as hot as you want to; you can make them just as hot as you want.

Q. Then it would not become fluid any sooner than other steels? A. You are speaking of the fluidity of Manganese steel?

Q. Then you think that Manganese steel is not more easily made fluid than other steels—now is it not true that Manganese steel has greater fluidity than most any other steel, excepting perhaps steel high in both silicon and Manganese? A. It is so long since my attention has been called to the melting point of Manganese steel that I should not like to answer that question.

Q. And then I understand it takes more labor to clean Manganese steel castings than it does other steel castings? A. I do not think I said that.

Q. I thought you said that they were harder, that they were more difficult to cut and more difficult to clean? A. More difficult to machine I said—yes, sir, but I don't think I said they were more difficult to clean.

Q. Is it not a fact that Manganese steel castings will leave the sand freer and require less labor, for removing sand from them than most other steels? A. I do not know, sir.

Q. What are the methods of removing inequalities from cast steel—you have the steel bar, to chip off inequalities, and you have the sand blast and the emory wheel—do you know of any other methods besides those three methods mentioned? A. You mean the cutting off of parts that want to be cut away?

Q. The removal of inequalities in the casting? A. I do not understand what you mean by "Inequalities"?

Q. Is there not some trimming necessary after the casting is made? A. Yes, sir.

Q. Is there any methods known to you to accomplish this cleaning or chipping, other than the use of the bar, the sand blast or the emory wheel?

MR. LINDABURY—I object to the question in so far as it asks for what the witness may know of the Highbridge process.

COURT—It would not make any difference unless they have a different method at Highbridge than at other places. You may answer the question whether you know of any other method in general use.

A. There are other methods, yes, sir.

Q. In ordinary use? A. Yes.

Q. What are they? A. Chipping the pieces off with a chisel and sledge, cutting them off with machine tools, such as a lathe, or planer and similar tools, forging them down under a hammer or rolling them down—this is not applicable of course to castings. I do not remember any others now. Well they can be hammered down cold, to a certain slight extent.

Q. These methods that I have mentioned, the use of the bar, the sand blast and the emory wheel, are well known methods, are they not? A. The use of the sand blast is a well known method; I do not understand what you mean by the bar.

Q. The steel bar, or chisel? A. The chisel is used on a steel, it is a common method.

Q. And the emory wheel, that is a very old and familiar method, is it not? A. I have never seen it applied to castings that I remember.

Q. Then my experience is broader than yours, I have seen it done four years ago—now, referring to the manufacture of shells at or before the Spanish war—do you know of any other methods that

were adopted for trimming or cleaning the shells, other than those you have mentioned, or that I have mentioned? A. No, sir—now, you are excluding of course the practice of Mr. Hadfield.

Q. That is the very thing I am asking you about—were any other methods adopted at Highbridge, for this purpose, of trimming and cleaning the shells, than those that I have mentioned, or that you have mentioned?

MR. LINDABURY—I have no objection to his answering yes or no to that question.

A. I do not remember any method that would not come under one of these classes. Of course it is understood that in applying these well known methods, there may be special ways of applying them, which in themselves would be inventions.

(*Mr. Corbin.*)

Q. You might use a two pound hammer, or you might use a one pound hammer? A. I should not think that would come under the nature of an invention. But there are other methods which would obviously be inventions, and therefore I suppose would be secrets.

Recess.

(The further cross-examination of Prof. Howe suspended at this point for the purpose of calling the next witness.)

FRED C. SMITH, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you reside? A. Scranton, Pa.

Q. What is your occupation? A. I am superin-

tendent of the washeries of the Delaware, Lackawanna and Western Railroad.

Q. Washeries of what? A. Of waste coal, thrown away years ago.

Q. Whereabouts? A. In the Lackawanna Valley.

Q. What place is it? A. Several of them are at Wilkes-Barre and Scranton.

Q. Are they all under your charge of these different places? A. Yes, sir.

Q. Do you use crushing machinery? A. Yes, sir.

Q. What do you crush? A. With one set we crush coal, and with another set we crush rock, as well as iron pirites.

Q. What do you use for the largest amount of your crushing? A. A solid casting made of Manganese steel, a roll.

Q. Where do you get them? A. The Taylor Iron and Steel Co.

Q. How long have you been getting them of the Taylor Iron and Steel Co.? A. Since January 1, 1904.

Q. From that time on you have used this Taylor Iron and Steel Co's. steel rolls—Manganese steel rolls—exclusively? A. Yes, sir.

Q. What did you use before that? A. A cast steel roll made by the Finch Manufacturing Co., of Scranton, Pa.

Q. How long have you used that? A. Since about March 1, 1900.

Q. Before that what did you use? A. The washery only started in March, 1900.

Q. So your experience begins in March, 1900? A. Yes, sir.

Q. How do the rolls compare—that is, this Finch Manufacturing Co. hard rolls compare with the Manganese steel roll made by the Taylor Iron and Steel Co.? A. Well, the Manganese steel rolls—the expense is so great on the other rolls, that I started

in to experiment, and I ran across a Manganese steel through Mr. Sherrerd, and I placed some of their rolls in for experimental purposes, and I haven't any tests outside of the enormous labor cost of maintaining the other steel rolls, but from my experience I found that the cost was about five to two in both wear and cost of labor and other elements.

Q. That is, the cost of these other rolls, as compared with the cost of the Manganese steel rolls, is greater in both the wear and in the cost of the labor to the extent you mentioned outside of these other elements you speak of? A. Yes, sir.

Q. And they wear about five to two—that is, the Finch Company's rolls wear about five to two of the Taylor Iron and Steel Co.'s Manganese steel rolls? A. Yes, sir, the other steel rolls cost was about five to two in both wear and cost of labor.

(No cross-examination.)

Henry M. Howe, recalled for further cross-examination:

Cross-examination by Mr. Corbin.

Q. I understood you, probably erroneously, but I understood you to say that ferro-manganese could not be melted in a crucible—you did not mean to say that, did you? A. No, sir, I did not.

Q. It can be melted in a crucible? A. Yes, sir, it can be melted in a crucible.

Q. And it would be difficult to melt and use it successfully in a cupola, would it not; it would tend to oxidize? A. The natural belief would be that it would tend to oxidize in the cupola furnace.

Q. If then it were desired to use ferro-manganese in a molten state as a physic, it would be al-

most necessary to melt it in a crucible, would it not?

MR. LINDABURY—I object to the question as not cross-examination upon anything that we examined this witness about.

MR. CORBIN—You have brought out the fact that ferro-manganese was used as part of your physic.

MR. LINDABURY—But not the state in which it was used, or the way in which it was reduced to that state.

COURT—I think you ought to confine your question to the knowledge which the witness has of how it has been done in other places than at Highbridge. If he does not know, then I do not think you are entitled to have him guess at it.

MR. CORBIN—As a skilled metallurgist I think he ought to know.

COURT—That cannot be a question of opinion, it must be a question of knowledge.

MR. CORBIN—That is precisely the class of question he is competent to answer?

COURT—I will overrule it in the first place because I do not understand it as being cross-examination, and in the next place your asking him his opinion, as to a question which is really a matter of fact. You may ask him if that is done anywhere else, or generally.

(*Mr. Corbin.*)

Q. Is it not a common practice to melt ferro-manganese, where it is necessary that it should be

melted, in a crucible? A. I have never known it to be melted in a crucible.

Q. Did you ever know it to be melted at all? A. I do not think so.

Q. You never knew it to be melted at all? A. No, sir. I don't think so.

Q. But you know as a matter of fact it can be melted in a crucible, do you not? A. Whether it can be economically melted in a crucible is another question, whether it can be or not is another thing. I have no doubt it can be melted, but whether it can be melted in a crucible economically or not I do not know.

Q. It is something you do not know anything about, and yet you have already stated that it can be melted in a crucible? A. As an abstract scientific proposition, it can be melted in a crucible, but it would destroy the crucible so fast that it is not a practical commercial question. But as a scientific fact, it can be melted. I answer this in the same way that I am answering all these other questions.

Q. I have in my question indicated certain methods of operating a cupola in the Bessemer process, and you have stated that those are methods in common use—I ask you whether the methods thus prescribed are not in use at Highbridge for operating the cupola?

MR. LINDABURY—I do not understand the witness' testimony to be as indicated in the preamble to the question. But I have no objection to his answering the question as to whether or not the processes we have there are the processes that are in common use.

MR. CORBIN—You will have to take the question as I have asked it.

COURT—You may answer Mr. Corbin's questions if you can.

A. That the processes which you have described in your question does not adequately or properly give the processes as practiced at Highbridge.

Q. That does not quite answer the question; is that process, as thus prescribed, used at Highbridge? A. I think I have answered that question.

Q. Is it or not? A. I have answered it that it does not admit of an answer yes or no, what you have stated does not adequately or properly describe the practice at Highbridge.

Q. Is it all used there as I have described it?

MR. LINDABURY—I object to the question—it is taking our processes apart and inquiring as to them in sections.

COURT—How can it be said to be a secret if it is generally known?

MR. LINDABURY—The combination of these with other processes are secrets. We use all along the line some features of the ancient practices, any one of course would understand that.

COURT—But the witness has answered the question by saying that the method in the question does not adequately or properly describe the practice at Highbridge, or the methods used at Highbridge. What more can he say, Mr. Corbin?

MR. CORBIN—I think he can say a good deal more.

Q. Is there any part of that process thus described which is not used or was not used when Mr. Nichols was there at Highbridge?

MR. LINDABURY—I object to the question, he has answered the question by saying that we do not use that single process as described in the question, he has told you that the process as you describe it does not adequately or properly describe the practice or methods employed at Highbridge.

Q. Is there any part of that process thus described which is not used or was not used when Mr. Nichols was there at Highbridge?

COURT—I will allow that question to be answered.

(*Mr. Corbin.*)

Q. That is the operating of the cupola? A. Really I should have to read over the whole of these questions that have been described before I can answer that question. I cannot recollect what those questions were. If I can have them before me, and read them over and study them, I could give you an answer; I cannot otherwise.

Q. I have described a certain process of using the converter, which you have said was in common use—is there any part of that process which was not in use when Mr. Nichols was at Highbridge?

MR. LINDABURY—I object to the questions for the reasons already given.

Question allowed.

A. I think I should have to see the process as you have described it before I can answer that question; I cannot remember what all the points you made were.

(*Mr. Corbin.*)

Q. You mentioned four points, with respect to which you said that you claimed that you had exclusive knowledge before the steel was made, and you said there were also four points with which you claimed exclusive knowledge after the steel was made? A. Yes, sir.

Q. You described the first four, but not the last four—can you tell us what the last four points you had in mind were? A. I did describe the last four points.

Q. You enumerated the first four points, and then, as I remember, you were interrupted and did not enumerate the last four points? A. Well, I can.

Q. Do so, please, I would like to get them in distinct form, if you can give them to me? A. The pattern making—that is the way of designing the castings, that would be the first point.

Secondly, the use of chills—that is the way in which the pieces of cooled iron should be distributed about and through the moulds with the purpose of regulating the rate of cooling the castings.

Third, the time of removal of castings from the moulds.

Fourth, the rate of heating the castings after their removal from the moulds.

Q. The rate of heating in the furnace? A. Yes, sir; I think I have given that to you before.

Q. How long is it since shells were made there? A. Some years. I cannot tell you how many.

Q. And has the annealing furnace been taken down? A. I do not really know. I have not been in that house for a long while.

Q. It is some years since you made them? A. Yes.

Q. Shells are mostly forged now, are they not? A. Yes, sir, I think so.

Q. The use of cast shells have been abandoned by the Government, have they not? A. By this Government, not by the British government.

Q. When the shells were made, did the Government specify at all how they should be made? A. No, sir—it specified the properties which it was to have, but it was understood it should be castings. I do not remember whether the Government specified that it should be castings or not. I do not remember. Of course the use of cast shells at any time may be resumed. I answered that question wrong —we did make some shells a short while ago—we made some shells I think it was in December of 1903, if I am not mistaken, I had forgotten that, we made a small lot for the Government.

Q. When? A. I think it was in 1903, it may be 1903—but it was within a rather short while. Of course that practice may be resumed at any time, the state of the Ordnance Department may at any time change, and they would go into the making of cast shells again?

Q. Do you know whether the special processes recommended by Mr. Hadfield were actually followed in the foundry? A. To a very great extent.

Q. Did not Mr. Brinton put them aside and adopt his own methods and reach a better result than by the Hadfield method, by the ordinary Bessemer processes? A. No, sir, of course Mr. Brinton and every one else introduced modifications and improvements as time went on, but there was no such absolute setting aside or abandonment or radical departure from Mr. Hadfield's methods as your questions seem to indicate.

Q. Did you take part in that manufacture of the shells? A. Of the shells?

Q. Yes. A. No, sir.

Q. Then your knowledge on the subject is not derived from actual observation of what was done?

A. I did not understand your question referred to shells particularly, I thought it was as to Mr. Hadfield's processes of making shells.

Q. No, your taking part in the manufacture of shells? A. No, sir; I took no part in the manufacture of the shells. I understood your question to apply to Mr. Hadfield's process of making shells or making steel.

Q. I was talking about shells? A. Well, then if your question as to whether Mr. Hadfield's practice in regard to shells was abandoned by Mr. Brinton or not, I think if it had been abandoned I should have been very likely to hear about it, and I do not think for a moment that there was any very important modification made in the manufacture of shells, but I do not know of my own knowledge as to that.

Q. Now, referring to the precautions taken to conceal the work—you have referred to a wall built about the converter I suppose—now were there not several openings or intervals in the wall for workmen to pass through? A. There was one opening so placed that people on the other side of the wall could not see through that opening at any of the important processes.

Q. But there were openings through which the workmen could pass, were there not? A. There was an opening through which qualified persons could pass.

Q. Is it not the fact that the workmen in the foundry, the moulders and the machinists, and all the workmen in the steel works, passed freely through this opening, and were the operations were carried in and around the converter? A. I don't think that is the case, that was not part of our intention. Our intention was that that should be a place by itself.

Q. If that is so, it was not known? A. It was

not our intention. How far Mr. Brinton maintained secrecy there and how far he carried out our desires in that respect I do not know, sir.

Q. Are you prepared to say that any instructions were given to Mr. Nichols to exclude the workmen from watching the process carried on about the converter? A. I should be very much surprised if instructions were not given.

Q. Have you any doubt about it? A. I have no doubt they were.

Q. You do not know that they were personally given to him? A. I cannot tell personally what orders our higher officers gave. I know what our policy was.

Q. You do not know personally that they were given to him? A. No, sir.

Q. It is a part of the operation most spectacular, and would attract workmen most, as to what is carried on in the operation of conversion, and pouring the casting, is it not? A. The parts we wanted to keep from observation were not at all spectacular. I think it would take a very close observer to detect some of them.

Q. But the operation of the converter is itself a spectacular part of the procedure, is it not? A. That is true, in a sense, but the flame of the converter, as I said, can be seen from beyond the wall, and in order to see that, which is the most spectacular part about it, it is not necessary for a man to pass through that wall; it is not necessary; a man to pass through that wall could not see the operations that we desire to keep secret.

Q. You are not prepared to say that the foundry men, the moulders and the other men employed in the steel foundry, were not in the habit of passing inside that wall, and uninterruptedly watching the operations that went on there? A. I do not think

they did that, because I should have seen them if they had done it.

Q. You can only testify as to the instructions given? A. I can testify that I never saw them when I was there, of course they had no business to be there, they ought to be attending to their own moulding operations.

Q. Before Mr. Brinton took charge of the works, were you not unsuccessful in filling a shell order? A. I do not think so, sir. I do not think we were ever unsuccessful in filling a shell order.

Q. Was there not an order from Chili for shells, in which there was a failure? A. No, sir, I do not think so, the shells for Chili at the time of the Chilian war scare or excitement—I was mistaken about this—those were some that I got from Mr. Hadfield, thinking the other day that we had made those at Highbridge, but I got this product from Mr. Hadfield, for the Government, and they were made in Sheffield, and we made none for them.

Q. You did not make any shells there? A. Yes, sir, we made some, but whether before Mr. Brinton came there or not I cannot just remember, but I think it was about the time he came, but it was before we went into this shell license that has been mentioned. But I remember we made those shells very early in our operations, it was a very important part of the business, and I cannot remember just whether we made any—I have a recollection that we made some shells, and yet it is pretty vague in my mind at this length of time.

Q. Well, under Mr. Brinton's process of manufacture, you made them successfully, did you not? A. I do not think Mr. Brinton has any process of manufacture, of manufacturing shells, and I never heard that he had.

Q. Well, no matter whether it was his process

or not, making them under his superintendence or under his direction? A. When do you mean?

Q. Didn't you make those shells for the Government after Mr. Brinton came there, and were they not made under his supervision?

MR. LINDABURY—I object to the question as not cross-examination.

Question allowed.

A. We made a great many shells at the time of the Spanish War; those shells were successful.

Q. Do you remember the number you made? A. Oh, I don't know, a great many.

Q. Was it not 600 thirteen-inch shells? A. Oh, I cannot tell you, I haven't any idea. We made a great many shells; it was an important part of our output.

Q. That was in 1897 or 1898, was it not? A. It was the time of the Spanish War, some time about 1898, I think.

Redirect by Mr. Lindabury.

Q. Do you remember that Mr. Brinton was sent abroad to learn the process of making shells of Mr. Hadfield? A. That is my recollection, that I met Mr. Brinton in Sheffield, and that he was there for that purpose.

(*Mr. Hardin.*)

Q. Reference has been made to your book, or a book that you publish, as you told us it was published in 1890—was the manufacture of Manganese steel carried on in this country at that time? A. No, sir.

Q. Were you describing in that book a practice of manufacture of Manganese steel? A. What I de-

scribed in that book was taken from Mr. Hadfield's printed papers on Manganese steel, and represented as much as he was willing to disclose to the public of the ways of making and not making Manganese steel.

JOHN M. SHERRERD, recalled in behalf of the complainant, saith:

Examined by Mr. Lindabury.

Q. Questions have been asked here with regard to the manufacture of Manganese steel and other steels on formula—does your company take orders for the manufacture of Manganese steel on a formula? A. No, sir.

Q. Or on any specifications as to the contents? A. No, sir, when we have a specification we decline to accept it, we furnish Manganese steel and guarantee the steel.

Q. But do not manufacture on specifications? A. No, sir, we do not guarantee the analysis.

Q. Well, but do you represent the analysis or disclose it? A. No, sir.

Cross-examination by Mr. Corbin.

Q. Then you undertake to furnish a uniform product, do you? A. We undertake to furnish a product for the purposes for which it is to be used.

Q. And you tell the steel maker what you want? A. Yes, we tell the steel maker the purpose for which it is to be used.

(*Mr. Corbin.*)

Q. Who determines—who in your concern determines what the percentage shall be?

MR. LINDABURY—I object to the question as not cross-examination.

(*Court.*)

Q. Do you know who furnishes the formula that they use in making this steel? A. The formula has been established by our practice.

(*Mr. Corbin.*)

Q. Then you have a standard formula for Manganese steel? A. I say we adapt our steels to the purposes to which they are to be used.

Q. Who determined which particular type of Manganese steel shall be furnished for the order? A. Well, that is determined by our experience in the matter.

Q. Whose experience? A. The combined experience of the manufacturer.

Q. You do not hold a meeting of the directors? A. Certainly not.

Q. Mr. Brinton or Mr. Christie, or whoever it is, determines it when the order comes in? A. The formula has been established by practice and experience.

Q. Well, do you determine it when you get the order? A. No, sir.

Q. Who do you give the order to? A. To our steel works department.

Q. To what individual? A. It goes through the course of business there; it passes through various hands.

Q. Do you know whether Mr. Christie settles the particular product, or which particular one of your standard manufactures shall be applied to a particular order? A. He may be consulted, possibly.

Q. Who decides it? A. I cannot say positively, it is decided in conference as a rule, I take it.

(*Court.*)

Q. Are you there yourself—what do you mean by "I take it"—do you know anything about it? A. Personally, no, sir.

GEORGE J. SIEDLER, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. Where do you live? A. At Highbridge.

Q. What is your business? A. Assistant general sales agent of the Taylor Iron and Steel Co.

Q. How long have you been in that position? A. Well, with that title, only about a couple of months, but I have been in that capacity for several years.

Q. What are your duties? A. My duties now are the general direction of the order department, so far as the main office is concerned, the handling of orders in the office, and the direction of the salesmen, subject to Mr. Sherrerd's over-power.

Q. You have the direction of the salesmen subject to his overruling wisdom? A. Yes, sir.

Q. Have you ever been on the road? A. Yes, sir.

Q. How long have you been on the road? A. I was on the road the greater part of five years.

Q. Selling the products of the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Where have you traveled? A. From the Hudson River to the Pacific Coast, and from the Lakes to the Gulf of Mexico.

Q. Do you know who the principal users of Manganese steel in this country are? A. Yes, sir.

Q. What class use it? A. A class of gold dredgers, really special work, the parts of crushers and mills that is subjected to severe wear and strain, and also in soft and field work.

Q. Is Manganese steel specially adapted for that kind of work? A. Yes, sir.

Q. Why? A. Because of its great toughness and tensile strength.

Q. Do you know what percentage of this trade is supplied by your company? A. By actual figures, no, but it certainly is a very large percentage.

Q. Well, can you approximate it? A. Well, it is rather hard to be general in all this class of thing.

Q. Well, separate them? A. In the dredging work probably ninety-five per cent. of the continuous bucket line, elevating dredges, have some of our Manganese steel or other special steel castings in service. Of the hard stone crushers, ninety per cent. of the output is handled by some of our special steel castings in some phase or other. As for the soft and railroad work, I do not have any method of judging.

Q. How many other manufacturers are there making or putting on the market, if you know, Manganese steel under that name or some other name in this country? A. I think I have heard of six or eight. I don't know that I ever counted them up. There is the Buckeye Steel Castings Co., of Columbus, Ohio, a concern at Portland, Oregon, the Western Engineering Works, I think they call themselves; there is the Isaac G. Johnson Co., the Pennsylvania Steel Co., the Busurious Company, the defendant company, the American Brake Shoe and Foundry Co., the Loraine Co., of Loraine, Ohio.

Q. Now, have you met in your work with any particular competition? A. I have run across the steels from some of these manufacturers, that have been offered, but from a competition standpoint—well, it is hard to be called competition.

Q. What percentage of the trade you referred to, as supplied by all these other manufacturers, would it all amount to? A. Well, one-half of one per cent.

Q. What do you mean by that? A. Well, I only know that in my travels I have only run into——

MR. CORBIN—I object to that.

(*Mr. Lindabury.*)

Q. What do you mean by that? A. Well, in all my travels, I have only run into these other so-called Manganese steels in a very small percentage of cases, and I have yet to find the first one where they have been successful.

Q. Do you take orders for the manufacture of steel as per formula or specifications? A. No, sir.

Q. How do you take them? A. We take them in many instances by sample, saying that we will put in a steel that will do the work economically at the price we ask for it.

Q. Do you ever receive orders under any specifications? A. No, sir, not as to analysis.

Q. What do you do if they send an order of that kind? A. We send them back, telling them we will fill the bill but will not guarantee the analysis.

Cross-examination by Mr. Goode.

Q. Do you know all of the customers of the I. G. Johnson Co.? A. I would not undertake to say that.

Q. Do you know the output of the I. G. Johnson Co.? A. No, sir, I do not.

Q. Do you know the output of the American Brake Shoe and Foundry Co.? A. No, sir, I do not.

Q. Do you know the output of the Pennsylvania Steel Co.? A. In what way, in tonnage?

Q. In tonnage of Manganese steel? A. I have seen the figures.

Q. Do you know of your own knowledge? A. Not by personal inspection.

Q. Do you know the output of any of these other steel foundries that you have testified made Manganese steel? A. I know about what they were turning out.

Q. Have you been through the foundry? A. No, sir, I have not been through the foundries.

Q. Then you do not know what their facilities are for turning out work? A. I know about the size of their plants and what their facilities are.

Q. How do you arrive at the conclusion that all of the foundries combined furnish about one-half of one per cent. of the total Manganese steel trade? A. I did not limit that to the total Manganese steel; I said special steel castings, and the answer that I offered was based on my personal observation and the observation of our salesmen in the field, as to the prospects that there were in the field, and the number of them that we have on our books.

Q. You don't know all the customers of the defendant company, do you? A. I would not attempt to say that.

Q. You don't know all the customers of the I. G. Johnson people, do you? A. I know a good many of the people that use the Johnson steel.

Q. It was just a guess on your part to say that one-half of one per cent. would cover all the combined product of these foundries you have mentioned? A. I would not call it a guess, it was not computed, it was an opinion.

Q. I want to know upon what you base that opinion? A. I have already stated that.

Q. From the conversations with your own customers? A. In part, yes, sir.

Q. Did you ever get an order from a customer which required the physical conditions of Manganese steel castings, without exact specifications? A. What do you mean by that?

Q. Why a physical specification—I don't mean as to the analysis. A. Do you mean as to strength?

Q. Yes, toughnes and hardness? A. No, sir.

Q. How about the Government? A. I think that

we have never furnished the Government with more than trial lots of Manganese steel.

Q. Did you ever furnish any castings for gunboats or torpedo boats? A. I don't know, but I think we have.

Q. Then you don't know anything about what the specifications were? A. No, sir, I never saw them.

Redirect by Mr. Lindabury.

Q. Did you furnish Manganese steel to the Government, for those parties—you did not make any shells of the Manganese steel, did you? A. We did not make any shells of the Manganese steel.

WILLIAM Y. MOFFET, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. Where do you live? A. Scranton, Pa.

Q. What is your business? A. I am superintendent of the Scranton Steam Pump Co.

Q. What is the business of that company? A. Building steam pumps, shaking grates and general repair, and sometimes breaker rolls, and I was manager of the Scranton Machine Works——

Q. How long have you been with the pump company? A. One year ago last September.

Q. Before that you were with the Scranton Machine Works? A. Yes, sir.

Q. How long? A. One year.

Q. What was your business before that? A. Foreman for the Erie Railroad Locomotive Shop.

Q. Where? A. At Dunmore, two miles from Scranton.

Q. Have you had experience in the repairs and

building of machinery, crushing machinery? A. Yes, sir.

Q. What kind of crushing machinery have you built? A. Coal crushers and rock crushers.

Q. Have you used any different kinds of steels for the crushing rollers? A. Yes, sir.

Q. What sort of steel have you used? A. They use different makers steels, tempering steel, for the inserting of teeth, and we have used the Manganese steel of the Taylor Iron and Steel Co., and we have had a sample of other steels that we did not take.

Q. What was the sample of steel you refer to? A. The Benjamin Atha flint steel—they sent it on for a trial and we found it was not up to the standard for workmanship or hardness, and we did not keep it.

Q. What others? A. There were others that came to see us, but by the reports we had of them we did not think it worth while to put it on.

Q. What others have you used? A. Carpenters steels, and the different steels for turned teeth, and we then tempered them afterwards and put them in ourselves.

Q. How did you do that? A. We just tempered them and hardened them in water, you know.

Q. What different ones have you used? A. We generally got them from the Scranton Rock Forge Company, and we didn't always specify any particular steel.

Q. And you did the tempering yourself? A. Yes, sir, we did the tempering ourselves.

Q. And you had a treatment of your own? A. Yes, sir, sometimes we would add a little salt in the water, and by heating it, and tempering them, after they were heated the boy would drop them in the water——

Q. From which did you get the better result, the

steels you got and tempered yourselves, or from the Manganese steel? A. The Manganese steel.

Q. Was it substantially better? A. Oh, yes, sir, four or five to one.

Q. In wear? A. Yes, sir, in fact the customers always specified after they had had a trial of that steel, they always specified the Taylor and Company's steel.

MR. GOODE—I object to all this and move to strike out the answer as hearsay.

COURT—I will let the answer stand.

Cross-examination by Mr. Goode.

Q. Did you ever use any other Manganese steel than the Taylor Iron and Steel Co. Manganese steel? A. Well, it was not called Manganese steel, it was called Flintstone.

(*Mr. Lindabury.*)

Q. Do you know whether that was claimed to be really a Manganese steel? A. No, sir, they did not claim that it was a Manganese steel, they claimed that it was equal, but it did not show up at all equal.

Q. They claimed it was as good as Manganese steel? A. It was supposed to be, but it was not.

JOSEPH B. VANNAN, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. Scranton, Pa.

Q. What is your occupation? A. Superintendent.

Q. Of what? A. G. & H. Repair Shops.

Q. What is the business of these shops? A. The manufacture of all kinds of mining machinery.

Q. Is there any need in the manufacture of the machinery there for steels that would wear very long? A. Yes, sir.

Q. For what special use? A. For rollers for the breakers.

Q. Have you tried different kinds of steel for this purpose? A. Yes, sir.

Q. What sorts of steel have you tried? A. We get most of our drop forge teeth or driven teeth rolls, and then I manufacture our rolls ourselves of cast chilled, and I use our Manganese steel.

Q. What is the drop forge roll—where do you get them? A. We just get the roller teeth, and then we turn them, and drive them and harden them ourselves.

Q. And you have cast steel of your own? A. Yes, sir.

Q. And Manganese steel? A. Yes, sir.

Q. And where did you get the Manganese steel? A. Of the Taylor Iron and Steel Co.

Q. Have you used any other steel than those you have mentioned? A. We tried the Chrome steel.

Q. Where was that made? A. I don't know, sir.

Q. Any others? A. No, sir.

(*Mr. Lindabury.*)

Q. Was it Chrome nickel steel? A. You could not turn it and it was too expensive to drive, and you could not make a perfect fit of it.

(*Mr. Hardin.*)

Q. What has been your observation as to the lasting qualities of these different steels that you have used? A. Well, the driven teeth roller will last two to one.

Q. Which steel roller? A. The Manganese steel roller.

Q. How about the other? A. About five to one; that is, a chilled roller.

Q. You mean that the Taylor Iron and Steel Co.'s Manganese steel as compared with the chilled roller that you manufacture? A. Yes, sir, the Taylor Company's Manganese steel compared with the chilled roller that we manufatcure, the Manganese steel will last longer.

Q. Which one will last the longer? A. The Manganese steel.

Q. The Taylor Iron and Steel Co.'s Manganese steel? A. Yes, sir.

Q. You manufacture sheave wheels, do you? A. Yes, sir.

Q. What are those wheels for? A. When I first started I manufactured cast iron sheave wheels.

Q. What is a sheave wheel? A. Well, you take a twenty or twenty-eight-inch rope, and we have run a cable a mile under ground, and I wanted to use my father's patent of a chilled grooved wheel, the groove is chilled, and I tried it, and it lasted about three times as long as the others. But we got some Manganese steel sheaves and put them in, on the 15th of last June, and I went down to see them the latter part of this month, and they didn't show any wear at all. I have a sample here of a three months' wear of a cast iron sheave (handing sample to counsel).

Q. What kind of stuff is that made of? A. A cast iron chilled sheave.

Q. Of your father's patent? A. Yes, sir.

Q. And did it begin a perfect circle—was it a perfect circle when you began with it? A. yes, sir.

Q. And the grooves that have been worn in it, are all done by a three months' use of it? A. Yes, sir.

Q. Now, the Manganese sheave that you have had in use for eighteen months shows no wear at all? A. No, sir.

Q. How long have you been using the Taylor Iron and Steel Co.'s Manganese steel? A. Well, they have been about seven years that I have used it myself; I have been superintendent of the place for seven years but we did get some; Allis and Chalmers got it for us.

Q. Do you know where the Allis and Chalmers people got it? A. I cannot say, no, sir.

Q. Have you made any efforts to use any other manufactured steel than the Manganese steel of the Taylor Iron and Steel Co.? A. No, sir.

(No cross-examination.)

Thomas B. Mitten, a witness produced in behalf of the complainant, being duly sworn according to law, on his oath saith:

Examined by Mr. Hardin.

Q. Where do you live? A. West Pottstown, Pa.

Q. What is your occupation? A. Superintendent of the Pottstown branch of the Vulcan Iron Works.

Q. Located at West Pottstown? A. Yes, sir.

Q. What is it the Vulcan Iron Works manufacture? A. Breaker machinery and cement machinery.

Q. Crushing machinery generally? A. Yes, sir, crushing machinery generally.

Q. What do you use for the jaws of your crushers and crushing rollers? A. We use cast chilled rollers, and driven steel teeth rollers, and Manganese steel rollers.

Q. Are you using them all at the present time? A. Yes, sir.

Q. What Manganese steel have you used? A. The Taylor Iron and Steel Co.

Q. Any other? A. We had one pair of crushers, made of Manard steel.

Q. Do you know where that came from? A. The Pennsylvania Steel Co.

Q. Did you try them? A. We made the rollers for the coal company.

Q. Do you know about their use? A. I have seen them once since they were put in use, but they haven't been used very much. We put them in about two years ago, it was for running the refuse of a culm-back in the mines, but the conditions were such that they were not ready to operate, and we started and ran about six months——

Q. Have you used any other makes of steel than the Manard and the Taylor Iron and Steel Co.'s Manganese steel? A. Nothing but the chilled steel and what we called the driven steel tooth rollers, driven in a cast iron bed.

Q. Do you harden or temper those yourselves? A. Yes, sir.

Q. What has been your observation in the use or wearing qualities of these various materials you have referred to, and which is the best of the three you mention? A. Well, the Manganese steel is about two to one, in the driven steel tooth rollers, and I should think about three to one in the cast chilled steel rollers. That is one pair of the Taylor Iron and Steel Co.'s rollers will wear as long as three pair of the cast chilled rollers, that is, they will break off with hard usage.

Q. How about the Manard steel, what has been your observation as to the wear on those rollers, at the time you saw them? A. Well, they had not been used enough to tell anything about it. They called my attention to them, and said that they thought they were chipping off, and I went to look

at them, and it was some little blow holes in the castings; they were not chipping.

(No cross-examination.)

COMPLAINANT RESTS.

Wesley G. Nichols, being duly sworn according to law, on his oath saith:

Examined by Corbin.

Q. Where do you reside? A. At the present time, in Philadelphia.

Q. What is your age? A. Thirty-eight last May.

Q. Are you married? A. Yes.

Q. Have you any children? A. I have two.

Q. What are their ages? A. Eighteen and fourteen.

Q. Are they daughters? A. Both daughters.

Q. They are living with you and your family? A. Yes, sir, they are.

Q. What is your occupation? A. My occupation is that of a steel-maker.

Q. How long have you been engaged in that occupation? A. Since 1885.

Q. Have you any other trade or profession? A. I have not.

Q. When did you first begin the business of making steel? A. In the fall of 1885.

Q. In what capacity? A. In the capacity as laborer.

Q. You were then under age? A. Yes, sir, I was then under age.

Q. Where were you employed? A. At the Glasgow Steel Co., Pottstown, Pa.

Q. What was your employment there, at first? A. A laborer, in the labor gang, wheeling slag away from the converters.

Q. What next did you do? A. Then I was helping on the converters for a while, and then, after that, helping on the cupola.

Q. You were employed as helper on the cupola? A. Yes.

Q. How long were you there? A. I presume I was on that work for six or seven months.

Q. And then what did you do? A. Then I had charge of the cupolas.

Q. You were put in charge of the operations at the cupola? A. Yes, sir.

Q. What was that position—was it a position as foreman? A. Well, we had two cupolas there, and I was supposed to take care of the melting and tapping of the materials.

Q. And how long did you operate the cupola? A. I operated the cupola in the neighborhood of a year, I think, as near as I can recollect.

Q. This was steel-making? A. It was one of the processes of steel-making.

Q. In the process of steel-making? A. Yes, sir.

Q. What was your next employment, after being a year in charge of the cupola? A. I then went to learn the blowing or converting of the steel.

Q. That is at the converter—was it not? A. Yes, sir.

Q. What was your position there? A. My position was that of assistant foreman.

Q. You were foreman in charge of the operating of the converter? A. I was foreman in charge of the Bessemer—no, not the Bessemer process, it was of the Clapp-Griffith process.

Q. How long were you foreman operating the converter? A. I think it was nearly two years.

Q. That was the Bessemer process? A. It was a pneumatic process.

Q. Not the Bessemer process? A. Not the Bessemer process, it was a side-blowing process, in-

stead of the air going in at the bottom of the converter, it came in at the side of the converter.

Q. It was a similar process? A. The principle was quite similar.

Q. At the end of the year, what became of the plant? A. The plant closed down; it was not a very profitable investment.

Q. About when was that? A. That was in 1888 or 1889, I think.

Q. Now, what was your next employment? A. The Chester Steel Co.

Q. When was that? A. In 1889.

Q. A rolling mill company, was it not? A. Yes, the Chester Rolling Mill Co.; later on it was called the Wellman Steel and Iron Co.

Q. It was changed later on to the Wellman Steel and Iron Co.? A. Yes, sir.

Q. Now, what was your occupation in that employment? A. I went there with the view of taking charge of one of the turns in the manufacture of the steel.

Q. You were a foreman, then? A. Yes, sir.

Q. How long were you employed by them? A. In the neighborhood of five years.

Q. What happened then? A. During the depression the plant closed down.

Q. During the depression of 1893? A. 1893 and 1894, yes, sir.

Q. The panic of 1893, they closed down? A. Yes, sir.

Q. And you were there foreman for about five years? A. Yes, sir, I was their foreman for about five years.

Q. Now, what was your responsibilities in that establishment? A. Well, we had the general routine of the steel-making business to look after, the matter of making up our mixtures; we had to observe the analyses of the material in the iron

yard, seeing that it was charged into the cupolas properly; seeing that it was advanced from there to the converters and converted into steel; and from there poured into the bowls in the pits, and from there to the blooming mills.

Q. Did your responsibilities change any while in that position? A. Well, later on our superintendent was compelled to leave us, and Mr. Brinton and myself had absolute charge of the place; that was for about, well, probably six or eight months before the plant closed down. He went on for one turn and I another.

Q. Was Mr. Brinton there when you went there, or did he come later? A. He came there a few months later—that is, Mr. Brinton was employed by the company at that time but not in that department.

Q. Then when you were in charge of one of the turns you met Mr. Brinton, then at that place; now, had he had any experience up to that time in the steel business? A. Not in the method of making steel, not to my knowledge.

Q. Now, when he started at the work there, was he under your direction? A. He was.

Q. And there were two turns? A. Yes, sir.

Q. And he had one turn and you had one turn? A. Yes, sir—understanding, of course, that he was not under my direction totally in the beginning. Mr. Humbert, who was our superintendent, was associated with Mr. Brinton and myself at the same time.

Q. Well, he had one turn and you had another? A. Yes, sir.

Q. And you had no superintendent there? A. We had a superintendent, yes.

Q. I thought you said the superintendent left the business? A. Oh, that was at the latter part of

the time they were running, within six or seven months of the time they closed down.

Q. After he left, you had the whole responsibility of it, had you not? A. Mr. Brinton and myself, practically speaking.

Q. Did he continue there as long as you did? A. Mr. Brinton was there a short while after I left.

Q. Now, after you left there, where did you go next? A. After I left there I went to the Pottstown, Pa.

Q. What were you doing there? A. Doing comparatively nothing for about eighteen months; I was working at almost anything.

Q. What was your next employment? A. With the Taylor Iron and Steel Co.

Q. On whose recommendation did you go there? A. Mr. Brinton's.

Q. He was there before you were? A. Yes.

Q. He was employed there first? A. Yes, sir.

Q. Now, in what capacity did you go there, or, first, when was it, what date? A. In 1896.

Q. March, 1896? A. Yes, sir, March, 1896.

Q. In what capacity did you go there? A. Assistant superintendent, I supposed.

Q. And Mr. Brinton was the superintendent? A. Yes, sir, he was.

Q. Now, you were employed then under a six-year contract, were you not? A. Yes.

Q. Expiring in March, 1902? A. Yes, sir.

Q. At the time of your employment, did that period have any connection with the expiration of the Hadfield patents? A. I understood so.

Q. The Hadfield patent expired then? A. In 1902, yes, sir.

Q. And your contract expired at the same time? A. Yes, sir.

Q. Was there a written agreement? A. There was an agreement pledging secrecy, so far as the

Hadfield process was concerned; I think that is what it embraced.

(*Mr. Lindabury.*)

Q. There was an agreement as to the Hadfield process, the secrecy agreement? A. That is what I had reference to.

(*Mr. Corbin.*)

Q. Now, when you went there, was there any representative of the Hadfield establishment there? A. No, sir.

Q. Had he lately left there? A. He had left one or two months, I think, before I came there.

Q. And you took up the work then, at that time? A. Yes, sir.

Q. Now, in March, 1902, was there any new contracts made? A. No, sir.

Q. You continued in the employment, did you? A. I did.

Q. Without any further contract? A. Yes, sir.

Q. Then you were paid, how often? A. Weekly.

Q. How long did that continue? A. That continued until March, 1905.

Q. Now, in March, 1905, did you have some negotiations with an officer of the American Brake Shoe and Foundry Co.? A. Yes, sir, I did.

Q. About entering their employ? A. I did.

Q. And what did you decide to do? A. I did not decide at the time that the representative called on me, but I had decided a few days later, after consideration, that I would make the change, that I would go with the American Brake Shoe and Foundry Co.

Q. I am talking now about March, 1905? A. I had decided to go, that is, I had decided in my mind that I would make the change, but that I had not made known to anyone,

Q. Then when you did communicate that to anyone—in March, 1905? A. I did not communicate it to any officer of the Taylor Iron and Steel Co., that I intended leaving, positively.

Q. You did not tell them that you intended leaving? A. No, sir, before I had an opportunity to do so, I was called away from the plant suddenly.

Q. When was that? A. March 12th, 1905, on Monday.

Q. What was the occasion of that? A. The serious illness of my sister.

Q. Then you went to your sister on that day, that is, Monday, the 13th of March, 1905? A. Yes, sir.

Q. And where was she? A. At Collinswood, near Camden, about six miles from Camden, I think.

Q. You went there on Monday, the 13th of March? A. Yes, sir, Monday afternoon, the 13th of March.

Q. And how long did you remain there? A. I remained there until the following morning.

Q. What was the result of your sister's illness? A. She died at six o'clock Tuesday morning.

Q. After her death, did you return the same day to Highbridge? A. Yes, sir.

Q. And when you got back did you have a conversation with Mr. Brinton? A. I did that night.

Q. That is the night of Tuesday, March 14th? A. Yes, sir.

Q. What did you tell him? A. I told him that my sister had died, and that it changed matters materially. And I told him that I would have to appeal to him for some financial help, and he appreciated the fact, that my mind was changed on certain lines, particularly that I felt the change would necessitate my staying at Highbridge, and he told me that the company would help me——

Q. Did you tell him at that time of the negotiations you had had? A. Yes, sir.

Q. That was the first time you had told him of them? A. That was the first time I had told Mr. Brinton——

MR. LINDABURY—I object to this evidence, I think you should give the conversations, not the results.

(*Mr. Corbin.*)

Q. What was that conversation with Mr. Brinton? A. I told Mr. Brinton that I had decided to go with the American Brake Shoe and Foundry Co. and that I had intended telling him as much on the Monday morning, but had been prevented from telling him on account of the sudden message that I had received from Collinswood, but I said that, owing to the death of my sister, and to other circumstances connected with the same, I felt that I would have to remain there and I stated my reasons for so doing——

(*Mr. Lindabury.*)

Q. Give the conversation, tell us what it was you said to him? A. I told him that I was in financial straits, and that I needed money to take care of affairs there, and he told me that he would do it willingly, but that he need not do it, that the company would like to do it, and I felt very well satisfied, and when I told him that I thought of remaining with the Taylor Iron and Steel Co., irrespective of certain conditions, he said that the company would appreciate it, and advance my salary, and he stated at the same time, he said, "Wes, you will have a contract to sign for a certain period of time." He did not state what that contract would embody,

that was virtually the end of the conversation, except that there might have been some further little remarks made afterwards, but so far as the business with the company was concerned, that was the end of it.

(*Mr. Corbin.*)

Q. Did you say that you had seen the representative of the American Brake Shoe and Foundry Co.? A. Oh, no, sir; I told Mr. Brinton that night that I had met the representative of the company.

Q. Now when was that? A. Oh, that was about the 7th or the 8th of March, that was the beginning of the thing. I told Mr. Brinton that I had met the representative of the American Brake Shoe and Foundry Co. and I told him what they had offered me.

(*Mr. Lindabury.*)

Q. Give the conversation in full—not your conclusions? A. Well, I went in to see Mr. Brinton and told him that I had received an offer from a member of the American Brake Shoe and Foundry Co., or the general superintendent I should say, and he was very much surprised, and I told him what it was——

Q. Give the conversation; you say he was very much surprised—what did he say? A. Well, I have to connect it a little bit, you know.

Q. You said you told him what it was—tell us what it was you told him? A. I told him—why, it struck me so comically, that I began to ridicule the consideration, and when I told him the amount that they had offered me, $5,000 a year—I told him that they had offered me $5,000 a year, and then after we got into the office again, he said to me, "Well, now, I can't stand in your light, it is a good propo-

sition, and I cannot see how you are going to ever reach that proposition here, for the time being at least," and later on he said that if I could put up a proposal to the company whereby I could get $15,000 or $18,000 on a three-year contract, then he thought I would look at it in a different light. Well, I think the conversation dropped at that, and I told him that I had stated to Mr. Snow that by Thursday I would write and tell him my conclusions about the matter, and there was nothing much said after that, up until the time I wrote to Mr. Snow. No, I think in the interval I saw Mr. Christie—yes, that was it—I saw Mr. Christie, and Mr. Christie told me that he was not in a position to make any offers to me, that he could not think of making any offers, that may be presented to their employees by parties desirous of getting some of their men, and he hoped that I would consider it well, and he said that my future was fixed there with them at Highbridge, etc. Well, I don't think there was very much talk about it until the Thursday night following when I saw Mr. Brinton—we did not discuss it very much after that, any more than that I know Mr. Brinton told me that it was something that I should consider——

(*Mr. Corbin.*)

Q. Then on your return from Collinswood on Tuesday, the 14th of March, you then told Mr. Brinton that you were inclined to refuse the offer, did you not? A. Yes, sir.

Q. And remain at Highbridge for certain reasons? A. Yes, sir.

Q. And that was connected with the death of your sister, was it not? A. Yes, sir.

Q. The reasons? A. Yes, sir.

Q. Then you say he told you that they would give

you an increase of salary and let you have some money? A. Yes, sir.

Q. But that you would have to sign a contract? A. That they would give me an increase of salary, and I would have to sign a contract; yes, sir.

Q. Now then that was Tuesday night—on Wednesday morning, what took place in reference to this matter? A. I was advised to go to the steel office on the following morning, to get a check for the money necessary for the expenses, and I went to the steel works, I think about ten o'clock that morning, and I talked the matters over a little bit, and Mr. Brinton told me that Mr. Christie was not quite ready for me at the office ,but that he thought he would be ready very shortly, and I remained there for quite a while, and Mr. Brinnton on one or two different occasions 'phoned to the main office, asking them if they were ready to present a proposition to me, as my time was limited, as I had to go away on the 1.37 P. M. train that afternoon.

Q. How far off was the station? A. The way I had to go, it was at least three quarters of a mile.

Q. Was anyone going with you? A. Yes, sir; my family and children expected to go on that train.

Q. And you were going to get them and take them with you? A. Yes, sir, that was my intention.

Q. And you were waiting there to get this check, were you? A. Yes, sir.

Q. What then took place? A. Well, about twelve o'clock we got to the main office, I was ushered into Mr. Christie's room along with Mr. Brinton, and we sat there quite some time. Finally, I found the time was getting late, and I presume they noted my anxiety relative to the matter, and then Mr. Christie left the room, and came back again with the contract in his hand, and I cannot

recall whether it was the original contract or a copy, but I thing it was probably the original——

Q. Up to that time, had you been consulted about the terms of the contract? A. I had not.

Q. Had you seen it? A. No, sir, I had not.

Q. This document was produced then and two copies, was it not? A. Only the original I saw that day, I think—I think it must have been the original, because it was the one executed that day.

Q. What took place? A. Well, I looked it over, and it was quite a lengthy contract, and I don't think I consumed more than two or three minutes in looking it over;I just gazed on the contract, and as I was reading it over, I asked Mr. Brinton whether he thought it was all right, and he said he thought that I could sign it for twenty-five years——

Q. What did he say? A. He said that.

Q. Did you have a chance to read it? A. Not as I should have read it. I looked it over. I could not look over a contract of that description in two or three minutes, not a contract of that character, and give it proper consideration——

Q. It was brought in to you typewritten? A. Yes, sir.

Q. Was that the cause of the delay, the typewriting of it? A. Yes, sir, they said so.

Q. Who told you that? A. I was told that it was not compared, it was not ready for me.

Q. It was brought to you for signature—how much time afterwards, did you have to get your train? A. Well, I presume I had three quarters of an hour or a little more than that.

Q. Now, did you have the check brought to you at the same as the contract was produced to you? A. After the business had transpired, after I signed the contract.

Q. Was it a check or cash you got? A. A check.

Q. How did you get the money on that check? A. I had to go to the bank and get it.

Q. You had to get this check cashed, and get your family and then get to the station? A. Yes, sir—my family did not get down on that train, they could not get there, it kept me busy to get there.

Q. Your family failed to get that train? A. Yes, sir, my family failed to get that train, and they followed on the following train.

Q. Did you get any dinner before you left? A. No, sir.

Q. You say you asked Mr. Brinton about the contract, what did you ask him in regard to it, and what did he say about it? A. When I was signing it?

Q. Yes, what did you ask him in regard to it, and what did he say to you about it? A. He told me I could sign it for twenty-five years, that it would be all right.

Q. Did you take a copy of the contract with you? A. If I did, I did not take it over to Collinswood with me, I cannot recall that very clearly.

Q. You had it some time—that is, there was a copy furnished to you? A. It might be possible that I took a copy with me, and left it at my home, because I was not thinking of the contract or its contents when I left the place to go to Collinswood.

Q. You went to your sister's funeral that same day? A. Yes, sir.

Q. You got the train? A. Yes, sir.

Q. Up to that time had you read the contract through? A. No, sir; that is I had not digested the contract, I simply glanced over it.

Q. When did you return to Highbridge? A. The following Sunday night?

Q. Did you then examine the contract? A. Yes, sir.

Q. After your return? A. After my return.

Q. Now, then, what did you do in regard to it; did you see Mr. Brinton in regard to it? A. Not until the Monday morning.

Q. And what took place between you and him then? A. It was either Monday morning or Tuesday morning, at all events it was the first opportunity that I had had to get with him, so as to have a talk with him, and I told him that the contents of the contract was not at all satisfactory to me; that I had looked it all over, and I said that the contract embraced things that tied me up materially, and that the contract did not suit me under any circumstances.

Q. And what did he say? A. He said it was all right, that I would be there anyhow for five years with him——

Q. What did he tell you about the validity of the contract? A. He told me that he did not think it would hold water.

Q. Did you have the contract with you when you went there? A. When I went to see Mr. Brinton?

Q. Yes? A. Yes, sir.

Q. What did you do with it? A. I put it on his desk.

Q. Did you later have any conversation about your contract with the company, and if so how long after? A. We did not discuss the question much, until probably ten days or two weeks after, and then the question was brought up again when a like proposition was presented to Mr. Brinton.

Q. What did he tell you about it? A. About the proposition that had been presented to him?

Q. Yes?

MR. LINDABURY—I object to the question as immaterial and incompetent, he cannot bind us by declarations with regard to a proposed contract with Mr. Brinton.

COURT—How is it competent? How can you bind this company about what their agent said about his company?

Objection sustained.

(*Mr. Corbin.*)

Q. Where you there in the next few months? A. Yes.

Q. In the month of July, were you engaged in the foundry? A. Not the month of July, I was ill.

Q. And where were you? At home? A. Yes, sir.

Q. At Highbridge? A. Yes, sir.

Q. Now, during that period, did any change in your relations with the company come up, and if so for what occasion? A. Some personal difficulties between the management of the concern and myself—yes, sir; personal difficulties.

Q. And did that induce you to wish to leave the employ of the company? A. It did.

Q. Those personal matters of your own? A. It did.

Q. Had it anything to do with the American Brake Shoe and Foundry Co.? A. No, sir.

Q. How large a place is Highbridge? A. Oh, about 1,600 or 1,800 inhabitants, I think.

Q. Is there any other concern there except the Taylor Iron and Steel Co., any important manufacturing concern? A. Not of any importance.

Q. Now, what did these personal matters that you refer to—how did they affect the desirability of Highbridge as a place of residence for you? A. It made it a very undesirable place to reside in with a family.

Q. So far as your family were concerned? A. It was simply unbearable, that I had unfortunately been connected with a matter that had been made so public that it was absolutely unbearable, not only for myself, but my family to remain there any longer.

Q. What action did you take with reference to your further employment? A. I tendered my resignation on July 31st.

Q. Had you prior to that time sought employment from the American Brake Shoe and Foundry Co.? A. I had corresponded with them a short while before that.

Q. With whom—do you remember with what individual? A. I think with Mr. Snow.

Q. In March, 1905, when you determined not to leave the employ of the Taylor Iron and Steel Co., at that time, had you communicated that to anyone in the American Brake Shoe and Foundry Co.? A. I did.

Q. Now, did you have any further communication with them, before you applied to them for employment? A. I did not.

Q. Did you in July call on any officer of the company? A. The latter part of July.

Q. Do you know the date? A. I cannot recall the date.

Q. Was it the latter part of July? A. Yes, sir, it was the latter part of July some time.

Q. Whom did you see? A. I saw Mr. Snow, I saw Mr. Cutler, and I saw Mr. Gallagher.

Q. Mr. Cutler, the president of the company? A. Yes, sir.

Q. Where did you see Mr. Cutler? A. In his office or the office of the company at 170 Broadway, New York City.

Q. That is the office of the American Brake Shoe and Foundry Co.? A. Yes, sir.

Q. Then you applied to him for employment? A. Yes, sir.

Q. Now, at that time, was there any proposal of term? A. No, sir.

Q. Did you mention the fact that you had signed a written contract in March previous? A. Yes, sir.

Q. Did you have the contract with you at that time? A. I am not very sure that I had it with me at that time, but I may have sent it over afterwards.

Q. What did Mr. Cutler tell you with regard to considering your application while in the employ of the Taylor Iron and Steel Co.? A. Mr. Cutler told me that when I was free to accept a position —well, now, I cannot recall his exact words—but I should have to be absolutely free to accept a position with them before they would make any contract with me.

Q. Did you accept any proposal? A. No, sir.

Adjourned to Wednesday, December 5th, 1906, at 10 A. M., at Newark.

DECEMBER 5, 1906.

WESLEY G. NICHOLS, recalled in his own behalf, his direct examination resumed, saith:

Examined by Mr. Corbin.

Q. At the close of the last examination you were referring to an interview with Mr. Cutler, and you said something about accepting an offer—I understood you also to say that no terms were agreed on? A. No sir.

Q. Then the offer was an offer to enter their em-

ploy? A. If I was free to enter their employ, if I was not employed by another company.

Q. Now then, did you present your resignation to the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Now, you had an interview with Mr. White and Mr. Christie? A. I did.

Q. What took place at that interview? A. Mr. White and Mr. Christie called at my house on a Wednesday night; I think it was August 2d, and they came with the view to tell me that it was simply impossible for me to leave Highbridge and stated why; that I had signed a contract, that I was bound to observe that contract, and if I thought of leaving Highbridge they would immediately serve an injunction. I stated to them how impossible it was for me to remain there, but they did not appear to give that any consideration, only in this way, that the difficulties could very easily be adjusted, that they would see Mr. Brinton and have a talk with him about the matter, and let me know later on as to their conclusions. But I knew full well Mr. Brinton's conclusions along these lines, and I knew the difficulties they would have ot contend with.

Q. What was that? A. Why the proposal was this——

Q. I am talking now about what they would permit you to do? A. Oh, they felt that I could go back to the plant and adjust the conditions with the two parties in question that I had had the difficulties with, and that it would be all satisfactory to all concerned. And I told them I did not think those matters could be adjusted in that way with Mr. Brinton, and they thought they could. And Mr. White stated that in any event, whether it turned out good or bad, that I could not leave, and that I could not go to work anywhere or do anything, I could not even peddle pencils or work in the streets, or any-

thing at all, and they said that unless I gave a decided answer that night they would serve me with an injunction early in the morning—that is the substance of it, as nearly as I can recall it.

Q. How long were they there? A. I should judge to about ten o'clock or a little later.

Q. What did you tell them finally? A. I told them that I would write to the American Brake Shoe and Foundry Co., that I had no other alternative; they did not feel disposed to leave until I gave them an answer of some description.

Q. Did you tell them you would refuse the offer of the American Brake Shoe and Foundry Co.? A. I did not; no, sir.

Q. Did you afterwards apply to Mr. Cutler? A. I went to New York the following morning; yes, sir.

Q. And where did he—— A. I did not see any member of the American Brake Shoe and Foundry Co. until the following Saturday.

Q. And then did you see Mr. Cutler? A. No, sir, I saw Mr. E. J. Snow, general superintendent of the company.

Q. Was any agreement reached then? A. None whatever.

Q. What was done? A. The idea was to go to Chicago and look matters over, to look into the conditions and see if they were satisfactory to me, and then we were supposed to come to some sort of an agreement.

Q. Who made that proposition? A. Mr. Snow.

Q. That you should go to Chicago and look over their plant? A. Yes, sir.

Q. And then take up the question of employment? A. Yes, sir.

Q. Now, when did you start? A. We started August 5th, on a Saturday; I think it was August 5th, on a Saturday.

Q. And you went to Chicago? A. Yes, sir; I went to Chicago and I got there on August 6th, Sunday.

Q. From there did you go to the foundry of the American Brake Shoe and Foundry Co.? A. The Monday following, that was August 8th, if I recollect correctly——

Q. Does the American Brake Shoe and Foundry Co. have a number of plants? A. Yes, sir, but they have one in particular, the one that I have reference to is at Chicago Heights.

Q. How far is that from Chicago? A. I presume about twenty-three miles.

Q. You went out on the railroad? A. We went out on the railroad.

Q. Did you examine the foundry? A. I did.

Q. How many days were you there? A. I was there three days altogether, but not in the foundry; that was the total length of time; in fact I was not in the foundry very much at all.

Q. You were there long enough to see what was going on, were you? A. Yes, sir.

Q. How the work was going on? A. Yes, sir, how the work was going on.

Q. Did you take charge of the work? A. I did not.

Q. Did you give any information as to the way in which it should be done? A. No, sir, I did not.

Q. You were served with an injunction on August 9th, were you not? A. On Wednesday, August 9th, at Chicago, after returning from Chicago Heights.

Q. Now going back a little, did you tell Mr. Christie that you had been offered $7,000 a year and a block of stock worth $10,000? A. No, sir, I did not.

Q. Did you tell Mr. Brinton in regard to your offer? A. The first man connected officially with the company I told, if I recollect correctly, was Mr.

Brinton, and that was the Tuesday night before I signed the contract.

Q. You gave him the offer as you had received it? A. Yes, sir,

Q. What was it? A. I told him that the original offer was $5,000, and that I had asked $6,000, and before they granted that, before Mr. Cutler granted that, he stated that they made proposals at times——

Q. This was in March, was it not? A. Yes, sir, this was in March.

Q. Go on? A. That sometimes they offered these proposals to their employees; that they would be satisfied to give me the $5,000 a year, and that they would set aside $10,000 worth of stock and its dividends, the dividends derived from that amount of stock, would nearly offset for the additional $1,000 that I had asked for, and that that was one of the proposals——

Q. Would the stock be given to you? A. The stock would be set aside in my name, if I understood correctly, and the dividends only would be devoted towards its payment.

Q. Towards the payment of the stock? A. Yes, sir, towards the payment of the stock.

Q. They stated that? A. Yes, sir, and the dividends earned would offset for the additional one thousand dollars that I had asked them as salary, that was my understanding of it, at least.

(*Court.*)

Q. What did he say? A. Well, he said that.

(*Mr. Corbin.*)

Q. Now, during the time that you were employed by the Wellman Steel and Iron Co. you used the Bessemer process, I think you stated? A. Yes, sir.

Q. How many men were employed there? A. I should judge in the neighborhood of five hundred.

Q. Now, you became, as you have stated, familiar with the Bessemer process of steel making at that place, did you not? A. Yes, sir.

Q. Did you use Manganese steel, made in the Chicago Heights establishment? A. Yes, sir.

Q. Have you read some text books on the subject of steel making? A. I have.

Q. What is the latest that you are familiar with? A. Hebberd's Metallurgy of Steel, that is very complete, it gives everything in detail.

Q. Have you read any other works? A. There are other works—Prof. Howe's work, and a work of MacFarland's, and a work of Longmuir, and another of Campbell.

Q. Are you familiar with the Hadfield patents? A. I am not familiar with the Hadfield patents; no, sir, I cannot say that I am thoroughly familiar with the Hadfield patents.

Q. You have examined them, have you? A. I cannot say that I have.

Q. First, what is the quality of iron used in the Bessemer plants? A. It is an iron of various silicons running fairly low in phosphorus and sulphur.

Q. And does it contain Manganese? A. It contains a percentage of Manganese also; yes, sir.

Q. In addition to the supply of iron, what other stock is on hand, kept on hand? A. You would have coke, limestone, steel scrap and Manganese, ferro-manganese.

Q. What is the steel scrap—any other materials? A. These are the principal materials.

Q. Now, then, the first thing, take up the cupola, which has been sufficiently described—you are familiar with the processes of using that? A. I am, yes, sir.

Q. Is there any other cupola or fixture in the plant? A. Yes, sir, there is a small cupola, used for recarburizing.

Q. What is that called? A. It is called a recarburizing furnace or physic furnace, I should call it.

Q. What is that used for? A. That is used for increasing the chemical contents of the heat, after it is blown, for instance, carbon.

Q. You mean it is used for preparing the material? A. Yes, sir, it is used for preparing the material.

Q. What kind of material? A. You can melt iron in it, to increase the carbon, and you can melt spiegel, and you can melt ferro-silicon.

Q. Can you melt ferro-manganese? A. No, sir.

Q. Why, not? A. On account of its oxidizing Manganese to a very great degree.

Q. What do you use to melt ferro-manganese? A. Crucibles.

Q. Now, describe the Bessemer process? A. The Bessemer process, you first have an analysis of the iron—(interrupted)——

Q. Right here, were you familiar with the analysis of the materials used in the Taylor Iron and Steel Co.'s works? A. No, sir.

Q. Were those materials, the character of the materials submitted to you in advance of the operation? A. No, sir.

Q. Did you know of any secrets—if there were any secrets used in the processes, were you aware of them? A. I was not.

Q. What came to your hands; how did you know what materials to put into the cupola? A. That was all laid out in the forms from laboratory, it came to the weigh-master or foreman of the stock yard; I say it came in a way which designated certain piles——

Q. By number? A. By number, of iron, so many pounds from this pile and so many pounds from that pile, and in addition to it, steel scrap, a number of pounds, as given on the form, it was concentrated, taken up in the elevator to the cupola, and then the cupola was charged.

Q. How were the ingredients directed for the small cupola—in the same manner? A. Yes, sir, in the same manner.

Q. Did you know the secrets of those mixtures, if there were any secrets? A. I did not.

Q. How were they made up? A. They were made up by the chemist.

Q. Without consulting you? A. Without consulting me.

Q. Did you know what they were? A. I did not.

Q. In taking charge of the process of the manufacture of ordinary Bessemer steel, would you be furnished with any statement of the required product? A. At times, yes, sir.

Q. And what were the amounts taken to procure that result? A. It was an ordinary class of material, we charged an ordinary class of goods such as pig iron, scrap, etc. If it was a high grade of material, which required low phosphorus and low sulphur and iron, we would use it.

Q. You would use what? A. We would use the better material for the better class of goods required.

Q. What kind of material? A. Pig iron lower in phosphorus and sulphur.

Q. Would you have regard to the percentages of carbon in it and manganese? A. As far as the carbon was concerned, we did not very correctly observe that, that did not enter into calculations at all, silicon principally.

Q. Silicon principally? A. Yes, sir, silicon principally.

Q. And then limestone? A. Then limestone and coke.

Q. Now, how would these things be selected, how would you determine how much of each—were they weighed? A. They were weighed. For instance, we would have a number of irons in the yard containing various percentages of silicon. We had a quite high silicon, and we had a low silicon, and we had an intermediate silicon. And we would have to use a portion of each obtained from the yard, so as to keep the stock down, and at the same time we would have to introduce scrap and then get rid of the shop scrap. And we would calculate our silicon to get it at a certain point to give a certain amount of temperature, coming from the cupola to blow as nearly correctly as we could possibly get it.

Q. And that would make up your mixture? A. Yes, that would make up our mixture.

Q. And that would be charged into the cupola and melted? A. Yes, sir, that is charged into the cupola and melted.

Q. And then what was done with the material? A. The material was then tapped out into an iron ladle. That iron ladle is set on scales, so as to weight the charge, so as not to exceed a certain amount.

Q. And then what is done with it? A. From there it is transferred to the converter or vessel.

Q. The converter is in a horizontal position? A. Yes, sir, the converter is in a horizontal position.

Q. What is done then? A. The vessel is rotated, allowing the iron to run into the converter. After it is in the blast is started, which goes through the tuyeres. After it is started the vessel is then rotated, until the bath of metal is directly in the top of the tuyeres and the metal coming in contact with it.

Q. And that starts the flame? A. That starts

the flame, that starts the combustion and it comes in contact with the carbon.

Q. And you are driving out the carbon and the manganese? A. We are driving out the carbon and the manganese and the silicon.

Q. How did you know when to stop the process? A. When these elements are dark again you can see it by the flame, it practically disappears.

Q. Suddenly? A. No, sir, gradually.

Q. Now, would you have left in any carbon, sulphur and manganese at all? A. A very slight percentage of it.

Q. But you would diminish what was there originally? A. Yes, sir.

Q. That is the end of the blowing period? A. Yes, sir, that is the end of the blowing period.

Q. And that is the end of the use of the converter? A. Yes, sir, that is the end of the use of the converter.

Q. Now, in the process, was there anything in the process of operating the cupola, in the Taylor Iron and Steel Co., different from the Bessemer process you have described? A. No, sir, the principle is identical.

Q. Was there anything in the process of operating the converter other than the ordinary process? A. The principle is identical; there is no other way to operate it.

Q. What methods are adopted, in case the heat appears to be too great?

MR. LINDABURY—In ordinary practices you mean?

MR. CORBIN—Yes.

A. It means that temperature must be reduced, by so doing we would introduce other steel scrap——

MR. LINDABURY—I object to this unless it appears that this witness knows something about the process of the manufacture of steel elsewhere than at Highbridge.

MR. CORBIN—He has already shown that he has had charge of it for years and knows all about it.

COURT—I understand that he has described the Bessemer method of making steel, and in reply to Mr. Corbin's question, he says that the same principles are used at Highbridge as are used elsewhere. Now, you might ask him if he learned the method of making the Bessemer steel elsewhere than at the Taylor Iron and Steel Co.'s works.

(*Mr. Corbin.*)

Q. You mentioned two works where you were employed before going to the Taylor Iron and Steel Co.? A. Yes, sir.

Q. And you also saw it going on at Chicago Heights? A. Yes, sir, and I also saw it going on at the Ilinois Steel Co., South Chicago, at Edgar Thompson & Co., and at the steel works at Braddock, Pa.

Q. And you are also familiar with the description of it as found in the text-books? A. Yes, sir.

Q. Now, when the fire apears to be too slow, what is the element you put into it to raise the heat? A. Silicon.

Q. Silicon? A. Yes, sir.

Q. What is used for that purpose then in raising the heat?

MR. LINDABURY—I object to the question. I think this witness ought to testify at

least that he has seen somewhere else than at Highbridge these methods employed, stating where he has seen them, instead of saying what he calls a principle, and then saying that that is the same principle exactly as is employed at Highbridge.

COURT—The objection is, that he does not state where it has been used and where he saw it used, and if he is to be confined to its use at the Taylor Iron and Steel Co.'s works, then they propose to object to it.

MR. CORBIN—I asked at first, without limitation, whether at the Taylor Iron and Steel Co.'s works or elsewhere, so as to raise the point fairly.

MR. LINDABURY—We object to that. We say this witness should not be allowed to disclose the practices at the Taylor Iron and Steel Co., which he has solemnly agreed that he would not disclose, that he would not divulge, and that he would not disclose them in Chicago, or anywhere else.

COURT—I will overule the question upon the ground that it is understood that this witness is not confined to general knowledge he had obtained elsewhere, but it also includes knowledge obtained at the Taylor Iron and Steel Co.

Q. (Question repeated) What is used for that purpose, then, in raising the heat—I will include in my question all knowledge that you may have acquired, outside of what you obtained at the Taylor Iron and Steel Co. works?

COURT—Do you understand the question? You are to state what knowledge you have acquired outside of the Taylor Iron and Steel Co.?

Q. For raising the heat of the materials? A. Silicon is the element used in raising the heat primarily; it is supposed to have it raised sufficiently high in the cupola; and then another method of raising it in the vessel or converter, is to side-blow it. I have also seen ferro-silicon prepared for use. for the same purpose, at Chicago Heights.

Q. Now, the forms in which the silicon is applied vary then? A. It is a question as to temperature.

Q. Now, the methods of material for reducing the temperature with the same limitation? A. I have seen steel scrap used; I have used it myself; in fact, I have used pig iron of low silicon content, and I have used steam.

Q. What kind of material generally is necessary for the purpose? A. Well, in bulk, any cold material of low silicon content is what is necessary to reduce the material in the vessel while the heat is blowing.

Q. The point is to put something cold in it? A. The point is to put something cold in it.

Q. Without the silicon? A. Yes, sir, that is it exactly, without the silicon.

Q. Ordinarily, is it necessary to put anything in it? A. Sometimes it is not necessary. I have made a full day's blast without making an addition of fifty pounds either way, the condition was regulated in the cupola so that it was not necessary.

Q. It is desirable that it should be done? A. Yes, sir—you are not limited to temperature, so much in a Bessemer plant.

(*Mr. Lindabury.*)

Q. You are speaking of what you have done outside of Highbridge now, are you? A. Yes, sir.

(*Mr. Corbin.*)

Q. These methods that you have described, for raising and lowering the heat, are those in use at the Taylor Iron and Steel Company's works?

MR. LINDABURY—I object to the question, upon the ground that he has agreed not to make known the methods in use at Highbridge.

MR. CORBIN—I have shown that they are not secret.

MR. LINDABURY—It makes no difference whether they are secrets or not, because the covenant does not relate to secrets alone; his covenant and agreement is not to disclose the methods and processes and secrets; it does not make any difference whether they are secrets or not—it does not relate to secrets alone, but it relates to what methods and processes are in use at Highbridge.

MR. CORBIN—The gist of the complainant's case is and has been that they have secrets, not generally known, and they have no place in a court of equity at all, unless they have secrets of that class. If what they call secrets are merely the ordinary processes which they are attempting to conceal and which they pretend to be secrets when they are not secrets in fact, then there is no injury being inflicted upon them from a disclosure of the processes, if they are gen-

erally known, and I think I have shown your Honor that they are generally known through the trade. Their case must rest as their bill puts it, and their bill puts it on the allegations, that they have secrets, not generally known to the trade, and that those methods and processes and secrets are valuable discoveries, which are not generally known to the trade, and unless they are, that is, if they are not secrets, then there cannot be any irreparable injury that would give them any standing in this court. If it appears that the processes they use are nothing but the ordinary processes, then it is our contention that they are out of court, because then their ordinary remedy would be at law, for the ordinary remedy of a breach of contract, and we therefore say, why don't you go to a court of law, for the only remedy you have, which is a breach of contract, if you have any remedy at all? They say that it will be an irreparable injury to us, because we have secrets, which would be disclosed and they put it so in their bill, and we have met that bill, and we deny it, and we show that they are not secrets, that they are not generally unknown to the trade—they are not secrets at all. They have come here with their witnesses, their experts, and Mr. Brinton particularly; they examined him, and in that examination he disclosed a part of what they were doing, and when he was questioned as to these other matters, they said, "Oh, we will not tell you about those,

because we have secret processes, we will not disclose, we cannot go any further."

Now then this witness comes on our side, and undertakes to describe the whole processes, the whole of the methods, which we say are not secret processes, and then they say, "stop, you cannot tell anything about it." They do this although it is a matter of common knowledge, and as I said before, we have shown to your Honor that it is a matter of common knowledge. Whatever the contract may call for, it does not affect the competency of the evidence in the slightest degree, and I insist, your Honor, that we have the right to examine this witness on this subject.

MR. LINDABURY—Of course we have a secret process within the definition of that term—we have shown them sufficiently and we can maintain that position. But we might as well understand where we are at. We are seeking here to compel the specific performance of a contract which does not limit us at all to the protection or to what are technically called "Trade secrets."

Now, go back to this 1896 agreement. In that agreement this witness undertakes, as do every other employee there, to observe secrecy, whether these secrets are of a character technically known as trade secrets or not makes no difference. (Contract of 1896 read.)

As I said, we have the right to rely upon the terms of this agreement, which covers everything there, whether they

are secrets or not, and for the very purpose of obviating the necessity of the party taking the covenant, establishing anything in any court, the actual secrecy of the processes there.

In the agreement which this man signed in 1905, it is there also provided, that he will not divulge during the term of the agreement. (Contract read.)

Your Honor will observe that he is not undertaking, and this agreement does not relate alone to secrets. He undertakes that he will preserve or that he will not violate or disclose whatever he has learned regarding the processes in use there, that is the treatment, and the processes and the secrets and whatever he has learned, he will keep inviolate. It does not make any difference in a covenant of that kind whether the processes that a man learned and covenants to keep secret are actual secrets or not. In other words, an employer has a right to eliminate that question as between himself and his employee, he has the right to say to this employee, that when he comes in here, these processes we are here using, we expect you to keep to yourself, whatever you learn here, you are not to divulge afterwards to anyone—we are guarding them by every means we know how. One of these covenants is to put you under a contract not to use or to divulge to any person at any time anything in regard to the processes we use here, whatever is in use here, or whatever you may learn here. Now, this does not refer to what

he knew before he came there, but in regard to everything that he is taught there and the employer says, you must under no circumstances divulge to any person at any time, anything with regard to them, or anything with regard to the processes used at this place. I do not mean that we would put him under a contract that he should not use anything that he knew, or that he had learned anywhere else, but as to what he learns in this place, then the employer has the right to demand that he should not divulge them, anything that he is taught, anything in relation to the methods and processes employed here. That is, what we give you as a secret, what we give you in confidence, what we impart to you during your employment here, whatever you are taught is a trust which you will keep and hold as such, and deliver over to us again unimpaired, and not to deliver it to anyone else or to use it anywhere else. To all the rest of the world but the defendant this thing is public, and all the rest of the world have the right to use it, but as to the defendant, he has agreed to keep it secret, and he has to do it, he cannot use it.

Now, we are here for the enforcement of a covenant which an employer had a right to take, as a condition of imparting information this man got something in return. What did he get? He had communicated to him the methods and the processes employed in this establishment, and that communication, that

information, that instruction, which we gave him there, he had a legal right to keep and use for us only, and he had no right to use it or to divulge it anywhere else, to anyone else, because it relates to processes we taught him, and it makes no difference whatever whether they are technically what are known as secrets or not, if we taught them to him under an agreement that he will keep them secret he is bound to do it.

COURT—What is the question??

Q. (Question read) These methods that you have described for raising and lowering the heat, are those in use at the Taylor Iron and Steel Company's works?

COURT—How does it appear that he learned that elsewhere? He may have learned it all at the Taylor Company's works, and he may now say that they were used elsewhere. He may have used them since, but did he know them, did he know these methods when he went there?

MR. CORBIN—I will ask that question if your Honor will permit me. I certainly thought I had covered that.

COURT—I will overrule the question as it now stands, for the reason that it does not appear at all, as yet, that the matter to which your question relates was known to the witness before he went to the Taylor Company's works.

(*Mr. Corbin.*)

Q. Were any of these methods known to you before you went to the Taylor Iron and Steel Co.'s works? A. Yes, sir.

Q. All of them? A. Not all of them.

Q. Have any of them become known to you since you left the Taylor Iron and Steel Co. from the practices of other concerns? A. Since I left the Taylor Iron and Steel Co. have I become acquainted with any of these methods by seeing them practiced in other concerns?

Q. Yes. Did you see any in practice in Chicago Heights? A. Yes, sir, I did.

Q. Without instruction from you? A. Without any instruction from me, I was under no contract with them, and I gave them no instruction whatever.

Q. Now, I renew the question—these methods that you have described for raising and lowering the heat, are they in use at the Taylor Iron and Steel Co.'s works?

MR. LINDABURY—I make the same objection.

COURT—I overrule the question because it is a general question, he now admits that part of what he has described, he did not know until he went to the Taylor Iron and Steel Co.'s works and learned it there.

(*Mr. Corbin.*)

Q. Were any of those methods taught to you there in confidence? A. No, sir.

Q. Were any methods of operating the converter used, other than those you have generally described, at the Taylor Iron and Steel Co.'s works? A. Not to my knowledge.

Q. Now, then, when the work is completed in the converter, in the practice of making steel, where is the steel made—you have now got iron in your converter? A. Yes, sir, the steel is made in the steel ladle.

Q. That is, it is turned from the converter, as appears here, into the steel ladle with the physic? A. Yes, sir, it is turned from the converter into the steel ladle with the physic.

Q. Where is the physic prepared? A. The physic is prepared in the small cupola, called the "Physic cupola," or prepared in a furnace or in crucibles.

Q. In crucibles? A. Yes, sir, in crucibles.

Q. Do you know anything about the preparation of Manganese for Manganese steel other than what you learned at Highbridge?

MR. LINDABURY—I object to the question, because it does not ask for what he learned before he went to Highbridge; it does not ask for what he learned at Highbridge either—it does not ask for anything other than what he learned at Highbridge.

MR. CORBIN—We expect to show by the witness that the methods used at Highbridge are also used elsewhere, by the knowledge of people using it, without any instruction from him. What we contemplate to show is, that the very things pretended to be secrets here are commonly practiced in other Manganese steel plants.

COURT—We have not reached that point yet. The present question is objected to because it is so framed that it may be that

the knowledge that he acquired, he acquired since he was at the Taylor Iron and Steel Co.'s, that is, he may have acquired it at Chicago Heights—that I understand is the basis of the objection.

MR. CORBIN—Well, suppose it is. Is it competent to know that he acquired such knowledge at Chicago Heights?

MR. LINDABURY—I do not object to his answering yes or no to that question.

COURT—You may answer yes or no to the question.

A. Yes, sir.

(*Mr. Corbin.*)

Q. In the mixing of the steel in the ladle, who furnishes—I think you have already stated that the materials used were prescribed by the chemist? A. Yes, sir.

Q. And any secrets connected with that, were not within your knowledge then? A. Not that part of it, no, sir.

Q. Was the percentage to be used, the weight to be used prescribed? A. Yes, sir.

Q. And you carried out that direction? A. Yes, sir.

Q. Was there any secret process in connection with that known to you beyond what you have already described? A. No, sir, none other than what I have described.

Q. Now, when these materials are mingled in the ladle, what is done with them next? A. They are taken to the foundry, or the ladle is taken to the foundry with its contents.

Q. And emptied into the moulds? A. Emptied into the moulds, distributed through the plant.

Q. Do you know any secrets in connection with the moulding? A. No, sir, I do not. Of course, it takes careful judgment, as must be exercised in any steel castings plant.

Q. Is there any special device known to you at Highbridge, above the ordinary methods used in steel foundries?

MR. LINDABURY—I object to the question—it brings up after all the question that we were discussing a little while ago, and I insist again, after all they cannot force us to the trial of the question as to what are ordinarily known as trade secrets or processes. They are processes we have used there, and we disclosed them to this man, and he cannot disclose them either one way or the other. One way might be to say that there is a process at Chicago, and then give the details of that process, that they do this, and they don't do that, and what they don't do there, then they do that at Highbridge. Now, that is just as good as asking him to disclose the methods employed at Highbridge.

COURT—I will allow that question to be answered yes or no.

A. No, sir.

(*Mr. Corbin.*)

Q. Now, when the castings are taken from the moulds, the next process, as we have been told, is the annealing furnace, is it not? A. Yes, sir.

Q. Are there any secret processes known to you for the annealing? A. No secret processes, no, sir.

Q. You have known of Mr. Brinton's patent? A. I have seen it.

Q. And is there any process employed outside of what is there described? A. Not to my knowledge.

MR. LINDABURY—In view of the Court's ruling, I would like it to be understood that this evidence is taken under objection. That we claim the defendants cannot disclose processes which were taught to him under his defense, that they are not secrets, and he may no more do it negatively than affirmatively.

(*Mr. Corbin.*)

Q. Now, when you were in Chicago Heights, you witnessed the practice of making Manganese steel, did you not? A. I did.

Q. Were any other steels being made there also? A. Yes, sir, various kinds.

Q. Ordinary steels as well as Manganese steel? A. Yes, sir, various kinds.

Q. Did you see the Manganese steel turned out? A. I did.

Q. Did you look at it, and examine it with a view to seeing what the quality was? A. It looked quite familiar, yes, sir.

Q. Was the process which you have described in the cupola used there? A. Yes, sir.

Q. And the process that you have described in the converter, was that used there? A. The principle, excepting the fact—the principle is identical but the converter is slightly different from the Bessemer converter, instead of a bottom blow, it has a top blow.

Q. Or a side blow? A. Yes, sir, or a side blow—the principle is identical.

Q. How was the ferro-manganese prepared?

A. The ferro-manganese was prepared in the crucible furnace.

Q. The carbon, was that put in along with the melted carbonizer into the ladle? A. Yes.

Q. What was put into the ladle first, the melted iron from the converter or the physic? A. The physic from the crucible furnace was put in the ladle first.

Q. Now, the physic consists necessarily of some carbon, or some material combining carbon? A. Yes, sir.

Q. And the ferro-manganese? A. The ferro-manganese contains carbon and manganese combined.

Q. Suppose they were making a steel at low grade of carbon, would there be sufficient carbon in the ferro-manganese to make it? A. Yes, sir.

Q. Then you would have need to put in nothing except the ferro-manganese? A. That is all.

Q. Ferro-manganese has what percentage of Manganese? A. Seventy to eighty per cent.

Q. And how much carbon? A. Five to six points of carbon.

Q. If you were making steel of a low point carbon, you would find all you needed in that one mixture? A. Yes, sir.

Q. Suppose you needed steel of a higher carbon, you would put in something else? A. Either iron or spiegel, to give the necessary carbon content.

Q. Some preparation containing the necessary carbon? A. Yes, sir.

Q. And that properly melted? A. Yes, sir.

Q. And placed in the ferro-manganese in the ladle? A. Yes, sir.

MR. LINDABURY—I object to this—the witness is testifying to something that he has already said he did not know anything about.

COURT—He is telling what he saw at Chicago Heights only.

(*Court.*)

Q. That is so, is it not? A. Yes, sir.

(*Mr. Corbin.*)

Q. Was this material put into the ladle in weighed quantities? A. Yes, sir; I presume so.

Q. Is that the proper practice?

COURT—He is testifying, I understand, to what he saw at Chicago Heights?

MR. CORBIN—Yes.

MR. LINDABURY—Not as to what he presumed then?

(*Mr. Corbin.*)

Q. Did you see this material used in that manner? A. Yes, sir.

Q. A sufficient quantity of melted ferro-manganese, and where more carbon was required, of some metal containing carbon placed into the ladle? A. Yes, sir.

Q. Which was put in first, the melted metal or the physic? A. The physic is put in first.

Q. And then the melted metal? A. Yes, sir.

Q. And then what is done with it? A. It was then distributed through the shop, in various moulds.

Q. Through the moulds? A. Yes, sir.

Q. Was there any part of the process, in the making of ordinary Manganese steel, which was not in use at Chicago Heights?

MR. LIDABURY—I object—it was all special work and for special purposes, you made

no commercial Manganese steel for the market?

COURT—I will allow the question.

A. The same.

(*Mr. Corbin.*)

Q. What were they making at Chicago Heights, what kind of goods? A. That is, in Manganese steel or ordinary steel?

Q. Manganese steel? A. While I was there I saw them cast a safe body of Manganese steel and some crusher jaws, and some miscellaneous class of castings, just what they were I could not say.

Q. Reference has been made to the manufacture of shells at Highbridge, do you remember that manufacture? A. I do.

Q. Were those shells made by any other than the ordinary Bessemer process? A. The production of the steel, made the same as in the Bessemer process, that is, the same principle as the Bessemer process.

Q. Were there any special processes used in the castings? A. No, sir; they were cast same as any other mould.

Q. Was there any preparation that were furnished by the Hadfields, that were used or not in use, for the purpose? A. No, sir; there were two or three different classes of shell work, the ordinary class of shell work, and then the armor piercing and the semi-armor piercing, and so on.

Q. What moulding sand did you use? A. The ordinary moulding sand as was used in the foundry.

Q. Was there any special preparation to use it? A. No, sir.

Q. I understood you to say that Mr. Hadfield furnished some process but that you did not find it useful?

COURT—He did not testify to that.

(*Mr. Corbin.*)

Q. What I want to know is, whether that is not the case—did Mr. Hadfield provide some special moulding sand which you found not worth while to use? A. Yes, sir; prior to the late order they had been using some sand that had been imported from England, and we did not use any of it while I was there, because we did not find it as useful as the sand we had been using there.

Q. In the process of cleaning the shells was there any special method used? A. No, sir.

Q. What are the ordinary methods of cleaning castings? A. The ordinary method is to take them to a sand blast, or clean it off to the hammer and a chisel, and you can break the heads and the gates from the castings, and then clean off by chipping it.

Q. In the case of these shells, you say there were no special methods used for the cleaning of them? A. No, sir; there were no special methods used in the cleaning of those shells.

Q. Then is Dr. Howe mistaken when he says there were special methods used in the cleaning of the shells? A. I don't know what he referred to, if he says there were special methods of cleaning the shells, I don't know what it was he referred to.

Q. You know of none? A. No, sir; I know of none.

Q. Do you know of any processes in the manufacture of steel at Highbridge which you have not either seen practiced elsewhere or found described in text books?

MR. LINDABURY—I object to the question—at least he would have to tell where they are described, or where he has seen them practiced.

COURT—It comes back to this proposition again. If he says he had seen these processes before he went there I will permit the question to stand. But if it refers to something he says he has seen afterwards I will overrule the question. I will overrule the question in its present form, because it is based on the theory that he is excused and justified in disclosing all that he has learned at the Taylor Company's works, provided he happens to see somebody else doing it. And there the contention of the complainant is, and I am rather disposed to think that that is the law, if he contracts not to divulge what he has learned there he has not the right to divulge it, he must keep it a secret. But, if by doing that he is enjoined from taking employment, then that is another question.

Q. (Question read.) Do you know of any processes in the manufacture of steel at Highbridge which you have not either seen practiced elsewhere, or found described in text books?

COURT—If you will limit the question to what he learned before he went there, that is another question, but I shall overrule this question, because it applies to things that he has seen since he left the Taylor Company's works, and also since he made his contract with them.

(*Mr. Corbin.*)

Q. Mr. Nichols, what construction was there; what inclosure was there about the converter at

the Taylor Iron and Steel Co.'s works? A. A brick wall.

Q. How high? A. A portion of it about six feet high; the other portion of it probably about eighteen feet high.

Q. What for? A. For the protection of workmen, principally, I should imagine.

Q. What was enclosed in the wall of the structure? A. The converter, the cupola, the crucible furnace and the physic cupola.

Q. What was the passage to get into it; what opening was there? A. How many openings?

Q. Yes. A. About five different openings.

Q. How many men were employed inside that enclosure? A. I should imagine about twenty or twenty-two, or somewhere in that neighborhood.

Q. And in that department—outside of it you had the moulders, hadn't you? A. Yes, sir, on the other side of that partition, the moulders worked directly against it.

Q. How many? A. In the neighborhood of one hundred.

Q. Any other men there? A. The helpers.

Q. How many of them? A. I should think there were two hundred or two hundred and fifty men employed in that immediate section.

Q. What precautions were taken to prevent these men from observing the work inside the inclosure? A. We took no precautions, particularly.

Q. Were they in the habit of going through the openings? A. Yes, sir.

Q. How many? A. As many as had occasion to go through that way; they never hesitated or stopped whenever they wanted to go through; they went through.

Q. Were any instructions given to them, or to the foreman, not to permit them to go through the openings to see the converter or the cupola, or

such work as that? A. No, sir, not to my knowledge.

Q. Were they in the habit of watching the operations there? A. Particularly in the noon hour; they would come in through there and look on at the processes, that is, the workmen, and if it was a stranger, even a strange man, not employed at the plant at all, if he were interested in it, and wanted to, he could go in and look at it.

Q. Were there any efforts made there to keep it secret?

COURT—To keep what secret?

(*Mr. Corbin.*)

Q. The processes carried on in that enclosure.

MR. LINDABURY—I object, on the ground that he should state what was done; you are asking for his conclusions; let him state what was done, and the Court will draw the conclusion.

COURT—Yes, I shall overrule that question. He may describe what was done.

(*Mr. Corbin.*)

Q. What was done in that regard? A. Nothing was done to keep the men from that department at all.

Q. Were any pledges of secrecy exacted from any of these men?

MR. LINDABURY—I object to that.

COURT—He may answer that.

A. To my own knowledge, they were not under any contract.

Q. Were any pledges of secrecy exacted? A. No, sir.

Q. What was it they could see on entering into the enclosure, what process? A. They could see the total process, they could see the pouring of the iron from the cupola, they could see the pouring of the physic from the cupola, they could see the taking of the material from the crucible furnace, and they could see the blow, and they could see the metal dumped in the steel ladle, they could see the whole thing in its entirety.

Q. Was there anything visible to you that was not visible to them? A. No, sir.

Q. After the steel was poured into the moulds, what opportunities were there to observe the operations then, that is, the casting operations then, that is, the castings? A. That was open to all the employees, if they had the desire and the time, they had the opportunity, that is, if they had the time to go into the foundry, they could see it all.

Q. Could they see how long the castings remained in the moulds? A. Yes, sir.

Q. Could they see how they were taken, and where? A. Yes, sir.

Q. Could they see the castings placed in the annealing furnace? A. Yes.

Q. Could they see how long the castings were kept there? A. Yes,—well, the day-turn men could not see how long the castings remained in there, because sometimes the castings remained in there until after they left, but the night-turn men followed them in, and they had the opportunity to observe those features.

Q. Could they see the appearance of the steel when it was taken from the foundry—was that apparent, was that exposed, that is, the castings when they were taken from the furnaces? A. Yes,

sir, that was open to the foundry men, and in fact it was open to the total plant, all of them.

Q. And could they see what cooling process was adopted? A. Yes, sir.

Q. The plunging of the castings into water? A. Yes, sir, that was all open.

Q. Do you know of any processes, beyond the chemist's preparation of the materials, that were not open to the whole shop? A. Well, there was a tempering plant there when I went there; that was not open to the employees generally, and, in fact, it was not open to me.

Q. You did not know what was carried on there? A. I saw it once or twice, but you would have to see it quite frequently to become familiar with this process.

Q. Were you familiar with the processes in that plant? A. I was not.

Q. Was any secret process ever taught you by the representatives of the Taylor Iron and Steel Co. while you were in their employ? A. Secret processes?

Q. Yes. A. No, sir.

Q. Was Dr. Howe there very often? A. I saw him there once in nine years.

Q. Not more than that? A. No, sir.

Cross-examination by Mr. Lindabury.

Q. Is there any difference between Manganese steel and other steels? A. Yes, sir.

Q. A difference in the primary mixture? A. Not necessarily.

Q. Will you answer the question—was there any difference in the primary mixture? A. No, sir.

Q. No difference in the primary mixture? A. No, sir.

Q. Was there any difference in the treatment? A. Yes.

Q. Was there any difference in the secondary mixture, the physic, as you called it? A. All the same, but different percentages.

Q. Well, then, there is a difference, is there not, there? A. Quite naturally.

Q. There is a difference in the treatment all the way through, is there not? A. That is between Manganese steel and ordinary steel?

Q. Yes. A. Yes, sir.

Q. Have you ever made Manganese steel before you went to Highbridge? A. No, sir.

Q. You were taught to make it there, were you not? A. I was taught through observation.

Q. How else do you think you could be taught? A. Well, I cannot answer that, how else I think I could be taught.

Q. Well, you have learned most of what you have learned in this world, have you not, by observation? A. Principally, yes, sir.

Q. And this observation you speak of was observation of the work that was being done by Mr. Brinton there, was it not? A. Yes, sir.

Q. You did not become the assistant to Mr. Brinton, when you first went there, did you? A. That was the view, that was the idea of my going there, to be the assistant to Mr. Brinton.

Q. But were you not for a time put in the fettling department? A. Well, my duties were not then all confined to the fettling department; when I went there first, it was with the idea that I should become the assistant superintendent, assistant to Mr. Brinton.

Q. Did you have the title of assistant then when you first went there, or was that title given to you some months after you got there? A. So far as the title was concerned, that was not so prominent until after I had been four or five years there, not

until after, when Mr. Gaston got there, but all the employees observed my title.

Q. From the beginning? A. Yes.

Q. Was not your work specialized, and did it not become that of the assistant to Mr. Brinton, after some months, or some years, did it not become confined to the work of assistant to Mr. Brinton, after some months or years? A. No, sir, I had been exercising that authority after the first month or two that I was there.

Q. After the first month or two of your going there, you exercised the authority of assistant? A. Yes, sir, until I got acquainted with the men and the department.

Q. Now, when you went to Chicago, you say you witnessed the primary mixtures there, and that you found it the same as that employed at Highbridge? A. The same.

Q. And you did not not know what the primary mixture was at Highbridge, did you? A. No, sir.

Q. And yet you say that you found the same primary mixture when you went to Chicago, as the primary mixtures that were used at Highbridge? A. Yes.

Q. But you did not know what the mixtures were at Highbridge, you said? A. I did not.

Q. How could you tell then—— A. Understand me—when I say I did not know the percentages going into the various heats, I did not, but I knew what they were—any man in the steel business is thoroughly familiar with those things—but the actual percentages, as they are figured out by the chemist, those I was not aware of——

Q. But the superintendent or the metallurgist decides what percentages he wants in the compound, and the chemist decides where to get them, is not that so? A. The chemist at Highbridge did that, almost exclusively.

Q. To what foundries did you allude when you said that there were others that used the same processes as are used at Highbridge? A. That is the ordinary moulding process.

Q. Tell me the name of any foundry where you say they used the same processes, as were used at Highbridge? A. The George H. Smith Steel Castings Co., of Milwaukee.

Q. When were you there? A. I was there last June.

Q. June of the present year? A. Yes, sir.

Q. Did you say the processes there are identical with the processes at Highbridge? A. I cannot say identical, but they are quite similar.

Q. What other foundries have you been in, to which you have alluded, when you stated that there were others that used the same processes as I used at Highbridge; give their names? A. The American Brake Shoe and Foundry Co. of Chicago.

Q. Are the processes there identical with those at Highbridge? A. They are quite similar.

Q. Will you answer the question, please—are the processes there identical with those at Highbridge? A. They are not identical with those at Highbridge, because the blowing process is different, but I say they are quite similar.

Q. Except in the matter of the blowing process, are they identical? A. I cannot say that they are positively identical, no, sir; that is, not practical.

Q. Now, what other foundry have you been to, where you saw them using the same processes as are used at Highbridge? A. There was a steel foundry—the Wellman Steel and Iron Foundry, at Chester, Pa.

Q. When were you there? A. From 1888 until four or five years afterwards, until 1893 or 1894, the time of the depression.

Q. Do you say that you saw them use the same

processes while you were there, that you had used at Highbridge? A. They did not have the Manganese steel, but other steel castings——

Q. Did the other steel castings receive the same treatment and go through the same processes as are employed in the making of Manganese steel—that is, in the making of thost steel castings? A. Not all steels.

Q. Well, now, what other place have you seen the same processes used as were used at Highbridge? A. We made some steel castings at our Bessemer process in Chester, Pa.——

Q. You did not make any Manganese steel at Chester, did you? A. No, sir, we did not make any Manganese steel there, but other castings.

Q. What other foundry have you been in, where the processes were the same as at Highbridge, anywhere, other than those you have mentioned? A. I have not been in any other foundries, that I can recall, where the processes are the same.

Q. In what books are the processes that are in use at Highbridge described, give the names of the books? A. I think there is a fairly good description in Hebberd's book.

Q. Are the processes now in use at Highbridge so described in that book that they could be duplicated? A. Well, I could do it—yes, sir, you are asking me the question—I could do it all, by knowing the Bessemer principles.

Q. Could somebody else, not educated at Highbridge, do it, do you think? A. A man familiar with the Bessemer process, by taking the process from these books could do it, yes, sir.

Q. You think he could make Manganese steel? A. I think you could do it, Mr. Lindabury.

Q. What other process is described in that book, that is, a process used at Highbridge? A. I do not say that they are described minutely as they are

used at Highbridge, I do not say that, it would be nonsense for me to say that.

Q. Well, does this last answer apply to your previous answers? A. What are those answers composed of, or those questions, rather, what are those questions composed of?

Q. You recall what you have been testifying to now, and the Vice-Chancellor has just asked me whether or not your last answer applies to your previous answers, and, in order that you may answer that question, I will ask the Stenographer to read your last answer?

The following questions and answers being read to witness:

"Q. You think he could make Manganese steel? A. I think you could do it, Mr. Lindabury.

"Q. What other process is described in that book, that is used at Highbridge? A. I do not say that they are described minutely, as they are used at Highbridge, I do not say that— it would be nonsense for me to say that."

Q. The Vice-Chancellor wants to know whether your last answer applies to the Hebberd book? A. That book, yes, sir.

Q. It does apply to the Hebberd book? A. Yes, sir, that book.

Q. When did you read that book? A. I have read a good bit of it in the past year.

Q. Is there any other work in which the processes in use at Highbridge are so described that it would be otherwise than nonsense to say that one reading them could put them in practice? A. I cannot recall of any.

Q. You say you have read MacFarland's book? A. Yes, sir.

Q. Does that describe the processes in use at Highbridge, so that they could be operated from reading that book? A. No, sir, I cannot say that it does.

Q. And, of course, Prof. Howe's book does not? A. No, sir, he describes certain portions of the process.

Q. But you cannot erect a plant and work the process, as Dr. Howe describes the process in his book? A. No, sir.

Q. Longmuir's and Campbell's work—was that one work, or two? A. I think there are three books.

Q. Is that a work gotten up by two men together, or have they one work each? A. By two men, yes, sir.

Q. Different men? A. Yes, sir.

Q. One book by Longmuir and one book by Campbell? A. Yes, sir.

Q. Well, does either of those books describe the processes as used at Highbridge, so that it could be operated by the reading of those books or either of them? A. No, sir, it is very similar to the description contained in Prof. Howe's description, extracts as it were.

Q. Now, you were at Chicago Heights witnessing the operations there for three days, were you not? A. Yes, sir.

Q. Was there any one along with you—was Mr. E. J. Snow with you? A. He was around the plant, not with me.

Q. You were with the foreman in the plant, were you not? A. I was with the foreman of the plant part of the time.

Q. How did you get in there? A. I walked in.;

Q. Did Mr. Snow take you in? A. I went in with Mr. ———; I think there were two or three members of the establishment there.

Q. It didn't appear to be free to any one who chose to walk in there, did it; you had to get a pass to get in there, hadn't you, or to go in with one of the officers of the company? A. I didn't get any pass, and I don't know what their form is, and I did not inquire to find out what their practice was in that respect.

Q. And you saw the process of making Manganese steel, employed there, you say? A. Yes, sir.

Q. Did you tell them nothing about how it was done at Highbridge? A. I did not.

Q. While you were there? A. I did not.

Q. Why not? A. Why not?

Q. Yes. A. It was not necessary; I was not employed by the American Brake Shoe and Foundry Co.

Q. I suppose you were not, but you were there seeing whether you could take the superintendency of their plant, were you not? A. Whether I would like it and whether the conditions would suit me.

Q. How is it—how did it happen that you did not say how things were being done at Highbridge, why didn't you? A. Would you, think you?

Q. I am asking you—why not—how did it happen that you didn't say how things were being done at Highbridge? A. I didn't think it necessary.

Q. He says he didn't mention it at all to any one out there, anything at all about the processes, as they were carried on at Highbridge, and I ask him, why not? A. I was not authorized to.

Q. Well, what do you mean by that? A. I was not in the employ of the American Brake Shoe and Foundry Co., and their officers did not authorize me or require me to extend any information whatever.

Q. Did you extend any information to their officers out there at all? A. No, sir.

Q. Did you discuss as to whether you should extend any information to their workmen, or not? A. No, sir.

Q. Do I understand you to say that you did not discuss whether you should extend any information to their foreman or their workmen, while you were out there? A. No, sir, I did not.

Q. Well, can you give us no other reason for not doing that, more than you have given us now?

MR. CORBIN—I object to the question as not being cross-examination, and on the further ground that counsel is not asking for the facts, but that he is entering into an argument with the witness.

Question allowed.

A. It seems uncalled for.

Q. Did you make any notes of their processes there, did you make any criticisms or notes of their processes, while you were there? A. I did not, materially, no, sir.

Q. Well, did you, immaterially? A. No, sir.

Q. You didn't do it at all? A. No, sir.

Q. Do you say you have only spent three days out there? A. Three days was all I spent there, yes, sir.

Q. How long did you stay in Chicago? A. I was in Chicago from August 6th to June 18th, about, of this year.

Q. Were you not at the works more than only during these three days? A. I never was.

Q. Was it not at the end of the three days, that the injunction was served upon you? A. Yes, sir.

Q. And then you camped outside of the works? A. I camped at Chicago.

Q. But you camped near the works, didn't you? A. Yes—I camped in Chicago.

Q. Do you know a man by the name of Leonard? A. Yes, sir.

Q. He was formerly employed at Highbridge, was he not? A. Yes, sir.

Q. Did he become connected with the Chicago institution? A. Yes, sir.

Q. When was he employed there? A. I cannot recall the date.

Q. What did he do while he was there? A. Well, he had various positions, while he was there, at first he was a moulder, and then assistant foreman, and then for another time he was a moulder, and after that assistant foreman, and I don't know what he didn't do.

Q. Do you know when it was that he was employed out there at Chicago Heights? A. I cannot recall the date, but it was some time last year, that is as near as I can get at it.

Q. After the injunction was put upon you, was it not? A. Yes.

Q. Did he travel back and forth to and from the works or to where you camped and the works during the time of this employment by this company? A. Well, sometimes I would see him, I might see him as much as once a week, and sometimes it would be only once every two or three weeks, and then not over once every three or four weeks, it all depended——

Q. You saw one another enough, you saw each other sufficiently? A. Yes.

Q. Where did you stay while you were at Chicago during that time? A. Part of the time I stayed at the Grand Pacific Hotel, and part of the time in Lake View, with my family.

Q. Who paid your expenses while you were at the Grand Pacific Hotel? A. Mr. E. J. Snow.

Q. Of the defendant company? A. Yes, sir.

Q. How long were you there—how long did you stay at the Grand Pacific Hotel? A. Ten or eleven days.

MR. CORBIN—I object to this evidence as not being cross-examination.

COURT—This witness has testified that he went out there to consider whether he would or would not enter the employ of this company. He did not enter the employ of the company because he was served with an injunction. Now, he has remained there from that time until June of this year. Why have they not a right to show, by a cross-examination, if they can, that that is not true, that he was actually in the employ of this company, and that he did stay there at their request, and he stayed there at their expense—I think they have a perfect right to prove the conscience that this witness—he is one of the parties to this suit, and I think the evidence is entirely proper.

(*Mr. Lindabury.*)

Q. You went from the Grand Pacific Hotel, where, to live? A. We went from there to board at Lake View.

Q. Was it a private house? A. Yes, sir.

Q. How long were you there? A. From August to December.

Q. Then where did you go? A. We went to housekeeping right in the same street.

Q. And kept house there how long? A. From then until June.

Q. Who paid your board at the Lake View House? A. Who paid my board?

Q. Yes, where did you get the money to pay your board with then ? A. I was compelled to borrow the money.

Q. Did you not receive the money from Mr. Snow? A. No, sir.

Q. Well, did you not receive the money in some way from the American Brake Shoe and Foundry Co.? A. I borrowed the money from the American Brake Shoe and Foundry Co., to defray my expenses.

Q. You borrowed the money from them? A. Yes, sir.

Q. What did you give them to show for it? A. Nothing but a receipt.

Q. Have you got a copy of it? A. No, sir.

Q. Who paid your rent? A. I paid it from the money I borrowed.

Q. You borrowed the money from them for that, too? A. Yes, sir.

Q. And then where did you go? A. I came on East, then.

(*Mr. Corbin.*)

Q. And went to Philadelphia? A. Yes, sir.

Q. And have you been keeping house there ever since? A. Yes, sir.

Q. Still on money borrowed from the defendant company? A. Yes, sir.

Q. You have been living on money borrowed from the defendant company ever since the injunction was served on you at Chicago, have you not? A. Practically speaking, yes, sir.

Q. Have you given anything to show for the loans other than the receipt you have mentioned? A. Yes, sir; I gave them notes.

Q. Promissory notes? A. Yes, sir.

Q. You gave them promissory notes from time to time? A. When the occasion demanded.

Q. Well, has the occasion ever demanded it? A. It certainly has.

Q. You borrowed these moneys regularly of them, have you? A. At different intervals.

Q. On the first day of every month I suppose—do you say so? A. No, sir.

Q. Or the last day of every week, which? A. When I find it necessary to need money, then I am compelled to borrow, whether it falls the first day or the second day or the last of the month——

Q. Who do you write to for it—Mr. Snow? A. No, sir; sometimes I write to Mr. Langstell——

MR. CORBIN—I object to all this as not proper cross-examination.

COURT—I think it is.

(*Mr. Lindabury.*)

Q. Who is Mr. Langstell? A. Mr. Langstell is the secretary at the Chicago office.

Q. To whom were the notes given, to whose order were they made?

MR. CORBIN—I object to the question as not cross-examination.

Question allowed.

A. The notes I have reference to was drawn to the order I think of John B. Goode.

Q. Who is he? A. That gentlemen sitting right there (indicating).

Q. What is his relation to the defendant company? A. I cannot tell you any more than he is an attorney at the present time.

Q. A lawyer, is he? A. I hope so.

Q. Who directed you to make the notes to him?

A. That was an arrangement with Mr. Goode, that I should apply to him for the money.

Q. When were you put under the direction of the attorneys of the company, who turned you over to the attorneys of the company? A. I have been in Mr. Goode's care ever since I was east.

Q. In whose care were you while you were in Chicago? A. Practically in my own.

Q. Now, you say that there were no pledges taken from any of the men at Highbridge who worked in the foundry with regard to secrecy—how do you know that? A. Because I had direct dealings with the majority of the men.

Q. Did you hire the men? A. A goodly portion of the men I did.

Q. You hired them? A. Yes, sir; in fact, the greater portion of them came under—either I sanctioned it or Mr. Brinton sanctioned it, either one of the two of us.

Q. What class of helpers do you refer to? A. To moulders' helpers.

Q. And those are the men you referred to as being able to see the processes, as carried on at Highbridge, without any restraint? A. Yes, sir, those were the men I referred to.

Q. And you think that those men, looking at what they were able to see at or during their lunch time, or at other times either, could take in the processes of steel making as they were in use out there at Highbridge? A. Not in all its branches, no, sir.

Q. Were strangers allowed in there? A. Very few strangers were allowed in there.

Q. Strangers were not allowed in there at all, without permission from the proper officers of the company, were they? A. No, sir.

Q. They were prohibited from entering there, were they not? A. Yes, sir.

Q. Mr. Snow had to get a pass when he saw you there, hadn't he, to get in the place? A. I presume he got a pass.

Q. And even then he did not get into the foundry? A. No, sir; I don't think so.

Q. Why didn't you take him into the foundry, why didn't you show him around? A. I was not taking Mr. Snow around the place.

Q. You knew you had no right to do it, didn't you? A. I would not have done it without permission from the officers of the company.

Q. You never did take anyone through the place, did you, without permission from the officers of the company, the proper officers? A. No, sir.

Q. You knew you were prohibited from doing that thing, didn't you? A. We knew that that was the rule of the foundry, yes, sir.

Q. Did you know that they had that rule? A. It is only like a great many other foundries, they prohibit strangers from going through——

Q. Why did you understand that they prohibited at Highbridge any one going through the foundry? A. For the purpose of keeping strangers out.

Q. Why? A. To keep them from seeing the processes, the making of the steel and the cleaning of the castings, and such things.

Q. The making of the Manganese? A. Yes, sir.

Q. Or from seeing the Bessemer process? A. Well, the principles of the Bessemer process is very fully described in books and is well known throughout all the world.

Q. The thing you allude to, or the principles you have alluded to, are they described in these books you have mentioned? A. That is, the basic principle of the process is alluded to in the books I have mentioned.

Q. That basic principle is what you understand all the world knows all about? A. Yes, sir; I suppose so.

Q. I suppose the different factories have gotten out different cupolas and adopted different methods in working out that fundamental principle? A. I presume so.

Q. And do not all foundries undertake to keep their processes secret? A. More or less.

Q. Is not that the general rule? A. More or less.

Q. And don't you know that there are secrets and that no two foundries, operating under the Bessemer process alone, observe the same methods and details in the treatment of their steel, don't you know that? A. It is the different methods that a man has of applying his knowledge of the method, that is all the difference.

Q. They all have their own secrets, as to their methods of treatment, and the details, even in the Bessemer process, have they not? A. In the Bessemer process there is no secret about the process, the only secret there is, is the different methods that the man in charge of the works has, of applying his own knowledge to that principle or method, that is all that is secret in that.

Q. Then they all have their secrets in the application of these general principles, is that it? A. To a degree that is quite natural.

Q. To a degree that is natural, is it? A. Yes, sir; to a degree that is natural.

Q. Now, where they make special steels, instead of commercial steels, they have these secret processes to a greater degree, haven't they, everywhere where they make special steels? A. No, sir; it is all made in the same department, it is a question simply of alloys, and that is not necessary to secrecy at all.

Q. Well, in the making of these special steels, requiring special alloys, do you know of any foundry that does not try to keep secret those alloys, those percentages? A. Those particular alloys?

Q. How about the percentages? A. Well, the percentages are worked out by the foreman in the department, and sometimes by the chemist.

Q. Do you know of any foundry where the special percentages, as they are worked out by the foreman or the superintendent of the works in that way, where they are not kept secret? A. Well, he had no occasion to spread them broadcast, it is not called for——

Q. Is it not a practice everywhere, really, to keep those secrets, not only at Highbridge, but in all these foundries where special steels are made, requiring special alloys, special steels, and percentages—are they not all kept secret in all such foundries? A. I cannot answer as to the whole of the trade.

Q. So far as your knowledge goes? A. They endeavor to keep those matters within the knowledge only of the official end of it.

Q. The work at Highbridge became very much specialized, did it not, unusually specialized, that is to an unusual degree—did it not? A. Can you make it a little clearer?

Q. Don't you understand me—the work up there at Highbridge became very much specialized, did it not? A. We took great pride in our work.

Q. And as you developed the work, it became more and more specialized, did it not? A. We aimed to specialize it, we aimed to make up as good a practice as could be produced anywhere.

Q. Yes, and you got to the point where you did not manufacture steels on specifications, did you not? A. Oh, yes, sir, but there were times we did manufacture steels according to certain specifications and requirements.

Q. That was in the beginning, but finally you did not? A. No, sir; not up to the time I left, but what they do now I do not know, sir.

Q. During the last few years you were there, was there much steel manufactured on specifications? A. Occasionally there was.

Q. It was only occasionally? A. I cannot say the number of times, the number of pounds, or the number of the orders, but we had frequent orders, specifying special conditions.

Q. Of Manganese steel? A. No, sir.

Q. That is my question—you did not manufacture Manganese steel on specifications, did you? A. No, sir.

Q. That was all special work, was it not? A. Manganese steel.

Q. Any work for special purposes, manufactured for special purposes or for a particular use? A. I understand it is one—you are speaking of Manganese steel now?

Q. Yes, Manganese steel, we are speaking of, you manufacture your Manganese steel for particular work, for particular uses? A. Yes, sir.

Q. What particular purpose, or work, or uses, do you manufacture it for? A. So as to take care of the wearing portions of machinery.

Q. That is all right— therefore, it would be what you would call as a special steel, would it not? A. Yes, sir; quite naturally.

Q. Now, you have spoken of your work at Chester, you did not make special steels there, did you? A. Yes, sir; we did make special steels there, but not for castings.

Q. What did you make for castings—you made ingots, did you? A. We sometimes made steel castings, in the same department.

Q. Did you make ingots for forging? A. Yes, sir.

Q. That was your principal work, was it not? A. Yes, sir, and then we made steel castings also for the trade, for the Bessemer process.

Q. For the trade? A. Yes, sir, but it was special just the same.

Q. The percentage of that, that is the percentage of your output was small, was it not? A. Yes, sir, the percentage of our output was small, but it was made from the Bessemer process.

Q. Now then, you and Mr. Brinton worked pretty faithfully in the development of this business, while you were up there, did you not? A. We worked hard, yes, sir.

Q. And you continued to learn, as you went along, you would learn something every day, and you would learn something every year? A. Well, we didn't go back.

Q. You really, you and Mr. Brinton, quite considerably developed the work while you were there? A. We hoped that was the result.

Q. You had those results too, did you not, and you were continuously aiming to improve your work and to obtain better results, were you not? A. We felt that we were obtaining better results, we worked along in that line, in a constant endeaor to obtain better results, yes, sir.

Q. And you attained to better results by means of constant study and constant experiment, did you not? A. We attained better results by constant attention and hard work, and a careful observation of the little things.

Q. And in that way you developed what I have no doubt you regard as one of the greatest steel plants in the world, didn't you? A. Well, I think it was one of the finest and best managed steel plants in the world; I cannot say that I think it the greatest steel plant in the world, I do not know about that.

Q. I will take it that way, that you think it one of the finest and best managed steel plants in the world—and the processes you employed there were

constantly being improved, as you say, by your careful observation of the little things? A. Not the processes, no, sir.

Q. Well, but were there not changes made in the way of doing things, during all these years, that you were there? A. Of what nature? Do you mean the treating end of the work, or the finishing end?

Q. The whole process? A. Oh, well, the natural tendency would be to develop something better each day, as we were endeavoring all the time.

Q. And you did develop something better each day, and you went on improving and developing something better than what you were taught when you began there? A. That would be natural, why wouldn't it?

Q. And you did go on developing something better in the way of the physic, something better in the method of treating the mixtures, something better in the way in which you managed the cupola, and the annealing furnace, didn't you? A. Well, as far as the mixture is concerned, I don't know anything about that, that is controlled by the chemist in the laboratory.

Q. Now, when you got to the cupola, you found out methods by which you could make an improvement there? A. I don't know what we did, careful melting and careful management of the cupola made good work.

Q. Do you mean to say that you ran the cupola in the same way in the beginning of your service there as you did at the latter part of your service? A. I cannot recall any difference in the method of manipulating the cupola from the time I first went there until the time I left.

Q. Did you make no improvements there at all? A. Yes, sir; we made considerable of improve-

ments there, that is in the making of the Bessemer steel——

Q. What I meant was, whether you made any changes in the method of controlling the cupola, not what they were, I didn't ask you that—did you make any improvements or any changes? A. Well, we adopted the Bessemer process for converting steel.

Q. How long had you done that ? A. Mr. Brinton did that before I came there.

Q. You said "we" adopted the Bessemer process —then the term "we" did not apply there, did it? A. We did it that way when I did come there, and we did it before he came there.

Q. I want to know what changes you made during the years that you were there, not what changes, but whether you did make any changes in the converter processes, that is, whether you used it at the end of your service there the same as you found it at the beginning, or whether you did the work in all senses just the same all the time? A. When I took hold of the method of converting the steel I observed carefully the alloys that I had been used to for years before that when in observation of the cupola, and we took great care and paid careful attention to the temperature——

Q. That is not an answer to my question; my question is whether you made any changes at all, or whether you pursued the same methods to the end that you began with; you can answer that question yes or no—will you answer that? A. No.

Q. You made no changes? A. No.

Q. Do you know whether any changes were made in the mixture, that is in the physics? A. I don't know, sir.

Q. You don't know about that? A. No, sir.

Q. Were any changes made in the moulding or in the treatment in the moulds—in the putting in

of the chills or anything else, such as the location of the chills or the size of the chills or anything of that kind? A. "Chills"—what are you referring to now?

Q. Don't you understand my question—don't you understand what the chills are used for in connection with the moulds? A. O, yes, yes; I catch your meaning now.

Q. Well, answer the question; were any changes made in the moulding, or in the treatment in the moulds, the putting in of the chills, as to the location of the chills, or the size of the chills, or anything of that kind? A. Well, there is no set rule for a thing of that kind.

Q. I asked you whether or not you pursued the same practice in regard to those things to the end the same as you began with—now, answer that question yes or no? A. No.

Q. You made no changes there? A. No, sir; I don't mean that, I mean to say that we did not pursue the same rules in regard to that.

Q. Oh, then you did make changes? A. As necessity arose.

Q. Now, as to the annealing—did you make any changes in the methods of annealing from the time you first began there to the end of your service there? A. There was a change made there, as covered by Mr. Brinton's patent.

Q. When was that change made? A. That change was made about a year after I went to the Taylor Iron and Steel Co., I should say about the year 1897 or 1898, when that change was instituted.

Q. Did you witness the whole processes of manufacture out there at Chicago during the three days you were there? A. Well, I don't know, I don't think I got into all the details.

Q. Did you see what they did with the steel

after it was taken from the moulds? A. No, sir; I was not there at the night time at all.

Q. Did you see their annealing furnace? A. Yes, sir.

Q. Did you see the steel put in the annealing furnace? A. No, sir; I cannot say that I did.

Q. Do you know whether they have an annealing furnace? A. I don't know, sir.

Q. And yet you have sworn that the process employed there was the same there as it was at Highbridge? A. Understand me, I meant the annealing furnace being similar to what they had at the Taylor Iron and Steel Co.'s works—that is what misled me, and caused me to answer the way I did.

Q. Well, did you see an annealing furnace out there at all? A. I did.

Q. But you are not prepared to say that they are similar to those out at Highbridge, is that what you meant to say? A. That is what I mean.

Q. The fundamental principles of all this is what you claim is similar at both places? A. Yes, sir.

Q. And that is that the fundamental principles relating to the mixing of the steel and the manipulating of the ingredients to give the desired finish to the product are the same? A. Yes, sir.

Q. And this runs through the whole thing? A. I was speaking of the processes from the beginning to the end, from the iron rod to the annealing furnace, and that covers quite a bit that I cannot describe.

Q. Well, they begin with the raw material, do they not? A. Yes.

Q. And they melt it? A. Yes, sir.

Q. And then they mix the ingredients? A. Yes.

Q. And then it is heated up? A. It is melted,

not only heated up—it is moulded after it is heated up.

Q. It is melted and then it is moulded? A. Yes, sir.

Q. And then it is heated up for annealing? A. Yes, sir.

Q. And then it is finished off in the water? A. You are speaking of Manganese steel?

Q. Yes. A. Yes, sir.

Q. And that is the fundamental principle in all the foundries, is it not? A. Yes; but it embraces a whole lot.

Q. There is a whole lot of detail hanging on to that, is there not? A. Yes, sir; just as there is in any other business, it is not devoid of details, by any means.

Q. Then all men that might understand that fundamental principle would have a sorry time of it in making a Manganese steel without they had some other knowledge? A. Well, I don't know how they accomplished it out there, but I know that they made a pretty good article out there which was made before I got there, too.

Q. Did you see any before you got out there? A. I saw some when I got out there.

Q. Did you see any of their stuff at Highbridge before you went out there? A. No, sir.

Q. You never saw any tests made of their stuff at Highbridge? A. No, sir.

Q. Did you ever see any of their steel that would wear one-quarter as long as the steel made at Highbridge, that is steel in actual use? A. I cannot answer that question.

Q. Haven't you been interested in that? A. I have been interested enough in it, but I have been very much tied up, and I haven't had the opportunity to look around me.

Q. You haven't been so tied up since you went

out there to Chicago, have you, that you could not have witnessed how their steel stood up as compared with the Highbridge steel? A. Well, you kept me pretty quiet.

Q. Well, how did you know it was good steel they made? A. Well, a man who has been in the steel business for twenty or twenty-five years can tell almost at a glance whether it is good or bad.

Q. Can you tell the wearing qualities of steel by looking at it? A. Yes, sir; your eye can give you a fairly good idea of that.

Q. Prof. Howe wants to know if you could find out the internal cracks in a piece of steel casting by looking at the outside of it? A. No; nor can Prof. Howe either, if he could he would have avoided internal cracks fifteen years or more ago.

Q. And you would, too, would you not? A. Yes, sir.

Q. And you don't know whether the defendant company's steel had any internal cracks in its castings or not by merely looking at the outside of it? A. No, sir; and the Taylor Iron and Steel Co. either.

Q. And you don't know whether the steel that you saw and which you said was so good had any internal cracks from the observation you had of it? A. No, sir; the steel made by the Taylor Iron and Steel Co. has water checks in it, too, that is not denied either.

Q. But the Taylor Iron and Steel Co.'s steel is singularly free from internal cracks, is it not? A. No, sir; it is not.

Q. As indicated by its wearing? A. As indicated by its wearing?

Q. Yes. A. A casting with an internal check would not give the service that it should give, although it does not interfere with its wearing qualities.

Q. What does the surface, its appearance prove, what you cannot ascertain by inspection? A. I don't quite catch that.

Q. What is there that you can only ascertain by the surface that the casting is good? A. You can ascertain by the surface inspection of a casting whether it is soft or hard.

Q. Can you tell that by the eye? A. No, sir; not from an inspection of the outer surface of the casting; no, sir; I am speaking of physical test.

Q. Can you see inside of a piece of steel? A. Well, I cannot, but I can look at a fracture if it is broken.

Q. What else is there that you can only determine in regard to a piece of steel by its use or wear? A. You can take its physical properties—you can give it a physical test, you can pound it and find out its condition and quality.

Q. Did you see the defendant company's steel subjected to that test, that physical test? A. The American Brake Shoe and Foundry steel?

Q. Yes. A. I cannot recall that I did.

Q. Did you see it subjected to any test at all? A. No, sir.

Q. But it was pretty good looking stuff you thought? A. That is conceded.

Q. You speaking of the interview that Mr. White and Mr. Christie had with you before you left Highbridge? A. Yes.

Q. I understand you complained to them that you were proposing to leave Highbridge because of the private troubles you had? A. Yes, sir.

Q. You made no complaint against the Taylor Iron and Steel Co., did you? A. No, sir.

Q. The matters that affected you were there of a social character? A. Yes, sir.

Q. And one of the gentlemen said that he thought Mr. Brinton could straighten them out for

you? A. No; he thought he could straighten it out with Mr. Brinton.

Q. Do you mean to say that your relations had become strained with Mr. Brinton? A. Evidently I had not seen Mr. Brinton for two weeks.

Q. You and Mr. Brinton had been very close personal friends, had you not? A. Yes, sir.

Q. All the years you had been there? A. We had; yes, sir.

Q. And was this your first little jar? A. Of this kind; yes, sir.

Q. Had you had other difficulties, you and Mr. Brinton? A. We had had some little natural differences that had occurred in our ten or fifteen years' association.

Q. And you had got over them? A. Yes.

Q. In the way that people have to get over those things? A. Yes, sir.

Q. Well, this little difference had existed how long between you and Mr. Brinton? A. For two weeks.

Q. And you, I understand from the testimony, you thought Mr. Brinton had not treated you quite right, and that he had put a couple of men to spy on you—was that it? A. Yes, sir.

Q. You were not angry towards Mr. Brinton for anything else than for that, were you? A. I was not as angry towards him as I thought he was towards me—he did not come to the house at all.

Q. Were you hurt because Mr. Brinton did not come to you to the house? A. I certainly was.

Q. Was your principal grievance against Mr. Brinton because he did not come to you, because he did not come to the house to see you? A. The principal grievance was the action of the men through the town——

Q. I understand that so far as Mr. Brinton was

concerned you felt that he had not treated you quite right in that he had put these men, as you thought, to spy upon you? A. I had every reason——

Q. I didn't ask you that, my question was so far as Mr. Brinton was concerned, you felt that he had not treated you quite right in that he had put those men, as you thought, to spy upon you—now I ask you whether that was it or not? A. Yes, sir.

Q. Now, Mr. White and Mr. Christie offered to see Mr. Brinton, you say? A. Yes.

Q. And did I understand you to say that you thought they could not do anything with him? A. I did.

Q. Did you think that Mr. Brinton was so irreconcilably angry with you that they could not do anything with him? A. I did.

Q. And you thought he was not willing to be friends with you any more? A. I felt that he would not concede to my wishes, so far as these particular men were concerned.

Q. You wanted those men to be put where you would not be brought in contract with them, did you not? A. That is it.

Q. You wanted them discharged? A. I didn't want to have anything to do with them.

Q. Were they employed by the Taylor Iron and Steel Co.? A. Yes, sir; they were.

Q. In what positions there? A. One was in the position of labor foreman, and the other was in the position as a general handy man around the place, a mechanic or something of that kind.

Q. Did you come in contact with them there? A. Regularly every day.

Q. And their conduct—no matter now what it was—had been such that you felt you could not

work where you had to come in contact with them daily? A. That is it.

Q. Did you ever ask any one to have them discharged? A. I think I told Mr. Christie that that was the only condition under which I would return to the Taylor Iron and Steel Co.

Q. And what did Mr. Christie say to that? A. Mr. Christie said that he would try and arrange those matters with Mr. Brinton.

Q. And what did you say to that? A. I cannot recall my answer to that.

Q. Mr. Christie was superior to Mr. Brinton, was he not? A. Yes, sir; I think so; I told him though that he would have difficulty in arranging those matters to Mr. Brinton's satisfaction.

Q. You knew though that he had authority over Mr. Brinton, didn't you? A. I knew that; yes, sir.

Q. Was that the extent of your objection as explained to those gentlemen? A. Yes, sir; that was the extent of my objection.

Q. So that, if these men had been discharged or put somewhere where you did not have to meet them every day, or at all, the whole difficulty would have been adjusted, would it not? A. No, sir; it would not—the conditions existing in the borough were such that it would not be adjusted in a short while.

Q. Oh, there was trouble in the borough, too? A. Yes, sir.

Q. You were a member of the Board of Education, I understand? A. Yes, sir.

Q. And there was some talk going on in the borough that you did not like? A. Yes, sir.

Q. And that your family did not like? A. Yes, sir.

Q. Did you wait for Mr. Christie to see Mr. Brinton? A. I did not.

Q. Did you ever inquire as to whether Mr. Brinton was willing to discharge those two men or not? A. I did.

Q. Who did you inquire of? A. Mrs. Nichols.

Q. Your wife? A. Yes, sir.

Q. Did she go to see Mr. Brinton, so far as you understood? A. Mr. Brinton came to see her.

Q. How soon after the interview between Mr. Christie, Mr. White and you? A. About three or four days, I think.

Q. Did you leave Highbridge the next morning? A. Yes.

Q. Then you didn't wait for your wife to see Mr. Christie, Mr. Brinton, or anyone else? A. Mr. Brinton saw her three or four days after that interview, I didn't see Mrs. Nichols for three or four days after that; I was away.

Q. You had already left with the intention of separating yourself permanently from the company before that time, had you not? A. Yes, sir.

Q. You did not wait until Mr. Brinton had sought Mrs. Nichols, did you? A. No, sir.

Q. Now, going back to the time Mr. Snow came there—what did Mr. Snow say to you when Mr. Estes called you out? A. I cannot recall the direct conversation.

Q. Give it to us as nearly as you can? A. He told me he had a vacancy at the Chicago Heights plant, and asked me if I cared to accept it.

Q. Did he say what kind of a vacancy they had at this Chicago Heights plant? A. The vacancy of superintendent of the plant.

Q. Did he tell you what they were doing there? A. He told me that they were making steel castings, of all descriptions and Manganese steel castings.

Q. What did he say about the Manganese steel

castings? A. He did not dwell on that particularly.

Q. Well, what did he say about it? A. He said they wanted to get a superintendent to manage the plant, and he said that they thought they would be successful if they could achieve that much of it——

Q. Did they say they wanted someone who could make Manganese steel? A. No, sir; not directly.

Q. Well, indirectly? A. No, sir; they wanted some one to manage the plant.

Q. Did he say anything about Manganese steel? A. Yes; he said that they were having some little trouble, as every one had who was trying to do it.

Q. Was that what he said? A. No, sir; that is what I said.

Q. Did he speak about their having any troubles in the making of Manganese steel? A. Yes, sir; he said they were having some little trouble with it.

Q. And did he say that he wanted you particularly for the knowledge you had of the methods or way of making Manganese steel? A. No, sir; he did not tell me that.

Q. Well, did he tell you he wanted you to make Manganese steel and other special steels at Chicago Heights? A. He told me that he would like to have me take charge of the plant.

Q. What did he say about the compensation? A. About the compensation—I asked him what the compensation would be, and he told me that it would be $5,000 a year.

Q. Is that all that he said? A. On that subject; yes, sir.

Q. And what did you say? A. I told him I would have to consider it.

Q. Did you say anything about a greater compensation to him? A. No, sir; not to him; no,

sir; I told him I would consider it and let him know by the following Thursday what I might be willing to do, and then our conversation closed right there.

Q. Did he say anything about keeping it secret, this interview between you—not to tell anyone? A. He asked me to keep it confidential.

Q. What did he say? A. That is all he said, he desired me to keep the conversation confidential.

Q. Well, did you communicate with him on the following Thursday? A. I did.

Q. How did you communicate with him—by letter? A. By letter.

Q. Have you got a copy of that letter? A. No, sir.

MR. LINDABURY—I ask for the production of that letter. I gave you notice on Monday to produce all letters and correspondence between the American Brake Shoe and Foundry Co. and Mr. Nichols—letters written by Mr. Nichols to the Brake Shoe Co., as well as letters written by the Brake Shoe Co. to Mr. Nichols—have you got this letter?

MR. CORBIN.—We have not got it.

(*Mr. Lindabury.*)

Q. Have you a copy of that letter? A. I made no copy of it.

Q. Did you get an answer to it? A. I do not think I got a letter, because I stated in my letter to him that I would see the parties at their convenience, either he, Mr. Cutler, or Mr. Snow at his convenience, and I think I got a telegram to meet him in New York the following Sunday.

Q. Did you go to New York the following Sunday? A. Yes, sir.

Q. Who did you see there on that occasion? A. I saw Mr. Snow and Mr. Cutler.

Q. Mr. Cutler, the President of the company? A. Yes, sir.

Q. Where did you see them? A. At the hotel—I cannot recall the name of the hotel now.

Q. Well, what took place there? A. We discussed the matter, and I told them I was not satisfied with the $5,000 a year.

Q. Go on, what took place—tell us all the conversation? A. And Mr. Cutler told me that if that was not satisfactory, what would be? And I told him that I thought to get $6,000 a year under the circumstances. And then he told me that they had made propositions at times to their employees, that he thought benefited them particularly, and it was this—that a certain amount of stock would be set aside for a particular employee or an employee, and the amount of the dividends derived from it per year would be devoted to the payment of that stock, which would nearly equal the additional $1,000 that I asked them for. That is as near as I can get at it. However, I refused that proposition, and I asked them for the $6,000 a year, which was granted.

Q. How was it granted? A. Well, it was granted if I came with the company, that I should receive that price or salary as superintendent of the plant.

Q. Was it not $7,000 a year? A. No, sir.

Q. And no stock connected with it? A. No, sir.

Q. You did not tell Mr. Brinton that the salary you were to receive was to be $7,000 a year? A. No, sir; I think Mr. Bart O'Rourke, I think it was—he was the man that formed that misconception or misconstruction of the thing.

Q. Mr. Brinton says that you told him that the salary was $7,000 a year and a block of $10,000 of stock? A. It must be a lapse of memory on the part of Mr. Brinton.

Q. Mr. Christie says you told him so also? A. Mr. Christie is in error if he says so, because I did not tell him that.

Q. Well, that was the Sunday after Mr. Snow's visit to the foundry? A. Yes, sir.

Q. And was it the succeeding day that you went down to your sister's deathbed at Camden? A. Yes, sir; Monday the 12th I was in New York, and on the 13th it was when I went to Collinswood.

Q. And you came back from Collinswood on Tuesday? A. Yes, sir.

Q. And your sister died early on Tuesday morning? A. Yes, sir; my sister died early on Tuesday morning and I came back on Tuesday night.

Q. When did you first speak to Mr. Christie about Mr. Snow's visit to the foundry; before you went to New York on Sunday, was it? A. Mr. Christie called me into the office a week before I went to New York; yes, sir.

Q. That was the same week, was it not? A. The next day after Mr. Snow called at the plant, if I recollect correctly.

Q. Mr. Snow was there about the sixth or the seventh? A. Somewhere in that neighborhood, I think.

Q. Now, what was the conversation between you and Mr. Christie? A. Mr. Christie told me that he was not in a position to meet propositions of that kind, and that he hoped I would not consider it, or something to that effect, because he said he felt things would come all right for me out there.

Q. And that he was not supposed to outbid the

defendant company? A. No, sir; he was not in a position to meet propositions of that kind, and that he hoped I would not consider it seriously, and that he felt that things would come out all right for me there, and he hoped that I would be satisfied with what I was getting——

Q. Now, on the Tuesday night after you returned from your sister's deathbed, that was the time you announced to them that you would stay with them? A. Yes, sir.

Q. When did you announce that to Mr. Brinton? A. On the Tuesday night.

Q. The same Tuesday night that you returned from Collinswood, you announced that to Mr. Brinton when you got home? A. Yes, sir.

Q. I understood you to say that you spoke to Mr. Christie about this offer by the Brake Shoe and Foundry Co. on the Thursday night before you went to New York, and you say that Mr. Christie said that he was not in a position to outbid the other company, and that he hoped you would reconsider the matter and that the company was not prepared to meet a proposition of that description? A. That was before I went to New York.

Q. That is to meet such offers as this one made to you? A. Yes, sir; but I told him at that time that I had intended to correspond with Mr. Snow on the subject, and I presumed that Mr. Snow had the letter on Thursday, and in the meantime I consulted with Mr. Brinton, and he thought it was something that I ought to look after.

Q. Why was it you said that you had made up your mind not to accept the defendant company's offer? A. Well, primarily it was owing to the fact that I was compelled to make some financial arrangements, it was necessary for me to borrow some money to bury my sister, and take care of those obligations——

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Q. And you wanted to get the money of whom? A. From Mr. Brinton.

Q. Mr. Brinton was your friend? A. He certainly was.

Q. Perhaps the closest friend you had? A. I always judged him so.

Q. And Mr. Brinton often loaned you money, didn't he? A. He had loaned me money.

Q. How much did you need to borrow in order to bury your sister? A. It cost me $235.

Q. Mr. Brinton had loaned you larger sums than that, hadn't he? A. He had.

Q. Had you any reason to suppose that he would not loan you that amount, even if you had gone with the defendant company? A. I could not have asked him for it under those circumstances.

Q. Why? A. I could not have asked him for any money under those circumstances.

Q. But you would have had greater resources to repay him if you had gone with the defendant company, and he had loaned you this money? A. Yes, sir.

Q. And you say he was your friend? A. Yes, sir.

Q. And he said that he would not stand in the way of your bettering yourself, didn't he? A. Yes, sir.

Q. And he showed no disposition to keep you there at Highbridge against your interests, did he? A. Well, I knew that he did not want me to leave him.

Q. True enough, he may not have wanted you to leave him, but he had never showed any disposition to keep you there against your interests, or to put anything in your way? A. No, sir.

Q. He had always shown a disposition to help you wherever he could? A. Yes, sir.

Q. Then why is it that you could not have bor-

rowed the money of him, even if you had been going to leave Highbridge? A. There was a condition at that time existing that I cannot explain to you, and I trust you won't ask me to do so, there was a feeling existing there then that made it necessary that I should pull in this direction——

Q. There was more than your need for this two hundred and odd dollars, was there? A. No, sir; it was not——

Q. Could you not have asked for it from the American Brake Shoe and Foundry Co., had you any doubts but that you could have got the amount of money you needed from the American Brake Shoe and Foundry Co., if you had asked them for it? A. I did not care to ask strangers, had I asked them for it the chances are I would have got it.

Q. And the chances are you would have gotten it from Mr. Brinton if you had asked him for it? A. Yes, sir.

The further cross-examination of this witness suspended, to permit of the examination of another witness.

WILLIAM W. SNOW, a witness produced in behalf of the defendants, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Hillburn, N. Y.

Q. What position, if any, do you occupy with the American Brake Shoe and Foundry Co.? A. I was chairman of the Board of Directors.

Q. In what business is the American Brake Shoe and Foundry Co. engaged? A. Making brake shoes principally.

Q. Have they an extensive number of plants? A. They have.

Q. Where are they located? A. One is located at Chattanooga, another one at Buffalo, another at Uniontown, another at Chicago Heights, and another at Mahwah—they own those plants.

Q. Do you in your capacity as chairman of the board have anything to do, or connection with the adminstration or executive part of the company? A. Nothing at all, except preside at the meetings of the board and the executive meetings.

Q. Are you acquainted with the complainant company, the Taylor Iron and Steel Co. and its officers? A. I used to be acquainted with the old gentleman, who is still living, and is ninety odd years of age, and his son William J. Taylor, and I have met Mr. Christie many years ago.

Q. How long have you been acquainted with them, Mr. Snow? A. Well, since about thirty years ago or more.

Q. Are you acquainted with the organization of the company? A. No, sir.

Q. And its commencement of business? A. The commencement of the business—the commencement of the car wheel business, I assisted them in starting that branch of their business, but their iron business I have nothing to do with it except the cast iron.

Q. You have always been on friendly terms with the head of the company? A. Yes, sir.

Q. In March, 1905, were you participating at all in the management of the American Brake Shoe and Foundry Co.? A. No, sir.

Q. Do you remember giving E. J. Snow a letter of introduction? A. I do.

Q. Will you state the circumstances under which you gave that letter? A. Well, he came to me and said, "I would like to go out and see Mr. Estes, who is a relative of the Snow family, and while I am there I would like to go through the Taylor

Works there."—as he said it was probably very interesting for him to see, and it would be easier for him to get in there, he said, "If I had a letter of introduction." I told him "I would be glad to give it to him," and so I did.

Q. Did you know at that time anything about Wesley G. Nichols? A. I did not.

Q. Did you know anything about their being a vacancy in the position of superintendent at Chicago Heights of the American Brake Shoe and Foundry Co.? A. I did not.

Q. You have heard or known of the existence of this lawsuit, have you not? A. I have.

Q. Do you know what it is charged—that Elmer J. Snow did on a visit there? A. I don't know about that, what the charge is that he done there, but I know that he went there and took my letter of introduction.

Q. Well, it is charged that while he was there he made the acquaintance of Wesley G. Nichols, and had some negotiations with him about going to Chicago Heights? A. I have heard that recently, I knew nothing about it when he went away, and I did not know what he was going there for, specially, except to visit Mr. Estes, and if the opportunity occurred he would see the works.

Q. Did you ever obtain a patent from the U. S. Government for the making of a brake shoe with a composition of Manganese and iron in the brake shoes? A. I have had three or four patents from the government, I have one on brake shoes I know, but I do not remember its composition now.

Q. Examine that, please, and say if that is one of your patents (handing Exhibit D 1 for identification to the witness)? A. I remember all about it now, having read it, I remember obtaining it, and I remember the circumstances connected with it a little.

Q. Had you prior to July 9th, 1889, experimented with manganese in composition with iron in making brake shoes? A. I do not remember the circumstances connected with all that matter, it is a good while ago, and my memory is not as bright as it might be at this time of life. I remember I used manganese more or less—why, iron is a constituent to manganese a good deal.

Q. In what way were those ingredients mixed by you at that time? A. I do not remember.

Q. Do you remember whether it was in the cupola or hot-air furnace? A. It was in a cupola.

Q. Do you remember how the manganese was added? A. It was in the capacity of white iron, there is more manganese in white iron than there is in any other kind of iron.

Cross-examination by Mr. Lindabury.

Q. How old are you, Mr. Snow? A. It is a pretty leading question—I am past seventy-eight, going on seventy-nine.

Q. Are you in active business any more? A. No, sir; I am not; I am just watching the boys, that is all.

Q. How long have your exertions been confined to watching the boys? A. Two or three or four years.

Q. Were you ever a steel maker yourself? A. Never a steel maker.

Q. What was your business during your more active life? A. In the foundry business, making car wheels mostly.

Q. How long have you been connected with the American Car Wheel and Foundry Co.? A. Since its organization.

Q. And when was that? A. I cannot give you the date, but it is since it was organized; in the first place, it was——

Q. I meant the American Brake Shoe and Foundry Co.? A. I knew what you meant, I can tell you in a minute. Well, the first company Mr. Sargeant was interested with me, in making brake shoes, away back in the early history of—what is the name of that shoe, Elmer, we used to make first—the Congan shoe——

Q. Do you remember when it was you became connected with the company, just roughly? A. Well, perhaps, five, six, seven, eight or ten years ago, I don't know exactly.

Q. And you were formerly connected with the Ramapo Iron Works, were you not? A. The Ramapo Foundry and Steel Co. originally, and then it became the Ramapo Iron Works.

Q. Now then the defendant company—that is, that business was taken over by the defendant company? A. What is the defendant company?

Q. The American Brake Shoe and Foundry Co.? A. No, sir, they never took any of those companies over.

Q. Are you still interested in the Ramapo Iron Works? A. I am still interested in all the companies.

Q. You were a personal friend of William J. Taylor the elder, were you not? A. Yes, sir.

Q. And a close friend of his for a good many years? A. Yes, sir.

Q. And had met Mr. Christie also, I think you said? A. Yes, sir.

Q. And you had helped them start part of their business up there at Highbridge, had you not? A. Yes, sir.

Q. And were on very friendly and close terms with them in the year 1905, were you not? A. Yes, sir, and I am now, I suppose; I don't know why I should not be.

Q. You did not know that E. J. Snow had as

a real purpose in going up to Highbridge, the going there with the idea of inducing or enticing one of their men away from their employ? A. No, sir, and I don't think so yet.

Q. And would you have given him a letter of introduction, if he had had any such purpose as that, and you had known of it? A. No, sir.

Q. Were any of your companies making Manganese steel at this time? A. No, sir, none of the companies that I was connected with.

Q. Was this defendant company? A. No, sir, I did not know anything about it, if they were.

Q. You were chairman of the board of directors, I understood you to say? A. Yes, sir.

Q. That is considered quite an important position in a corporation to-day, is it not? A. I suppose so, I am there to watch the boys, you know.

Q. Have they succeeded in making any Manganese steel up to this time? A. I don't know anything about it.

Q. Yet you are the chairman of the board of directors of this defendant corporation, and do you say that you do not know whether that company has succeeded in making any Manganese steel up to this time? A. No, sir, I know nothing about the making of Manganese steel anywhere, and I would not know anything about it, unless the matter came before the board of directors.

Q. Well, it did not come before the board of directors, that they were making a success of the making of Manganese steel there, did it? A. I don't know anything about it.

Q. I will ask you one more question—Mr. Snow, did you ever successfully use this patent in making Brake shoes (D 1 for identification)? A. Oh, yes, sir, we were very successful in that particular at the time I got that patent, we were having some opposition and the shoes were not wear-

ing as well as they should have done, and I used this white iron, which had a large amount of Manganese in it, and we had very much better success then.

Q. In the brake shoes? A. Yes, sir, we had much better success then in the brake shoes that we made.

Q. You used it in making brake shoes I take it from this patent entirely? A. Yes, sir.

MR. GOODE—I renew my offer in evidence of this patent, heretofore marked Exhibit) D 1 for identification.

COURT—It may be marked in evidence.

Marked Exhibit D 1.

WESLEY G. NICHOLS, recalled in behalf of the defendant, for further cross-examination.

Cross-examination resumed by Mr. Lindabury.

Q. I understood you to say that you first communicated to Mr. Binton your resolution to stay with the complainant company? A. Yes, sir.

Q. In March last? A. Yes, sir.

Q. That was on the evening that you returned from your sister's burial? A. Yes, sir, March 14th.

Q. Where did you see Mr. Brinton that evening? A. At his house.

Q. What did you say to him with regard to leaving or staying with the company that evening? A. I had found him in the morning first, but on my return from Collinswood that evening I told him I felt I would have to remain with him.

Q. That is what you said? A. Yes, sir.

Q. And that was in the evening? A. That was in the evening, when I think I repeated it to him.

Q. You went to his house, you say? A. Yes, sir.

Q. Now, I would like the whole conversation, just as it occurred, what you said, and what he said? A. I cannot do that, it transpired too long ago for that.

Q. Well, as near as you can? A. We spoke, of course, first about the occurrences at Collinswood; we also dwelt briefly on the fact that it was necessary for me to have some money, and then Mr. Brinton told me—of course, I naturally to get it of Mr. Brinton, that is why I appealed to him first for it——

Q. Did you ask for the money before you told him that you would remain with the company, or did you tell him you would remain before you asked for the money? A. No, sir, I had told him before I had asked him for the money, or before he told me who would give it to me, that I thought I would remain with the Taylor Iron and Steel Co., and he seemed very much pleased at it.

Q. What did you say to him, give the whole conversation—what reason did you give him for having reached that conclusion, I want all your talk on that occasion? A. When it came to the issue of my leaving him, along with the circumstances that had happened at that time, it was rather a serious question with me, and in view of the accommodation that I had asked from him, I felt that I could not tell him that I was going to leave him, I felt that it would not be right, my conscience would not permit me to do that, that was the substance of what I told him.

Q. You are giving your views rather than your statements to Mr. Brinton, I take it? A. No, sir, I think that deals as closely to the statement I made to Mr. Brinton at that time, as it is possible for me to come to it.

Q. You think you told Mr. Brinton that you could not conscientiously get the money from him, and then leave the Taylor Iron and Steel Co.? A. I cannot recall the words that I used in making that communication to him, of course, but I think that was the substance of it.

Q. You think you gave him to understand that your reasons for concluding to stay with the Taylor Iron and Steel Co. was that it was necessary for you to borrow some money? A. Yes, sir, he understood it that time, that there was a tie between him and myself, rather than any consideration for the company, and I, as I explained before, under the circumstances, felt that I could not leave him, I felt under those circumstances, that it would not be proper for me to leave him, my conscience would not permit me to do that; I told him so, and he understood it——

Q. I am not asking you now whether you had really decided to leave the employ of the Taylor Iron and Steel Co. and go into the employ of the other company; my question is, whether you gave him to understand that your reasons for concluding to stay with the Taylor Iron and Steel Co. were, simply because you found it necessary to borrow a little money of him or not? A. That, and in connection with the fact that I hated to leave him, that is what I told him.

Q. You did tell him that the fact of borrowing the money entered into it, in your mind? A. Yes, sir.

Q. You told him that you did not like to leave him personally? A. Yes, sir.

Q. You were very fond of him, were you? A. Yes, sir, and I am yet.

Q. And he seemed to be very fond of you? A. Yes, sir.

Q. And you have now a great regard for Mr. Brinton? A. Yes, sir.

Q. And you think he has the same regard for you? A. I haven't the least doubt of it.

Q. And those were the circumstances, that is, the borrowing of some money, and the personal feelings existing between you and Mr. Brinton that caused you to tell him that you could not leave him? A. And the fact that my sister's death had made a change—that my mother, who had always lived with my sister, and now my sister was dead, my mother was not particularly desirous of having me go away so far.

Q. Where did your mother live? A. At Collinswood, with my sister.

Q. And that is what made you feel that you could not leave the Taylor Iron and Steel Co. and Mr. Brinton, and why you then told him that you had concluded not to go away? A. I felt that way, yes, sir.

Q. And did you tell him that you felt in your conscience that you could not honorably leave the Taylor Iron and Steel Co.—did you tell him that you had some constraint of that kind upon you? A. Yes, sir, I felt in that way at that time.

Q. Why, what obligations of honor appeared to you, I mean at the time that we are speaking of? A. Well, it was the kindness of Mr. Brinton to me particularly that made me feel that way, and the other members of the company, they were also kind to me, there is no question of that; I do not deny that, and I had a kindly feeling for them.

Q. You had been with them there for years? A. For nine years.

Q. And you had learnt most of what you knew there, hadn't you? A. Not most.

Q. Well, you had learned much that you knew, all your later information in regard to the business?

A. Quite naturally, working for nine years in one place, in one plant, you would naturally learn considerable of the business of the concern.

Q. You got all your later experience there, did you not? A. So far as steel casting was concerned, yes, sir.

Q. That is what I meant? A. Yes, sir.

Q. And you got all of what you had learned in regard to the making of Manganese steel, or Manganese work there, did you not? A. Yes, sir.

Q. Had you ever been in any foundry before that? A. No, sir, not before I went to the Taylor Iron and Steel Co.

Q. I mean up to this time, in March, 1905? A. No, sir, not where they manufactured Manganese steel.

Q. Up to the time of your receiving this offer from Mr. E. J. Snow, you had not been in any other foundry, except the foundry at Highbridge, had you? A. No, sir.

Q. You never were up to the time you left there, were you? A. No, sir.

Q. Well, I suppose Mr. Brinton was delighted with that information, that you had decided to stay with them? A. He was, apparently, very much pleased.

Q. Did you tell him how much money you wanted? A. Yes, sir, I told him I would like to have $150.

Q. And he said he would let you have it, but that the steel company had said that they would like to let you have it, instead? A. He said that he would let me have it with pleasure, but that the steel company had said they would let me have it.

Q. But the steel company had let you have money before that, hadn't they? A. I cannot re-

call that they had ever loaned me any money before that.

Q. You cannot recall it? A. No, sir, I cannot recall that the steel company had ever loaned me any money before, but Mr. Brinton had.

Q. Well, had they permitted you to overdraw your account, or anything like that? A. No, sir, not to my knowledge.

Q. And you say you cannot recall it? A. No, sir, I cannot; I had appealed to Mr. Brinton before that, when I had needed money in excess of my salary.

Q. And he had often helped you? A. Yes, sir.

Q. You told us that this morning, didn't you? A. Yes, sir.

Q. Now, after making that communication to Mr. Brinton, then it was that Mr. Brinton said to you, that he was very glad that the company was proposing to do something handsome for you, by increasing your salary? A. I found in the morning that the chances were that I was going to remain with them, and I told them so, that the chances were that I should remain with the Taylor Iron and Steel Company.

Q. Oh, you had let them know in the morning of that day that the chances were that you were going to remain with them? A. Yes, sir.

Q. That you had practically made up your mind to stay with them? A. I felt that I had about made up my mind to stay with them.

Q. And that is your expression at that time, that you felt that you had made up your mind to stay with them? A. Yes, sir.

Q. And then it was that Mr. Brinton told you that the company proposed to increase your salary, was it not? A. Yes, sir.

Q. Did he say how much? A. I cannot recall whether he told me the amount, probably he did—yes, sir, $500 in cash.

Q. And how much had you been getting? A. $2,500 a year.

Q. And what did he tell you they would give you? A. They proposed to increase it to $4,500 a year, reserving $1,500 a year, each year, until the expiration of it, but $500 would be paid in cash each year.

Q. Did he tell you that you would have to sign a contract then? A. Yes.

Q. And what did you say to that? A. I felt very much pleased.

Q. And altogether, you both felt very happy, did you? A. We did, both of us felt very well pleased indeed.

Q. But you did not accept that, did you? A. No, sir, I did not accept that proposition.

Q. You supposed, after your talk with Mr. Christie, that you would get no raise, even if you stayed with them? A. That is what I anticipated from the conversation I had with Mr. Christie, that I would not get any increase of salary, after I stayed with them.

Q. Your salary had been raised year after year, all the time you were there, notwithstanding the fact that you had started out with a six years' contract? A. Yes, sir.

Q. This was on Tuesday night, you say? A. Wednesday night—no, sir, pardon me, it was Tuesday night.

Q. What did you do with yourself the rest of that week, did you work? A. Part of the time was consumed in burying my sister.

Q. The funeral had not taken place? A. No, sir.

Q. But did you not say that it was Monday they presented the contract to you? A. No, sir, Saturday.

Q. They presented the contract to you on Saturday? A. Oh, no, sir; Wednesday the contract was

presented to me, on Wednesday the 15th of March, 1905.

Q. And the next day it was, that you had this conversation? A. Following the night that I had had the conversation with Mr. Brinton; my sister died on the 13th, and I came back from Collinswood on the 14th, and my conversation with Mr. Brinton was on the night of the 14th of March.

Q. And the next day you signed the contract? A. Yes, sir.

Q. And you are quite sure that Mr. Brinton did not show you that contract before you went to Mr. Christie's office and saw it there? A. Positive, certain.

Q. You are sure of that? A. Yes, sir, I am positive certain of that.

Q. And you are also certain that you read it hastily and not leisurely? A. I did not have any time to read it; I just glanced over it.

Q. And you did not fully digest it, to use your own expression? A. That is right.

Q. By that contract you were to get an increase of salary, were you not? A. Well, I understood that on Wednesday night.

Q. You saw it in that contract, didn't you? A. I went over it so hastily, that I do not recall whether I saw it in the contract or not; I just glanced it over; I did not take the time necessary to read it.

Q. You did not take the time necessary to read it; and you did not see the increase of salary mentioned in the contract? A. I took Mr. Brinton's word for it, that everything was all right, and I did not pursue it further.

Q. And you don't know whether you took a copy of that with you that day or not? A. Yes, sir, thinking it over since the other day, I think that I did take a copy of that contract with me from the office.

Q. Did you examine it when you got to Collinswood? A. I did not examine the contract until after my sister was buried, whether that was Saturday night or Sunday, I cannot now say when it was that I did examine it.

Q. Well, you think you did examine it some time before Monday, do you? A. Yes, sir, I think I examined it some time before Monday.

Q. Did you employ a lawyer? A. No, sir.

Q. You examined it yourself? A. Yes, sir.

Q. And you examined it quite fully, did you? A. Yes, sir, I examined it quite fully; I read it over.

Q. And you came to know what the terms of the contract were, didn't you? A. Yes, sir.

Q. And then it was that you had the Monday's conversation with Mr. Brinton? A. Yes, sir.

Q. And then it was that you threw the copy of the contract down on his desk? A. Yes.

Q. As you have stated? A. Yes.

Q. Now, what was it in that contract that you objected to? A. I objected particularly to the structure of it.

Q. In what respect? A. The fact that it embodied trade secrets, and that it resulted in tying up the trade secrets that I had learned before I came to the Taylor Iron and Steel Co., and those which I had been taught, that is, it tied them up both before and after the expiration of the contract.

Q. Did you think that the contract prevented you from using your knowledge of what you had learned before you went to the Taylor Iron and Steel Co? A. That is my interpretation of it—did you say before I came to the Taylor Iron and Steel Co?

Q. Yes, did you think that the contract prevented you from using your knowledge of what you had learned before you went to the Taylor Iron and Steel Co.? A. That is one thing I would not like.

Q. Did it prevent you from disclosing or using the processes that you had learned before you went with the Taylor Iron and Steel Co.? A. I think that is what is embodied, that is one of the views I took of it.

Q. And another one, I suppose, because it prohibited you from making use of information you had got there during what we will call your first contract, that is, during the first six years you were there—did you object to that? A. I objected to it in its entirety; I did not think it was properly framed, and that is the way I put it to Mr. Brinton——

Q. Never mind that; we will get along to that bye and bye—I want to try and get at just what your mind was at that time—did you think and did you then object in your own mind to a provision in that contract that required secrecy with regard to anything that you had learned while you were in the employ of the Taylor Iron and Steel Co.? A. Yes, sir, I thought that was entirely too strong.

Q. You thought you ought to be allowed to make use elsewhere or disclose to others what you had actually learned for the first time during your employment with the Taylor Iron and Steel Co.? A. No, sir, only those things which we had actually perfected, that is what I objected to.

Q. Then the objection was not to the part of that contract which would prevent you from disclosing what had been taught you, but rather what you had learned yourself, in the development of the processes during that employment? A. I claimed that as the process itself, that which we had developed.

Q. Not the process as it was when you went there, but as you had developed it and made it? A. Most assuredly.

Q. That thing which you felt was part of your own creation, you felt that you should not be prevented from disclosing that part of the processes? A. That was my feeling.

Q. Because it was in a sense your own child, your own creation? A. If you care to look at it in that view, yes.

Q. I am trying to get at your mental operations, that is all—that was about it, was it? A. Yes, sir.

Q. Did you mention that to Mr. Brinton? A. I do not think I went into it in quite as careful details as we are at present, the statement or conversation was cut short before it got that deep.

Q. Was there any other feature of the contract to which you took exception? A. I cannot recall that there is, to me; no, sir.

Q. Of course your objection to being restrained from disclosing, or using elsewhere, these processes that had been taught you was not because they were already in use elsewhere, because you did not know whether they were or not—do you understand the question, or is it a little vague? A. It is a little vague.

Q. I say, you did not object to being restrained from disclosing, or using elsewhere, those processes that had been taught you, on the ground that they were generally known, for you did not know whether they were or not, did you? A. No, sir, but then it is not quite clear to me about the processes that were taught me; I confess I did not know anything about Manganese steel castings when I went there, but there was lots I did know when I went there.

Q. The Bessemer process, for instance? A. Yes, and the mixture of iron with steel.

Q. Of course, you did not object to being restrained from disclosing what you had discovered and been instrumental in building up there, on the

ground that that was known elsewhere, because it could not be known elsewhere, could it? A. No, sir, there was some points that were exclusive, for a steel plant, and every steel plant has its own methods and processes that are exclusively its own.

Q. Those things you and Mr. Brinton had worked up you have not told anyone, had you? A. No, sir, we had no occasion.

Q. You did not tell anyone about those things, which you and Mr. Brinton had worked up in the course of your and his employment in that foundry? A. No, sir, we worked those up between ourselves, and we kept them to ourselves.

Q. And Mr. Brinton had not told anyone, so far as you knew? A. I don't know what Mr. Brinton did.

Q. Well, so far as you know? A. No, sir, not so far as I know.

Q. So that, so far as you were concerned, those things which you and he had adapted and put in use yourselves were absolute secrets, so far as you could tell? A. They were not absolute secrets to anyone who was there; It was all open and free to everyone there.

Q. They were the secrets of the Taylor Iron and Steel Co.—yourself and Mr. Brinton, and the Taylor Iron and Steel Co. people—they were not known outside, were they? A. No, sir, I cannot say that they were known outside at all.

Q. Now, your feeling was that you ought not to be restrained from using or divulging them, because you had had a hand in creating them? A. It was our hard work that had developed them.

Q. It was your hard work that did it, you say? A. Yes, sir.

Q. It was your hard work that did it? A. Yes.

Q. Well, now, did you have a further difficulty, in your own mind, with regard to the length of

time that you were to be employed under the new contract—that is, did you object that, while you were employed for five years, you were tied up forever; did you have that feeling about it? A. Yes, sir, I think I expressed myself that way; but that was in ridicule, so far as our conversation was concerned.

Q. That was not serious? A. No, sir, he felt that beyond the five years something would develop that would be satisfactory to all concerned.

Q. And you would stay on, as you had done? A. With him, yes, sir.

Q. Now, Mr. Brinton talked the matter over with you, and handed you back the contract? A. After several days.

Q. After some days? A. Yes, sir.

Q. And you took it? A. Yes, sir.

Q. What did you do with it? A. I think I probably took it home.

Q. And you observed all its terms on your own part, did you? A. We went along in the same channel as before, faithfully observing our work, and taking care of conditions, as they arose.

Q. You got your pay under the contract? A. Yes, sir.

Q. Down until July? A. Yes, sir.

Q. And you never, from that time to this, made any objection to the contract, as a contract; you never, from that time until the suit was brought, I mean, made any objections to the contract, as a contract? A. Yes, sir, we discussed the question about ten days or two weeks after that.

Q. You said something about that—you wrote a letter about two weeks after? A. Not two weeks after; it was between the time my sister died and the time she was buried that I wrote the letter, before I had had time to examine the contract—the one I wrote from Collinswood, asking for fifty dol-

lars more—that is the time, between the time my sister died and the time she was buried. It was then that I had not examined the contract as carefully as I should have done.

Q. Did you read it a second time? A. Not at that time.

Q. You did read it, and took it home with you, and put it away, did you? A. Yes, sir.

Q. Now, from the time you did have this Monday conversation with Mr. Brinton, did you object to the contract as a binding obligation upon you, either to Mr. Brinton, or Mr. Christie, or anyone else, down to the time you left? A. Yes, sir, I did, to Mr. Brinton; we talked about it occasionally, and I told him I did not consider the contract as binding as it showed forth in the contract.

Q. You did not believe it was binding? A. No, sir.

Q. You took the salary under it? A. I worked for it, too.

Q. I haven't any doubt you did? A. Yes, sir, I did.

Q. Was it your idea that you could work under the contract, and draw your salary under it, but repudiate it whenever you got ready to do so; was that the idea you went on? A. It was not the idea under which I accepted the contract, under no circumstances, no, sir.

Q. I want to get at your mind; when you went home, after your talk with Mr. Brinton, or when you took the contract, and put it away in your desk, and went to work and continued there, was it the idea that you could accept your salary under that contract, but repudiate it, or repudiate your obligations under that contract when you got ready to do so? A. No, sir, I went home, feeling happy and contented, with this fact in view—that, after the expiration of the five years, we would

work contentedly until the expiration of the five years' contract, and then we would probably go into business for ourselves; that is the way I went home, feeling so contented——

Q. So, you did not go home with any notion that you could work under the contract, and draw your pay under the contract, but repudiate it whenever you wanted to do so? A. No, sir, I did not feel that way, at that time, about it.

Q. No, I don't believe you did—do you remember writing a letter on the 12th of July, 1905, to Mr. Brinton—I show you a letter, with the envelope in which it came, or supposed to have come, and I will ask you whether or not it is in your handwriting (handing witness paper)?

MR. CORBIN—I object to counsel examining the witness upon this letter until I have seen it. I think, before the witness is questioned in regard to a paper, I ought to have an opportunity to examine it.

COURT—He is only asked whether it is in his handwriting or not.

Q. Is it in your handwriting, or not? A. Yes, sir, it is in my handwriting.

MR. LINDABURY—I ask that the letter and the envelope be marked for identification.

Letter marked for identification C 22.
Envelope marked for identification C 23.

(*Mr. Lindabury.*)

Q. Now, I show you another letter, dated July 31st, 1905, directed to Mr. Brinton, and I ask you to look at it, and tell me whether or not that is

in your handwriting (handing witness a paper)? A. Yes, sir, that is in my handwriting.

MR. LINDABURY—I ask that that letter be marked for identification.

Marked for identification C 24.

Q. I show you another letter and the envelope in which it came, addressed to Mr. Percival Christie, and dated August 1st, 1905, and I will ask you to look at that letter and state whether or not it is in your handwriting? A. That is my handwriting.

MR. LINDABURY—I ask that those be marked for identification.

Letter marked for identification C 25.
Envelope marked for identification C 26.

Q. I show you another one of the same date, and addressed to the same gentleman; please look at that letter and envelope, and say whether that is in your handwriting? A. That is correct, it is in my handwriting.

MR. LINDABURY—I ask that those be marked for identification.

Letter marked for identification C 27.
Envelope marked for identification C 28.

Q. When did you first communicate with Mr. Snow, or anyone connected with the American Brake Shoe and Foundry Co., after you signed the contract? A. Some time in July; I cannot state just what date, I cannot recall the date. I wrote Mr. Snow, stating that I contemplated making a change in position—I cannot recall the exact

words, but that was the substance of it. I placed myself as an applicant for a position in one of their plants, and told him that I contemplated making a change.

Q. You do not know what time in July it was you wrote the letter? A. I think it was July 16th, if I recall correctly.

Q. Did you get an answer to that letter? A. I think I did, the latter part of that week.

Q. Have you that answer with you? A. I think I have an acknowledgment of the receipt of my letter.

Q. Let me see it? A. It is something mutilated, but I suppose you can read it.

Q. We are used to mutilations. (Paper handed to counsel.)

MR. LINDABURY—That letter reads as follows:

"Mr. W. G. NICHOLS,
Highbridge, N. J.

Dear Sir:

Replying to your favor of July 16th, I would be glad to meet you in New York City at most any time and place you may name.

Yours very truly,
E. J. SNOW,
Gen. Supt."

Q. Well, what happened then? A. I wrote and asked him if he would meet me in New York and he wanted to know where, and I told him where to meet me, and in that same letter, that—I expressed a sort of doubt if I would be considered at all, after what had happened last March or somethink like that, I cannot recall exactly, and I haven't the letter at all.

MR. LINDABURY—I now ask counsel, if they have the letter which Mr. Nichols wrote to Mr. Snow and to which the witness refers, in reply to the letter which has just been read into evidence. You will remember that I gave you notice on Monday to produce all correspondence, all letters between Mr. Snow or anyone else connected with the defendant corporation, and Mr. Nichols.

MR. GOODE—We have not got this letter, but if we can find it, we will produce it.

(*Mr. Lindabury.*)

Q. Did you have this letter in your pocket the other day, when you said that you did not know that you had received any letters from anyone connected with the defendant corporation in relation to their endeavor to get you away from the Taylor Iron and Steel Co. employ—did you have this letter in your pocket then? A. I don't think I said that, if I did I made a mistake, because I was the one that made the application to the American Brake Shoe and Foundry Co.—I made that application to them for a position and I naturally expected an answer to it.

Q. I show you the letter dated July 21, written to Mr. Brinton; is that letter in your handwriting? A. Yes, sir.

Letter marked for identification C 29.

Q. What next occurred, after you received this answer from Mr. Snow—the top of this letter from Mr. Snow to you is torn off, is it not? A. Yes, sir; I tore the top of that letter off myself; I made a a little notation on the top of that letter and I tore that off.

Q. It did have a date on it, did it? A. Yes, sir; it was the latter part of that week; I did not get the reply very promptly.

Q. Well, within a week after you wrote them? A. Yes, sir; within a week after I wrote them.

Q. What did you do in consequence of this reply? A. I think I telephoned that I would be down—I cannot recall when—but I think I went down on the following week some day.

Q. Was your letter addressed from Chicago or New York? A. New York.

Q. Well, was your letter addressed from New York, or where? A. It may be Mahwah, or New York, I cannot recall now.

Q. Anyhow, you sent your telephone and made the engagement for New York? A. Either there or Mahwah, I cannot say positively about that.

Q. And you appointed a time to go there? A. Yes.

Q. And you went in at that time? A. Yes, sir.

Q. Who did you see? A. I saw Mr. Snow first.

Q. And where did you see him? A. In New York.

Q. Where? A. At the ferry.

Q. Did he meet you at the ferry? A. I asked him to meet me at the ferry, I did not know where their office was.

Q. What ferry did he meet you at? A. The Jersey City ferry.

Q. Of the Jersey Central Railroad? A. No, sir; the Pennsylvania Railroad ferry.

Q. Does the Pennsylvania Railroad run to Highbridge? A. No, sir; it runs to Clinton, N. J.

Q. And you came in by the Penn. R. R.? A. Yes, sir; on the Lehigh Valley train.

Q. Oh, yes—the Lehigh Valley? A. Yes, sir.

Q. Did you spend any time in the ferry house

with Mr. Snow? A. No, sir; we went directly to New York.

Q. To the office of the defendant company? A. Yes.

Q. And who did you meet there? A. Mr. Cutler.

Q. The president of the company? A. Yes, sir; the president of the company.

Q. Did you have a conversation with him and Mr. Snow? A. I think Mr. Snow was present at the office the time we were there.

Q. Was anyone else called in? A. Mr. Gallagher, I think, was there.

Q. Anyone else? A. Not to my knowledge.

Q. That did not get in the attorney and the company on that day? A. I cannot recall seeing him.

Q. What day was this—you are pretty good at dates, and I think you will help us on this—what day was it? A. I will try, I am sure, and I can assure I have nothing to conceal; I should judge this was the 24th or the 25th or the 22d or the 23rd—well, I will say between the 22d and the 25th probably.

(*Court.*)

Q. Of what month? A. Of July.

(*Mr. Lindabury.*)

Q. You had not met Mr. Cutler and Mr. Snow at the company's office on the occasion of your being in there in March, I suppose? A. No, sir; I was not at their office at all.

Q. That was a Sunday visit? A. Yes, sir.

Q. Well, how long were you there that day? A. I presume about an hour, or an hour and a half.

Q. You had your contract with you, I suppose? A. Yes, sir; I did.

Q. And displayed it before these gentlemen? A. I asked their opinion on it, yes, sir.

Q. And you got it? A. Not definitely, no, sir.

Q. Did they all read it? A. I cannot recall whether they all did or not.

Q. Somebody read it out aloud? A. Not to my knowledge, no, sir; I don't think they did.

Q. It was the subject of anxious careful consideration, was it not? A. I presume it was; on my part it was quite natural.

Q. And it had been for some time the subject of anxious consideration on your part, had it not? A. It is natural to suppose it would be, from the time I signed it.

Q. So that there was mutual anxiety—and you think they did not call in the attorney? A. No, sir; they did not, not while I was there that I recall.

Q. Did you leave the contract with them? A. No, sir; I took it home.

Q. Did you leave a copy of it with them? A. No, sir.

Q. Was there any arrangement made that you should see the lawyer? A. No, sir; I think I sent the contract down again.

Q. Was that the arrangement that you should send your contract down? A. I don't know whether it was or whether I did it unsolicited.

Q. Who did you send it to? A. I sent it to the office of the American Brake Shoe and Foundry Co.

Q. Was it not directed to any individual? A. I cannot say whether I directed it to Mr. Snow or Mr. Cutler or who it was, I am not positive about that.

Q. You did send it to someone there? A. I sent it to some member of the company, yes, sir.

Q. Was this done so that they might get a legal opinion on it for you? A. Yes.

Q. When was this you sent it; was it after you went back—you say it was the 25th that you were there? A. Well, it was between the 25th and the 28th I will say.

Q. And I suppose you got an opinion before the 31st of July, didn't you? A. Well, I got no express opinion.

Q. Did you get any reply, after sending your contract down there? A. The contract was returned to me without any comments on the contract portion of it. That was about the 28th, I got that back.

Q. The 28th, do you think? A. Yes, sir.

Q. Where is the letter that you got back with the contract; I want to see that?

(Letter produced and handed to counsel.)

MR. LINDABURY—I will read that letter into the evidence; it is as follows:

"AMERICAN BRAKE, SHOE AND FOUNDRY CO.

170 Broadway, New York.

JULY 28, 1905.

Mr. W. G. NICHOLS,
Highbridge, N. J.

DEAR SIR:

After Mr. Cutler's letter to you of this date was mailed to you, I discovered that it was wrongly addressed, that Highbridge is in N. J., and not in N. Y. I, therefore, give below a copy of his letter to you, that there may be no delay in your receiving the information:

"'JULY 28th, 1905.

MR. W. G. NICHOLS,
Highbridge, N. J.

DEAR SIR:

Your letter of the 27th was received. In the belief that you have of your own accord, severed your connection with the Taylor Iron and Steel Company, and that you are under no obligations elsewhere, and are therefore free to enter our employ, if mutually satisfactory arrangements can be made, I have referred your application to Mr. E. J Snow, general superintendent, with instructions to communicate with you and arrange for an early interview at which time the terms of your employment can be discussed fully and definitely arranged.

Yours truly,
AMERICAN BRAKE SHOE & FOUNDRY CO.,
OTIS H. CUTLER, Pres.'

"I think Mr. Snow would like to have you arrange to go to Chicago Heights with him about the middle of next week.

Yours truly,
M. B. JUSTIS."

Letter offered in evidence and marked Exhibit C 30.

Q. You had not severed your relations with the Taylor Iron and Steel Co. at this time, had you?
A. No, sir.

Q. Your resignation followed the receipt of this letter, didn't it, and was dated the 29th of July?

A. Dated the 29th of July and was mailed on Sunday, I presume.

Q. You got this letter dated July 28th, I presume on the 29th, did you not? A. Yes, sir; it was dated the 28th there.

Q. And hence the resignation of that date—is that right? A. On the 31st of the month, the resignation was given.

Q. Where did you send that contract to—to New York? A. I said New York, yes, sir.

Q. And you got it back from there? A. Yes, sir.

Q. It did not seem to have been enclosed in Mr. Cutler's letter—from the letter? A. I think it was enclosed in that letter; I think it was enclosed in that same envelope.

Q. Notwithstanding it is not mentioned in this letter from Mr. Cutler? A. Yes, sir.

Q. Was there any other memorandum referring to the contract or an opinion, or anything else from anyone in it? A. No, sir.

Q. Did you go to New York again before the 31st and after the receipt of this letter, which you must have got on the 29th? A. No, sir; I did not.

Q. Did you send any reply before the 31st? A. Not that I can recall; I think I sent a reply the early part of the week following.

Q. You sent in your resignation on the 31st; when was it that Mr. Christie saw you with Mr. White? A. On the 2d of August, the night of the 2d of August.

Q. You had not left Highbridge in the meantime? A. No, sir.

Q. Had you been to New York after the visit that you have told us about? A. I don't think that I was; I don't think I went to New York until the following Thursday.

Q. Did you receive any other letters from the defendant company, or any of the officers of that

company? A. Not to my knowledge, I can not recall that I did.

Q. You haven't any here? A. No, sir.

Q. You have exhausted your pocket, have you? A. I have exhausted my supply.

Q. Of these letters? A. Yes, sir.

Q. You had the interview with Mr. Christie and Mr. White, and it wound up by your promising, in order to get rid of them, that you would write to Mr. Snow? A. I said I would write to the American Brake Shoe and Foundry Co.

Q. Well, one or the other? A. Yes, sir.

Q. You did not tell them what you would write, did you? A. No, sir.

Q. Did you promise them to go to work the next Monday? A. No, sir; Mr. Christie was not in a position to exact anything of that kind from me, because he did not know how the thing would terminate, until he saw Mr. Brinton.

Q. Was he not the superior to Mr. Brinton in authority? A. Yes, sir.

Q. Well, nominally or actually? A. Actually

Q. Were you not in a position to go back the next Monday to work? A. No, sir; I was not.

Q. You were in a position to start if things were made satisfactory, were you not? A. No, sir; I was not.

Q. You thought you could not live in Highbridge, because of this little scandal or trouble? A. That is it.

Q. Didn't it occur to you that almost any man once in a lifetime has to live down a little thing like that? A. There were sixteen hundred people down there that didn't seem to think so.

Q. You had had troubles before, hadn't you? A. Yes, sir.

Q. And lived them down mentally, hadn't you? A. Yes, sir.

Q. And you would have done it this time, if the American Brake Shoe and Foundry Co. had not been in existence? A. No, sir; I don't think I could have remained in Highbridge, under any such circumstances.

Q. You don't think so? A. No, sir; I do not.

(*Court.*)

Q. When you resigned, did you know how much salary you were going to get from the American Brake Shoe and Foundry Co.? A. No, sir; we had not gone into any details at all; I simply applied for the position.

(*Mr. Lindabury.*)

Q. Didn't you understand that you were to get what was offered you in March? A. No, sir, I did not; they would not make any arrangements absolutely with me.

Q. No, of course not, not absolutely, but didn't they discuss the arrangement, and undertake to make one subject if you pleased to your severing your relations with the Taylor Iron and Steel Co.? A. They told me when I was free to come and accept a proposition; then was when they would talk that kind of thing to me, or with me, and not before then.

Q. "I think Mr. Snow would like to have you make arrangements to go to Chicago Heights about the middle of next week"—hadn't they talked about your going to Chicago Heights before that? A. No, sir; they wanted me to go out there and look things over there; of course, I did not know that I would like the things as they were out there.

Q. Who paid your expenses? A. The American Brake Shoe and Foundry Co., I suppose.

Q. Did not you have any talk with these people

before you sent in your resignation? A. No, sir; in March, understand, now——

Q. No, I mean in July. A. No, sir.

Q. Did you tell Mr. White and Mr. Christie that night that they called on you in August, that you were advised that the contract was not valid? A. Mr. Brinton had told me that it was not valid.

Q. That is not what I asked you, you will observe. My question was: Did you tell Mr. White and Mr. Christie on that night that they called upon you in August that you were advised that the contract was not valid? A. Yes, sir.

Q. Did you tell him that you were advised by a lawyer it was not valid? A. I don't know that I made it as broad as that, probably I did, under the circumstances; yes, sir, I probably did.

Q. Do you mean that Mr. Brinton saw a lawyer, or consulted a lawyer in regard to it? A. I felt that he might have consulted a lawyer; if he did not, I did not know it, whether he had or not, but I know I did not.

Q. You had consulted no lawyer in New York, had you? A. No, sir; not at that time.

Q. You testified this morning, Mr. Nichols, that you were not taught any secret processes at Highbridge. I doubt whether we understood you correctly, and I will ask you again: You did not mean that you were not taught anything at Highbridge that you did not know before? A. Oh, no, sir; that is incorrect to suppose that.

Q. And you do not mean that the processes which were taught you there were in use anywhere else, to your own knowledge? A. The method of converting steel is in use at other places. I was familiar with it before I went there, which is the main branch of the business.

Q. I know, but that is a very general matter. The method of converting iron into steel, of course, is

not new; it has been in use a long time. That is not what I meant, I meant details and practices, and other things which were taught you there and you did not know before. Now, I say, you did not know that those things that were taught to you there, though unknown to you before, were actually known to others, at the same time, do you? A. No, I am not in a position to say that others knew those very same things that may exist there.

Redirect by Mr. Corbin.

Q. Before you received the letter of Mr. Cutler, which has been read, had you told him that you had decided not to work further for the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Had you told him that you could not remain at Highbridge? A. Yes, sir.

Q. Now, among the grounds of objection that were raised by you to the contract, was there anything said between you and Mr. Brinton about the omission of the contract to state the kind of work you were to do, or the place where you were to do it?

MR. LINDABURY—I object to the question on the ground that it is leading.

COURT—You may ask the witness if he has stated all that he wanted to say as to the objections to the contract. I will overrule the question except as to that point.

MR. CORBIN—I will accept your Honor's suggestion and ask him that question:

Q. Were there any other objections against the contract? A. These objections suggested themselves to my mind, but I did not discuss them with Mr. Brinton.

Q. What objections? A. To the effect of just what you have cited.

Q. State it? A. The question as to where the steel shall be made, or as to what place and how.

(*Court.*)

Q. Any other reasons? A. I think I have told all others outside of those.

Q. Mr. Corbin wanted to know if there were any other reasons for which you criticised the contract? A. No, sir; no other reasons.

OTIS H. CUTLER, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Suffern, New York.

Q. What position do you hold in the defendant company? A. President.

Q. Where is the principal office of the company located? A. Mahwah, Bergen Co., N. J.

Q. The principal office? A. Mahwah.

Q. Your business office, I mean? A. 170 Broadway, New York City.

Q. What business is the American Brake Shoe and Foundry Co. engaged in? A. It is engaged in the manufacture and sale of brake shoes and miscellaneous iron and steel castings.

Q. What plants has the company in operation? A. I might add in reply to your former question that it is also engaged in the malleable iron business, though they are independent corporations. It has plants in Bloomfield, N. J., Mahwah, N. J., Lancaster, N. Y., Buffalo, N. Y., Chicago Heights, Ill., Chattanooga, Tenn., Uniontown, Pa.,

and points of manufacture elsewhere, in plants belonging to other companies.

Q. At what plant does the company make steel castings? A. Chicago Heights.

Q. What else is made at Chicago Heights besides steel castings? A. Brake shoes and iron castings of various sorts.

Q. What is the prominent part of the business of the company of Chicago Heights? A. The Brake shoe business.

Q. Are you acquainted with Wesley G. Nichols, your co-defendant? A. I am.

Q. When did you first meet Mr. Nichols? A. In March, 1905.

Q. Where did you meet him? A. At the Bretton Hall, where I was then residing, in New Jersey.

Q. For what reason did you meet him there instead of at the office of the company? A. Mr. Snow brought him to call on me one Sunday at my place of residence.

Q. You may state what occurred between you and Mr. Nichols at this meeting in March, and if you remember the date of that Sunday you can give it? A. I can only say that it was early in March, probably within the first ten days of March. Mr. Snow was the general superintendent of the company, and he had been engaged for some time in the search for a superintendent of our plant at Chicago Heights and had mentioned a number of names to me including that of Mr. Nichols. He brought Mr. Nichols to see me on that day with a favorable recommendation as to his availability, and with the desire that I should talk with him, and form my own conclusions as to his desirability for employment in that position. I talked with him in a general way, regarding his knowledge of the steel business, his past experience, and tried to inform myself, generally, regarding his character and ability

for the branch of work which we had in mind, and I was favorably impressed with it.

And there was some discussion regarding the location of our plant where he would be employed. He did not know much about Chicago Heights, and he asked me a number of questions concerning the community, and the nature of the work, etc., and finally he discussed the character of the work that he would be called on to perform and the salary which he would expect to get for it. That is about the general extent of our talk.

Q. Did you come to any determination with him in regard to his salary? A. Well, as I remember now, I had authorized Mr. Snow to go as high as $5,000, if he could find a suitable man, and I think Mr. Nichols expressed himself as somewhat dissatisfied with that amount. I cannot say whether or not we agreed on $6,000 as the amount of salary to be paid him in case we employed him; there was no direct offer of that amount to Mr. Nichols, and yet I think that was the amount that was understood between us as the compensation which he would desire and we would pay in case he entered our service.

Q. Did you at that interview offer Mr. Nichols $7,000 a year and a block of $10,000 of stock? A. Not to the best of my recollection.

Q. Don't you know that you did not? A. I am positive I did not.

Q. Now, did you have any other conversation, or did any other conversation occur at that meeting other than you have related? A. Well, nothing of any moment that I recall.

Q. When next did you hear from Mr. Nichols or have any communication with him? A. Well, as I remember, I left the matter in Mr. Snow's hands to be pursued with Mr. Nichols, and I think the next advice I had was from Mr. Snow, saying that

he had had some communication from Mr. Nichols indicating that he did not care to make the change, or had changed his mind.

Q. Do you remember how soon it was after this interview at Bretton Hall that that took place? A. Well, after some little time, perhaps a fortnight.

Q. Did you have any further communication about that time with Mr. Nichols? A. No.

Q. When was your next communication with him, or when did you next hear anything from him? A. I think the next I heard of Mr. Nichols was a report from Mr. Snow, that he had received some communication from him, and that he desired to reopen the subject of his employment with our company.

Q. Who desired to reopen the subject of his employment with your company? A. Mr. Nichols.

Q. I will hand you a telegram, and will ask you to see if you recognize it by the stamps or otherwise as having received it? A. Yes, sir; I remember the receipt of that telegram.

Telegram marked D 2 for Identification.

Q. What is the date of that telegram? A. July 20th, 1905.

Mr. Goode—I offer that telegram in evidence. It reads as follows:

"Dated Clinton, N. J., July 20th, 1905.

Mr. Cutler,
Amer. Brake Shoe Co.,
170 B'way, New York.

Would like to make an appointment with either yourself or Mr. Snow on question dwelt on last March. Will be in Highbridge after to-day.

W. G. Nichols."

(*Court.*)

Q. Where was it sent from? A. Clinton, N. J.

MR. GOODE—I offer that telegram in evidence.

Marked Exhibit D 2.

Q. Had you had any message or letter or communication of any sort from or with Mr. Nichols, after the 20th of March, 1905, until you received that telegram? A. I cannot say whether Mr. Snow notified me first that he had had a communication from Mr. Nichols or that I received the telegram, it was about simultaneous, in a day or two Mr. Snow advised me that he had heard from Mr. Nichols, and I received this telegram.

Q. When was the first communication that you had had from Mr. Nichols? A. That was it.

Q. That was the first communication you had had from Mr. Nichols? A. Yes, sir.

Q. Do you remember replying to that? A. No, sir.

Q. You don't know whether you wrote a letter or not? A. I don't know whether I wrote a letter or whether I referred it to Mr. Snow.

Q. I show you a letter which has just been marked D 3 for identification, and I will ask you to read that letter and say whether you wrote it or not? A. I think it is very probable that I wrote him that letter.

MR. GOODE—That letter reads as follows:

"July 20th, 1905.

Mr. W. G. NICHOLS,
Clinton, N. J.

DEAR SIR:

Replying to your telegram of this date, I understand that Mr. Snow has already written

you, suggesting that he will keep any appointment which you may make to meet him in New York within the next few days. If you feel disposed to seriously consider a business proposition, on the lines of our discussion last spring, I shall be glad to see you, and would suggest your coming to the city, either Monday or Wednesday of next week. I have an engagement on Tuesday. Mr. Snow and I can see you in the day time preferably, or in the evening if necessary.

Please reply promptly regarding date and hour of appointment.

Yours very truly,

AMERICAN BRAKE SHOE & FOUNDRY COMPANY,
OTIS H. CUTLER, President."

MR. GOODE—I offer that letter in evidence.

Marked Exhibit D 3.

(*Mr. Goode.*)

Q. At that time, Mr. Cutler, that you wrote that letter and received that telegram from Mr. Nichols, had you any knowledge of any contract between him and the Taylor Iron and Steel Co.? A. None whatever.

Q. When did you meet Mr. Nichols next? A. Well, I should say within four or five days after writing that letter.

Q. What occurred at that meeting? A. Mr. Snow brought Mr. Nichols to my office, and said that he had had some talk with him, and that he understood that he had left the employ of the Taylor and Steel Co. people, and was seeking other employment. I asked Mr. Nichols what the situation was, and he told me quite a long story, about some personal complications that had arisen between him

and the Taylor Iron and Steel Co., and that he had not been to work for several weeks, as I remember, and had tendered his resignation to the Taylor people, and was going to find work somewhere else, and desired to know if we had an appointment for him.

Q. Did he say anything about a contract that he had signed? A. Yes, sir; I asked him, "Have you resigned, and if his resignation had been accepted." He said, "Not directly, except by the knowledge of the company, that he had left their service, and that there was a contract in existence, which had been drawn up at the time of his deciding to remain with them in the previous March. That this contract—shall I go ahead, and tell you what my recollection is as to that?

Q. Yes? A. That this contract had been offered to him by Mr. Brinton, whom I understood was his superior officer, and that at a time when his mind was disturbed by the death of a relative, and that he had accepted it without a knowledge of its contents, and with Mr. Brinton's assurance that it was all right and that he had signed, or was about to sign a similar one which Mr. Nichols said was the factor that inclined him to accept the contract without consideration. But that afterwards he learned that Mr. Brinton had not executed a similar contract, and that he therefore had informed Mr. Brinton as his superior officer that he did not regard his acceptance of it as binding and effective. He had a copy of the contract with him, as I remember, and showed it to me, and I glanced over it and then handed it to Mr. Gallagher, our vice-president, who was a former member of the New Jersey Bar, and he expressed the opinion that the contract was so far-reaching as to be inoperative anyhow. And I told Mr. Nichols that he had better find out where he stood on that contract, and

that if he was free we would then talk to him about employment.

Q. Now, was anything said at that time about Mr. Nichols going to Chicago to look over the plant? A. Well, I am not sure about that. That had been talked about last March, as a condition precedent to his entering our employ, that he had better look over the Chicago Heights plant and see what he thought of it, and whether it would be a a satisfactory place for him to work or not. That may have been mentioned that night.

Q. That was the extent of your conversation that you had with Mr. Nichols in your office? A. Yes, sir.

Q. Are you acquainted with Mr. Howard E. White? A. Yes, I have met Mr. White on occasions.

Q. When first did you meet him? A. Mr. White called on me at my office some time soon after this interview with Mr. Nichols, and I should say early in August.

Q. Did he state his business to you when he called? A. Yes, sir; he stated that he was the counsel for the Taylor Iron and Steel Co., and a director in that corporation, and he came to see me in behalf of that company, to protest against our employment of Mr. Nichols.

Q. Who else was present at this interview between you and Mr. White? A. Mr. Fallows.

Q. And you say that Mr. White stated that he had learned that Mr. Nichols had entered the employ of the American Brake Shoe & Foundry Co.? A. Yes, sir.

Q. What reply did you make to that? A. I told him that was not so, that he had not entered the employ of the American Brake Shoe & Foundry Co. and that he would not, unless he was free to do so, with my approval.

Q. Did Mr. White have anything to say about

his being under contract? A. Yes, he said the Taylor Iron and Steel Co. people considered that Mr. Nichols was under contract to remain in their service for a period of years, and then went on to describe the man's habits and character as being bad, and manifested, I thought, some decided feeling against him.

Q. Can you recall just what was said by Mr. White in that connection—give the conversation as nearly as you can? A. I have given a general outline on it, I could not attempt to give it verbatim. I made an affidavit about that time which recites it and when it was fresh in my memory, and if I can be permitted to look at that affidavit——

MR. LINDABURY—We object to it.

Objection sustained.

Witness—Well, Mr. White said that Mr. Nichols was not the type of man we thought he was, undoubtedly; that he had been the assistant foreman or superintendent of some sort out there, and that if we were under the impression that we were going to get a man with a full knowledge of the details of the Manganese steel business we would be mistaken; that Mr. Nichols did not have this, that he was not in possession of an intimate acquaintance with the details of the Manganese steel castings business. I told him we were not concerned about that. He then spoke of his private troubles, and he said he was not a man that we could trust. And I think I replied, that if the Taylor Iron and Steel Co. desired to retain him in their service so anxiously it did not seem to me that these disqualifications could be very serious. Mr. White inquired if I had seen a copy of the contract, I believe I told him I had, and he asked Mr. Fallows

if it had been referred to him, and Mr. Fallows told him it had not. And I think he then said he would send either myself or Mr. Fallows a copy of the contract.

Q. Did he have anything to say to you about the reason that they desired to continue Mr. Nichols in their employ? A. Yes, he said the reason they wanted to keep Mr. Nichols was that he was familiar with the requirements of a lot of large and pressing orders which they had in hand at that time, and that they wanted to utilize his knowledge of those orders until they were filled; that if Mr. Nichols could stay there for a few weeks they would probably be disposed to let him go after that time.

Q. Did you have anything to say to Mr. White about your desire to employ Mr. Nichols while he was in their employ, or what you wanted Mr. Nichols for? A. I stated a little while ago that I said to Mr. White, I told him that we had told Mr. Nichols that we would not consider his employment unless we were satisfied that he was free of the Taylor Iron and Steel Co., and that we wanted to employ him as general superintendent of our plant at Chicago Heights.

Q. That plant at Chicago Heights, I believe you said, you make brake shoes and steel castings there? A. Yes, sir; we make brake shoes and steel castings there.

Q. Other steel castings beside Maganese steel castings? A. Yes, sir.

Q. What proportion of the general business of the Chicago Heights plant would it bear to the Manganese branch of it? A. Do you mean in dollars and cents, or tons?

Q. Well, either or both, or percentage? A. I should think that the gross of the Chicago Heights plant was about equally divided in dollars and

cents between brake shoes and steel castings, probably with a heavier tonnage in brake shoes, and the Manganese steel possibly one-quarter of the total steel tonnage produced.

(*Mr. Lindabury.*)

Q. One-eighth of the output is Manganese steel? A. Yes, sir, approximately.

Q. I suppose you can give us your books with respect to that? A. I can have any statement prepared that you might want as to that.

Q. Did you give any instructions, in that conversation, about the employment of Mr. Nichols? A. Well, I think I had previously given instructions to Mr. Snow to follow the matter up with him.

Q. In the conversation with Mr. White, and the matter being discussed, about giving employment to Mr. Nichols at all, did you confirm that? A. Well, perhaps nothing further than as I have instructed Mr. Snow.

Q. Has Mr. Nichols been employed either directly or indirectly by the American Brake Shoe and Foundry Co., at any time at all? A. No, sir.

Q. Did you give any instructions about the employment of him after this interview? A. Well, no, sir, I cannot say that I did.

Q. Mr. Cutler, after the conversation with Mr. White, did you make any memoranda for the purpose of making an affidavit? A. Yes.

Q. Was that affidavit dictated in your presence, if so, by whom? A. Partially by me and partially by our counsel, Mr. Whitman.

Q. Your counsel in Chicago? A. Yes.

Q. Is the affidavit which you filed in this cause a copy of that? A. Let me see it, and I will tell you.

Q. I will hand it to you.

MR. LINDABURY—I object to that.

Objection sustained.

(*Mr. Goode.*)

Q. After this interview with Mr. White in New York, did you have any further interview with him elsewhere? A. Yes, sir.

Q. Where? A. In Chicago.

Q. Who was present? A. Mr. Gallagher, Mr. Christie, and Mr. Whitman.

Q. Was Mr. Terbell present? A. I think he was.

Q. Was anything said at that interview by Mr. White in regard to Mr. Nichols' information about steel? A. Well, I think he reiterated the statement that he had previously made, that Mr. Nichols was not a Manganese steel expert.

Q. Did he state any reason that the Taylor Iron and Steel Co. had of interfering with Mr. Nichols accepting employment with you? A. Yes, sir, he said that Mr. Nichols was one of a number of employees with whom they had a contract, and that while they did not care about losing Mr. Nichols, they did care about other employees getting the idea that they could with impunity violate those contracts, and that the Taylor Iron and Steel Co. would spend any amount of money to prevent Mr. Nichols obtaining employment in the steel business.

Q. Did he say anything about Mr. Brinton, the superintendent of the steel department, having employed any detectives? A. I think, as I recall now, that he said he had Mr. Nichols shadowed for some time, and that he had full reports as to his movements, and knew what he had been doing, and where he had been living, fully, through their reports.

Q. Did he have anything to say about Mr. Nichols returning to Highbridge, in view of what had hap-

pened there, before his departure? A. Well, I believe the point was touched upon, that it would not be pleasant for Mr. Nichols to live in Highbridge at any time in the future, and that the Taylor Iron and Steel Co. would endeavor to find employment for him somewhere else, perhaps in the sales department, as I recall it.

Q. Did you have any conversation with Mr. White about arbitrating the questions? A. Mr. Gallagher talked with him more than I did about that. It was discussed between all three of us, but Mr. Gallagher and Mr. White had most of the conversation about arbitration, I think they discussed that at a previous meeting.

Q. What did Mr. White say about it? A. Well, he said—I believe the conclusion of the talk was, that Mr. White refused to arbitrate unless the decision of the arbitrators could be subject to review by the Court; that they would not agree to abide by the decision of arbitrators, which we had suggested, as a ready means of finding out whether Mr. Nichols was free from their service or not.

Q. Did Mr. White have anything to say about the American Brake Shoe & Foundry Co. giving Mr. Nichols any financial backing, while this suit was pending? A. Yes, he asked us to forsake or abandon Mr. Nichols, and leave him to his tender mercies, and he said if that was done he felt that Mr. Nichols would have to return to a jurisdiction where he could get hold of him, and, being without means, he would be obliged to assent to most anything that Mr. White wanted him to.

Q. What reply did you make to that? A. I told him, having gone as far as we had, I did not think we would abandon Mr. Nichols until we were satisfied that we should do so.

Adjourned to December 6th, 1906, at 9.30 A. M.,
Newark, N. J.

DECEMBER 6, 1906.

OTIS H. CUTLER, recalled in behalf of the defendant, for cross-examination.

Cross-examined by Mr. Lindabury.

Q. Do you remember receiving a letter from Wesley G. Nichols of the date of July 27th, 1905? A. Yes, I saw the latter.

Q. I haven't it, and I am going to ask you for it? A. I cannot recall a letter on that specific date——

Q. In your letter to him of July 28th, 1905, you begin by saying, "Your letter of 27th is received"—have you that letter with you? A. No, sir.

Q. Where is it? A. Well, I don't know, maybe in our files.

Q. Don't you know whether it is or not? A. I do not, I do not keep the files.

Q. Don't you know that we requested it the day before yesterday, that you should produce all correspondence between your company and Mr. Nichols?

A. No, sir, I was not in court yesterday.

Q. And you don't know where it is? A. No, sir.

Q. Do you remember the contents of that letter? A. No, sir.

Q. Do you remember the date of the interview you had with Mr. Nichols preceding that letter? A. Well, I believe it was July 20th, I had only one interview with Mr. Nichols.

Q. Did he tell you in that interview that he had offered his resignation to the complainant company? A. Yes, sir.

Q. Did he tell you he had resigned? A. Yes.

Q. He said that in that interview, did he? A. Yes.

Q. And that his resignation had been accepted? A. No, sir, I asked him that question, and he said there had been no formal acceptance of his resigna-

tion, except through the knowledge that the Taylor Iron and Steel Co. had of his absence from business, for some time.

Q. Did he tell you that he had informed them that he did not propose to stay with them any longer? A. Yes, sir.

Q. And had resigned? A. Yes, sir.

Q. Why did you not so state yesterday? A. I think I did.

Q. This was the interview when he had his contract with him? A. Yes, sir.

Q. You say you had but a single interview? A. At that time, I had the preceding interview with him in March.

Q. I read from your testimony, as given yesterday:

> "Q. Did he say anything about a contract he had signed? A. Yes, sir; I asked him, 'Have you resigned, and if his resignation had been accepted.' He said, 'Not directly, except by the knowledge of the company, that he had left their service, and that there was a contract in existence which had been drawn up"——

A. Yes, sir; his resignation had not been accepted, entirely.

Q. You testified to that yesterday, did you not? A. Yes, sir; it was my intention to refer to the resignation as having been accepted.

Q. He therefore told you he had resigned, did he not? A. Yes.

Q. As early as the 20th of July? A. Yes, sir.

Q. The interview was on the 20th of July, was it not? A. Yes, sir; I had but the one interview.

Q. And it was before the 27th of July? A. Yes, sir.

Q. And he there distinctly told you he had resigned, did he? A. Yes,

Q. And left the works? A. Yes, sir.

Q. And in stating that the resignation had not been accepted, he stated or added the qualification "except by the knowledge of the company, that he was not continuing there"? A. Yes, sir.

Q. How long have you been president of the defendant company? A. About two years.

Q. When was that company formed? A. In 1902 —one moment—about two years, I have been president.

Q. You have not been president since it was formed? A. No, sir.

Q. It was formed in 1902, you say? A. Yes, sir; in 1902.

Q. And consisted of a consolidation of some other companies? A. Yes, sir; a number of companies.

Q. And an amalgamation of the business carried on by them? A. Yes.

Q. Do you make Manganese steel anywhere except at Chicago Heights? A. No, sir.

Q. Have you ever made made it anywhere else? A. No, sir.

Q. When did you begin to make it there? A. During Mr. Potter's administration as superintendent, I think. I think something over two years ago —about two years ago I should say.

Q. Mr. Potter's administration was that of superintendent? A. Yes.

Q. Was that the same Mr. Potter who made an affidavit early in this cause, or don't you know? A. I presume it is, but I haven't in my mind the affidavit to which you refer.

Q. Have you ever had but one Mr. Potter connected with the superintendency of the Chicago Heights plant? A. No, sir.

Q. What is his first name? A. Winfield—Winfield S. Potter.

Q. Do you remember when he went there and became superintendent of the plant? A. The date?

Q. Yes? A. No, sir; I do not recall it.

Q. Was it about two years ago? A. I cannot tell you; Mr. Snow, our general superintendent, can give you that date.

Q. Is he there still? A. No.

Q. How long was he superintendent? A. Well, I should think for a year or more, approximately a year—I will say a year.

Q. And did you make or endeavor to make Manganese steel during the whole time he was there, after you began to make it two years ago? A. Yes, sir.

Q. And continue to make it, up until he left? A. Yes, sir; and since then also.

Q. I will speak about what you have done since then later—for what did you make it? A. The general uses that Manganese steel is put to.

Q. You made it for the trade? A. Yes, sir; for the market.

Q. For the market generally? A. Yes, sir.

Q. And you do not remember for what uses you manufactured the steel when Mr. Potter was there as superintendent? A. Well, I have answered that I think, in stating that it was for the general trade, the ordinary uses that Manganese steel is put to.

Q. Well, you mean that you make the Near-Bar steel that can be always moulded? A. No, sir; I am referring to the Manganese steel castings.

Q. Well, you don't mean that you made castings to be moulded into all sorts of shapes, or for all purposes? A. So far as Manganese steel castings can be moulded, yes, sir.

Q. Were they not designed for particular uses? A. Our castings, I presume, were all designed for particular uses.

Q. Do you know what the uses were for which you made them? A. Well, I can give you some outline, Mr. Lindabury, but if it is the facts you want,

and not my own personal knowledge, Mr. Gallagher has direct charge of the details, and Mr. Snow, our general superintendent under him, they could give you more information than I can.

Q. You are the president of the company? A. Yes, sir.

Q. And I do not imagine you are in any sense, a figurehead? A. I trust not.

Q. I think you mentioned in your direct examination that you made this steel for crusher work, did you not? A. I do not think so.

Q. Perhaps my recollection is at fault. A. Yes, I haven't that recollection.

Q. Well, where did Mr. Potter go when he left you? A. Mr. Potter left our employ for a little time and returned to Brooklyn, where his father resided. The occasion of his leaving being the poor health of his father, he had given notice——

Q. Never mind?

MR. GOODE—If your Honor please, I would like the witness to state fully as to this matter—I hope your Honor will permit the witness to complete his answer.

COURT—He may proceed.

A. Mr. Potter had given us notice of his desire to leave the western country and return to the east on account of the condition of his father's health, and that was the reason Mr. Potter left us and came east, and Mr. Snow immediately went to work to look for a successor to Mr. Potter, that was the reason Mr. Snow and the rest of us were looking for Mr. Potter's successor.

Q. When did Mr. Potter come with you first? A. In the winter of 1904 and 1905.

Q. And when did he leave? A. Well, I will say later in the summer of 1905, in the meantime he

had been absent for a few days at a time visiting his father.

Q. And who succeeded him? A. There has been no regular appointment as superintendent, we have appointed an acting superintendent.

Q. Upon his leaving, which you think was in the summer of 1905? A. Yes, sir.

Q. You then appointed what you call an acting or active superintendent? A. An acting superintendent.

Q. Who was he? A. A Mr. Jones.

Q. Had he been with you before? A. Yes, sir.

Q. As what? A. He had been superintendent of the Bloomfield plant of the Mahwah plant, assistant to the general superintendent, Mr. Snow, and acting for assistant chief engineer in the western territory.

Q. Had he been making Manganese steel in these other places? A. No, sir; not in our service.

Q. Or in the service of anyone else, so far as you know? A. Not so far as I know.

Q. Is he still there? A. Yes, sir.

Q. Still acting superintendent? A. Still acting superintendent.

Q. Did Mr. Potter come back to you? A. Mr. Potter re-entered our employ as chief chemist later.

Q. When? A. I should say in the spring of 1906 or the winter.

Q. Where is he stationed? A. At Mahwah, N. J.

Q. Do you manufacture Manganese steel there? A. No, sir.

Q. He is chief chemist of what—what company? A. Of the company.

Q. The services he performs are for the company generally? A. Yes.

Q. And availed of in any of its plants, anywhere? A. Yes, sir; he has assistant chemists stationed at the local plants.

Q. And with whom he keeps up correspondence, I suppose? A. Yes.

Q. He has not been back to Chicago Heights, to the plant there, since he left in the summer of 1905—that is to stay there? A. No, sir; not to stay; he has been there repeatedly as the nature of his business has required him to be there.

Q. Who has been in charge of the manufacture of Manganese steel since Mr. Potter left? A. Well, the various officials who have to do with it, the general foreman of the steel foundry would be the immediate man in charge of the manufacture?

Q. Who is he? A. Mr. Sands.

Q. How long has he been there? A. A good many years, he was there before we took over the plant. Mr. Potter as superintendent has supervision of it, and Mr. Jones is the acting superintendent.

Q. You meant Mr. Jones when you said Mr. Potter, did you not? A. Mr. Sands as general superintendent has the general supervision over it, and Mr. Potter as chief chemist and Mr. Gallagher as executive officer are in charge of the operation.

Q. Mr. Gallagher had never made Manganese steel before he went with you, had he? A. I should hate to say that he had not, because he has done most everything.

Q. He had been practicing law here in Newark, before he went with your company, hadn't he? A. Yes, sir.

Q. Had you anyone, in the spring of 1905, there, who had had previous experience elsewhere in the making of Manganese steel? A. Well, I think Mr. Potter had made Manganese steel before he came with us.

Q. Excepting Mr. Potter, had you anyone else who had had any previous experience elsewhere in the making of Manganese steel? A. I cannot say, not to my knowledge.

Q. Not so far as you know? A. No, sir; not to my knowledge, though it is quite probable there may be a foreman there who had.

Q. Have you a man named Leonard in your employ? A. No, sir.

Q. Don't you know a Mr. Leonard from Highbridge? A. No, sir.

Q. You had nothing to do with the installing of him there? A. No, sir.

Q. Or Mr. Estes? A. No, sir.

Q. Don't you know of a man by the name of Estes from Highbridge being there? A. No, sir; I do not know him.

Q. You have given us some conversations that you had with Mr. White in New York and Chicago, do you recall the language used by Mr. White in those conversations? A. I have attempted to repeat it as closely as I can from recollection.

Q. What I was wondering was, whether you did remember the words he used, or whether you gave us your recollection of the effect by what he said? A. I should say more the effect than the exact words, except as I quoted them in my affidavit, when they were fresh in my mind.

Q. You made an affidavit, did you? A. Yes, sir.

Q. And you recollect it better then than you do now? A. Yes, sir.

Q. And you think you have got them better there than you have them now in your recollection? A. Yes, sir; it is very likely.

ELMER J. SNOW, a witness produced in behalf of the defendants, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. At Mahwah, N. J.

Q. What is your official relation with the Ameri-

can Brake Shoe and Foundry Co.? A. I am the general superintendent of the company.

Q. What is the principal business of the American Brake Shoe and Foundry Co.? A. The manufacture of brake shoes, iron brake shoes.

Q. Where are the different factories of the company located? A. At Mahwah, N. J., Buffalo, N. Y., Uniontown, Pa., Chicago Heights, Ill., and Chattanooga, Tenn.

Q. When did these plants become the property of the American Brake Shoe and Foundry Co.? A. Well, two plants, the Mahwah plant and the Chicago Heights plants, became the property of the company on the consolidation of the Ramapo Foundry Co. and the Sargeant Co., in January, 1902, the others became the property of our company at later times.

Q. Is the company doing a pretty extensive business? A. Yes, sir.

Q. About what does it amount to in a year, the sales? A. It amounts in sales to $4,000,000 or $5,000,000 a year.

Q. At the time of the acquirement of these different plants, were any of them engaged in the manufacture of steel castings? A. Yes, sir.

Q. Which ones? A. The Chicago Heights plant.

Q. What was at that time the output of that plant?

MR. LINDABURY—In what?

(*Mr. Goode.*)

Q. In tons of steel castings? A. Something like two hundred or three hundred tons per month.

Q. Has that output increased or diminished since that time? A. It has increased since that time.

Q. How does the output of steel castings compare with the other general business of the company, in

regard to the amount of it? A. Well, I should say that the steel foundry sales were, approximately, one-twentieth of the company's total sales.

Q. In other words, it is a small part of the business of the company? A. Yes, sir.

Q. A small part of the business of the Chicago plant, is it not? A. Probably in dollars the steel is equal to the iron, but in tonnage it is very much less.

Q. That is at the Chicago Heights plant? A. Yes, sir.

MR. LINDABURY—He said that the steel constituted one-twentieth of the output, as I understood him, in the Chicago Heights plant.

WITNESS—No, sir, the whole business of the company.

(*Mr. Goode.*)

Q. Who has been superintendent of the steel plant of Chicago Heights since it was taken over by the American Brake Shoe and Foundry Co.? A. Mr. Clark—A. M. Clark was superintendent at the time you took it over and remained as superintendent until Mr. Potter took charge, which was, as I remember, the first of June, 1904.

Q. Do you remember, Mr. Snow, how long Mr. Potter remained with you? A. He remained nearly a year, I think he left on the first of May, 1905.

Q. Are you sure about the date that he left? A. No, sir.

Q. When did you have notice that Mr. Potter contemplated leaving your company? A. Well, I don't recollect the exact date of that notice, but it was early in 1905.

Q. It was before March, 1905? A. Yes, sir.

Q. Well, that made it necessary for you to get another superintendent, did it not? A. Yes, sir.

Q. What are the duties of the superintendent of the Chicago Heights plant? A. The general supervision of the plant's operations.

Q. Do I understand you that that covers the whole plant? A. Yes, sir.

Q. The making of brake shoes, iron castings and steel castings? A. Yes, sir.

(*Court.*)

Q. What is the difference between a brake shoe and an iron casting. A. A brake shoe is an iron casting.

Q. Then they are only two classes, iron castings and steel castings? A. Yes, sir; except that it is customary for us to distinguish our miscellaneous castings business from our brake shoe business.

Q. When was Mr. Potter re-employed by the company, if you remember? A. I think it was in October, 1905.

Q. He was away from the company then, from the time he resigned in the early summer or late spring, until about the first of October? A. From about the first of May until about the first of October, yes, sir.

Q. In what capacity is Mr. Potter employed? A. As chief chemist.

Q. What are his duties as chief chemist now? A. His duties are the selection and supervision of the metal used in our foundries, in all of our foundries.

Q. He visits all your foundries at different times? A. Yes, sir.

Q. Were you ever at Highbridge, Mr. Snow? A. Yes, sir.

Q. Visiting the plant of the Taylor Iron and Steel Co.? A. Yes, sir.

Q. When were you there? A. I think it was March 7th, 1905.

Q. You may state, Mr. Snow, the circumstances connected with your visit there, what occurred? A. Well, I had a relative living there, of the name of Estes, and I was anxious to visit the complainant company's plant, that is the plant of the Taylor Iron and Steel Co., to gain any information that I could pick up, as to general practices in the shop, and I applied to my father-in-law for a letter, having heard that he knew some of the Taylor Iron & Steel Co.'s officials, and he gave me a letter. I went there and I called for Mr. Estes and I saw him and took lunch with him, after which I went with him to the office of the company, and was introduced by Mr. Estes to Mr. Christie, and I presented my letter to Mr. Christie. Mr. Christie told me that it was against the rules of the company to admit any visitors to their steel department, but that I might visit their machine shop and cleaning room.

We then left the office, where this conversation took place, and went to the machine shop, and spent a while there, and afterwards went into the cleaning room. And then we stopped at the time office—I think it was the time office, near the place where we go in and out of the plant. After having been through all the departments that I was allowed to go through, I think Mr. Estes asked me if I would like to meet Mr. Nichols, whom he said was a friend of his. I told him yes, I would like to meet Mr. Nichols. And he sent for Mr. Nichols, and I had perhaps ten or fifteen minutes' conversation with him on the general subject of steel foundry practice, and was favorably impressed with Mr. Nichols as a superintendent of the steel foundry.

Q. Had you ever known Mr. Nichols before that time, Mr. Snow? A. I never knew that such a man existed.

Q. Until that day? A. No, sir.

Q. Now, you may state what occurred between you and Mr. Nichols that day? A. Well, I have

described as fully as I can the conversation, I cannot say what we discussed exactly, but as I said before, I was favorably impressed with Mr. Nichols, and as I had been looking for a steel superintendent prior to that time, for some weeks, and I don't know but for some months, it occurred to me that Mr. Nichols might be the man I was looking for, and I told him that we anticipated very shortly having a vacancy in the superintendency of our Chicago Heights plant, and asked him if he was open to an engagement for such a position? And I think he inquired as to what the duties would be, and what the compensation would be? And I told him that the company would pay $5,000 a year, if they could get the right man for the position. Mr. Nichols then told me that he would consider the matter, and let me know on the following Thursday by letter.

Q. Did you have anything to say to Mr. Nichols about your success or unsuccess with Manganese steel? A. I don't think that I had anything to say about the success or unsuccess of it. I dont 'recall mentioning that we were manufacturing Manganese steel at all.

Q. Did you offer him any stock of the American Brake Shoe and Foundry Co. at that interview? A. No, sir.

Q. Well, subsequent to that interview, what further did you hear, or have communicated to you from Mr. Nichols in regard to his considering the question of employment? A. I think it was on the following Thursday, I received a letter from him, which letter was not very plain as to——

MR. LINDABURY—Let us have the letter?

WITNESS—I haven't the letter.

MR. LINDABURY—We had better know what has become of it, before we talk of its contents.

MR. GOODE—I think it is likely I can get it.

COURT—If you have the letter you must produce it. I shall overrule the question.

(*Mr. Goode.*)

Q. Well, what occurred between you?

MR. LINDABURY—I make the same objection.

COURT—He may state the conversation and then state if that is the end of it.

A. That was the end of my conversation with Mr. Nichols.

(*Court.*)

Q. On that day? A. Yes, sir; on that day. I mean to say that the last thing that was said, was said by Mr. Nichols and that was that he would let me know the following Thursday.

(*Mr. Goode.*)

Q. Did he let you know the following Thursday? A. I received a letter from him the following Thursday.

Q. Have you that letter. A. No, sir; I have not.

Q. You will endeavor to find it? A. Well, I have already endeavored to find it, and I do not believe it is in my office, or in the office of the company at Mahwah.

Q. Did you have, after that time, any further correspondence with Mr. Nichols? A. Yes, sir.

Q. When? A. Well, do you want me to tell the things that transpired after I received this letter from Mr. Nichols or answer your question?

Q. I want to know when you had any further communication with Mr. Nichols after that letter? A. I think I had another letter from Mr. Nichols about the 15th of March.

Q. Can you produce that letter? A. No, sir.

Q. After that, did you have any further communication with him, and if so, when? A. Well, I cannot recall any further communication with Mr. Nichols after that time. Mr. Goode, I would like to correct my statement, and say that I did have some further communication with him, about the 20th of July.

Q. I show you a letter, is that a letter that you addressed to Mr. Nichols? A. Yes, sir.

Q. And the letter you have been called upon to produce, is the letter to which this is a reply, which has been called for? A. Yes, sir.

Q. Is that the first communication which you had with Mr. Nichols, directly or indirectly, since your correspondence with him in March? A. Yes, sir.

Q. That is the first? A. Yes, sir; that is the first.

Q. What was the result, as to meeting or otherwise, as to this correspondence in July? A. He wrote me a letter, I believe, about the 16th of July, I was away from my office and the answer was delayed, possibly until the 18th or 19th of the month; in the meantime, Mr. Nichols, I believe, telephoned to Mr. Cutler.

Q. That telegram is in evidence and marked Exhibit D 2, is it? A. Yes, sir; and the meeting was arranged in New York for the 21st of July, as I remember it.

Q. Pursuant to that correspondence, did you meet Mr. Nichols? A. Yes, sir.

Q. Where did you meet him? A. I met him at the ferry in Jersey City.

Q. Then where did you go? A. We went over to the office of the company at 170 Broadway, New York City.

Q. You had an interview with him at the office of the company, 170 Broadway? A. Yes, sir.

Q. Who was present at that interview? A. Well, I talked with him alone—that is, I talked with him alone in going over with him on the ferry, and I think we were alone for some time in the office before Mr. Cutler was able to see us. After Mr. Cutler was able to see us I think we adjourned into his room.

Q. Well, what occurred at that interview—state the conversation as nearly as you can? A. Well, Mr. Nichols told us that he had found it very unpleasant at Highbridge, for some little time before the time of this conversation, and owing to a personal matter in which his family were more or less involved, he did not wish to stay any longer at Highbridge, and had severed his connection with the company.

Q. Was there any discussion at that meeting of wages or agreement to employ Mr. Nichols? A. No, sir.

Q. When did you next see him again? A. I next saw him again on the 5th of August.

Q. What conversation did you have with him at that time? A. He told me that he had sent in his formal resignation, and we discussed the matter of going out to Chicago Heights together, which we did on that day, that afternoon.

Q. What was the object of your going to Chicago Heights? A. Our object in taking him to Chicago Heights was to have him see the plant, and to judge myself, with him on the ground, as to the propriety and advisability of employing him.

Q. How many days did you visit the plant at Chicago Heights in company with him? A. I think three days.

Q. Do you know whether you went there with any other person, than yourself, or at any other time, than you were with him? A. I don't know, sir.

Q. Did he have anything to do with the work at the foundry when he was there? A. No, sir, he was a spectator, merely.

Q. Did he give any advice, or instruction in regard to the making of steel, or the operation of the plant? A. He did not, to the best of my belief, he did not to me, or in my presence.

Q. Well, why did he not continue to go there after August 9th? A. He was served by a court officer, with an injunction on the evening of August 9th, restraining him from—well, I don't recall the wording of the injunction.

Q. Well, he was served with an injunction? A. Yes, sir.

Q. Up to that time, state whether or not he had been employed by the company, or whether any terms of employment had been agreed upon? A. He had not been employed, and no terms had been fixed, of course.

COURT—Ask him what that injunction was issued from, or out of?

(*Mr. Goode.*)

Q. Do you know from what court that injunction was issued? A. I do not.

Q. You know it was issued in Cook County, Ill.? A. Yes, sir; I do.

Q. Was it not from the Superior Court of Cook County, Ill.? A. I do not remember.

Q. Was it a New Jersey injunction or an Illinois injunction? A. It was an Illinois injunction.

Q. Has Mr. Nichols been employed by the American Brake Shoe and Foundry Co. since? A. No, sir.

Q. Has he had anything to do with the operation of the company at all? A. No, sir.

Q. Are you acquainted with Howard E. White? A. I have met Mr. White.

Q. Do you know what connection Mr. White has with the Taylor Iron and Steel Co.? A. I believe he is their general counsel, and is a director in the company.

Q. Were you present at the office of the company in Chicago when Mr. White had an interview with Mr. Gallagher? A. Yes, sir.

Q. And was Mr. Terbell present, also? A. Yes, sir.

Q. What was the date of that interview? A. It was August 10th.

Q. Do you remember what Mr. White said to you and Mr. Gallagher and Mr. Terbell, on that occasion, in connection with Mr. Nichols' contract with the Taylor Iron and Steel Co.? A. Why, I remember that he told Mr. Gallagher that the Taylor Iron and Steel Co. had a contract with Mr. Nichols for his services for a term of five years, and that in view of this contract he thought our company had no right to employ Mr. Nichols.

Q. What response did Mr. Gallagher make to that? A. I think Mr. Gallagher replied that he had seen the contract and did not consider it valid, because it attempted to restrain Mr. Nichols from, or attempted to go beyond the terms of the contract and restrain Mr. Nichols in his whole life, from using a knowledge or any knowledge that he might have gained, or thereafter should have gained in the employ of the Taylor Iron and Steel Co.

Q. Did Mr. White have anything to say in regard to Mr. Nichols' knowledge or information? A. Mr. White said that Mr. Nichols was not in possession of any secrets of the Taylor Iron and Steel Co., and that the reason they served the injunction on him was to make an example of him, so as to show the other employees who were in possession of secrets, and with whom they have contracts, that they could not jump their contracts.

Q. Did he have anything to say about any then existing contracts that Mr. Nichols was engaged in filling? A. Yes, sir, he said there were some important contracts which were not filled, work which Mr. Nichols could perform better than any other employee, and it was their desire to have him come back to High Bridge for two or three weeks, to look after those unfilled contracts, after which he thought there could be no difficulty in arranging for the Taylor Iron and Steel Co. to release Mr. Nichols from his contract.

Q. Was anything further said by Mr. White, during that conversation about secret processes? A. Well, he said repeatedly that Mr. Nichols was not in possession of the secret processes of the company. Furthermore, that he was a man of routine, not a steel expert, nor a man capable of handling men very well except under the supervision of some one over him.

Q. Was anything said about the intention of the company to put Mr. Nichols back at Highbridge? A. Why, he said the company was probably, or would probably find employment for Mr. Nichols elsewhere; that he believed that Mr. Nichols' usefulness at Highbridge was over; he did not want to go there and that the Taylor Iron and Steel Co. people would not have him go there again against his will, but would find work for him elsewhere, or something to that effect.

Q. Was anything said by Mr. White in connection with the employment of Mr. Nichols, about proposing to bring suit in this jurisdiction, that is, in the State of New Jersey? A. He said that he was about to bring the suit in New York or New York, against this American Brake Shoe and Foundry Co., restraining them from employing Mr. Nichols, and I think he said he would bring suit for damages, in case they did employ Mr. Nichols.

Q. Did Mr. Gallagher have anything to say about the injunction, the Illinois injunction, I am referring to now? A. Mr. Gallagher told him that during the pendency of the injunction, that the American Brake Shoe and Foundry Co. would not employ Mr. Nichols, but that he, Mr. Gallagher, would proceed to dissolve the injunction.

Q. When you went to Highbridge in March, 1905, were you aware of the claim of the Taylor Iron and Steel Co., of the existence of secret processes there? A. No, sir, I was not.

Q. You knew, Mr. Snow, that they had certain patents, didn't you, or claimed to operate under patents? A. I do not recall whether I was aware of the Hadfield patent, at that time or not, but I think I was not aware of it.

Q. Where were you employed, Mr. Snow, before you went with the American Brake Shoe and Foundry Co.? A. Directly before that I was employed by the Ramapo Foundry Co.

Q. How long were you employed by the Ramapo Foundry Co.? A. The Ramapo Foundry Co.?

Q. The Ramapo Wheel and Foundry Co., was it not? A. No, sir; the Ramapo Foundry Co.

Q. How long were you employed by that company? A. About a year and a half.

Q. Before that, whom were you employed by? A. Directly before that, for a little over a year, I was employed by the H. W. Worthington Co.

(*Mr. Lindabury.*)

Q. The pump company? A. Yes, sir.

(*Mr. Goode.*)

Q. Give the different concerns, that are engaged in the iron or foundry business, with whom you were employed or connected before you went with the American Brake Shoe and Foundry Co.? A.

Oh, well, beginning with the beginning, I was employed about two years by the Ramapo Iron Works.

(*Mr. Lindabury.*)

Q. Give about the date? A. Yes, sir; about from 1884 to 1886 I was employed with the Ramapo Iron Works. From 1886 to 1889 I was employed by the Ramapo Wheel and Foundry Co. From 1889 to 1890 by the Dickson Manufacturing Co.

Q. Was that the Jersey City Co.? A. No, sir; the Dickson Manufacturing Co.—not the Dixon—and from 1890 to 1891 by the Bement-Miles Co., and from 1891 to 1897 again by the Ramapo Wheel and Foundry Co.; and from 1897 to 1898 by the Steel Tired Wheel Co.; and from 1898 to 1899 by the Worthington Co.—and the rest I have given you.

(*Mr. Goode.*)

Q. What was the business of these concerns, Mr. Snow, in a general way? A. Well, they were all in the iron business—that is to say, they were manufacturers of iron in some form or other.

Q. During your employment by these companies, have you acquired a knowledge of iron and steel castings? A. Well, I have acquired some knowledge of iron and steel castings.

Q. How long have you been general superintendent of the defendant company? A. Since shortly after its organization.

Q. You have the supervision of the castings business, including the steel and Manganese steel of the company, now? A. Yes, sir, I have general supervision of the superintendents of the various foundries.

Q. To what extent is the business of ordinary steel casting engaged in by the trade, generally, so far as your observation goes? A. I do not quite understand that question.

Q. Well, are there a large number of concerns, engaged in making steel castings in the country? A. Oh, yes, sir; there are.

Q. Is a knowledge of the methods of steel casting confined to a few, or is it generally known by the people in the business? A. It is generally known by a large number of people.

Q. How is it as to Manganese steel?

MR. LINDABURY—I object to the question on the ground that counsel has not shown any basis for this class of question.

COURT—He may answer the question.

A. I can name a large number of manufacturers of steel castings if that is necessary.

(*Court.*)

Q. The question is as to Manganese steel, what knowledge have you of that?

MR. LINDABURY—If counsel changes the question and asks if the witness knows who makes Manganese steel in the country I would not object.

(*Mr. Goode.*)

Q. I will change my question to meet the wishes of counsel—do you know who makes Manganese steel in this country? A. Yes, sir. Manganese steel is made by the Isaac G. Johnson people, of Spuyten Duyvil and it is manufactured by the Smith concern, in Milwaukee, and by a concern at Harrisburg——

(*Mr. Lindabury.*)

Q. Do you know the name? A. No, sir, I do not know the name of that concern, and I have been told——

MR. LINDABURY—That won't do—I object to that.

Objection sustained.

(*Mr. Goode.*)

Q. Well, you are testifying, now, just to the concerns you know of your own knowledge that make it? A. Well, I cannot say that I have seen them manufacture it at all of them.

Q. But it is general in the trade, is it not? A. Yes, sir, what is generally known in the trade as manufacturers of Manganese steel.

Q. Well, state that? A. That is all.

Q. You have stated that the American Brake Shoe and Foundry make Manganese steel, have you? A. I assumed that you understood that.

Q. You cannot assume anything? A. Well, the American Brake Shoe and Foundry Co. and the Taylor Iron and Steel Co.

Q. Well, what success have you had in making Manganese steel yourselves?

MR. LINDABURY—I object.

COURT—What is the ground of your objection?

MR. LINDABURY—There is no objection to his telling how much they make, and there is no objection to his telling what use it is or has been put to, and how it stood up under that use. But whether it is a success or not, is one of the things we

are trying to find out here, and his mere opinion that it is a success is a conclusion which the Court will have to form for itself—we want the facts, and the Court will draw its conclusions from the facts.

COURT—I will allow the question. I must know, however, how much they make, and to whom they sell it, and how it wears, in order to form a judgment, as to whether it is a success or not.

MR. GOODE—I will show your Honor how much is sold and how it is used by the consumers and such as that.

COURT—Proceed, I will allow this question.

A. We have made it successfully.

Cross-examination by Mr. Lindabury.

Q. You say that Manganese steel has been made at Chicago Heights, before you took over that plant? A. No, sir, I do not.

Q. Where had it been made, in any of the plants you took over, if anywhere? A. Prior to our taking over the plants, it had not been made in any of the plants we took over.

Q. Then I misunderstood your previous evidence? A. Yes, sir, you did then.

Q. When did you introduce the making of it there at Chicago Heights? A. Well, I believe about the fall of 1904.

Q. Had you had any previous experience in making Manganese steel? A. No, sir.

Q. Had anybody then connected with the plants any experience in making Manganese Steel? A. I think Mr. Potter had.

Q. No, before Mr. Potter's time? A. No, sir; not that I know of.

Q. When did you employ Mr. Potter? A. We employed Mr. Potter in June, 1904.

Q. You employed him for the purpose of making Manganese steel, did you? A. No, sir.

Q. What? A. No, sir.

Q. Had you no idea when you employed him, of engaging in the manufacture of Manganese steel? A. No, sir.

Q. Was it the suggestion of Mr. Potter that you should go into that business, that caused you to make it? A. I do not recall that it was.

Q. Whose suggestion was it, that you should go into that manufacture? A. I do not recall whose suggestion it was.

Q. None of your various plants were then engaged in the making of Manganese steel, were they? A. When do you mean?

Q. When you employed Mr. Potter? A. No, sir.

Q. Or when you began the making of Manganese steel at Chicago Heights? A. No, sir.

Q. And you haven't any idea who suggested that you should go into it? A. I have an idea, yes, sir.

Q. Give me the idea, please? A. I think Mr. McKee, our sales manager, probably suggested it.

Q. You have a man who is your manager of sales, have you? A. Yes, sir.

Q. For the company? A. No, sir; for the steel department.

Q. Did he make the suggestion to you? A. No, sir.

Q. But you understood the suggestion came from him? A. Yes, sir.

Q. Mr. Potter was relied upon to inaugurate that business, was he not? A. Yes, sir.

Q. You employed no one else who had had any previous knowledge of the manufacture of Manganese steel, did you? A. No, sir.

Q. When did Mr. Potter begin it? A. I think it was in the fall of 1904.

Q. And he conducted it up to May? A. Yes.

Q. Following? A. Yes.

Q. And then he concluded he would rather live east, and left you? A. He left us on account of his father's advanced years, and certain business interests, that he wanted to help him take care of.

Q. How much had his father advanced in years, between the time that he went there first, and the time he wanted to go east? A. He was with us a little less than a year.

Q. Before he concluded that he wanted to go east? A. Yes, sir.

Q. Can you fix the time when he gave you that notice, that he wanted to go east? A. No, sir, I cannot exactly; it was some time prior to March.

Q. Some time in the winter? A. Yes, sir, I think it was.

Q. So he had not been making Manganese steel more than three months, had he? A. Something like that.

Q. And then he gave you notice that he was coming east? A. Yes, sir.

Q. And since he left, you had a man named Jones? A. Yes.

Q. Who had had no previous experience in making Manganese stel? A. No, sir.

Q. Which one was it, that you said had made it successfully, Mr. Jones or Mr. Potter? A. I did not say.

Q. Will you tell us then? A. Both.

Q. Oh, both did? A. Yes, sir.

Q. For what uses did they make it? A. They have made crusher jaws, rolled shells, dipper lips, and other castings, that I cannot name now.

Q. Can you tell where any of these are in use? A. No, sir.

Q. You don't know that? A. No, sir.

Q. You cannot tell us where a single one of these

castings which you made so successfully are in use—is that right? A. No, sir, I cannot tell you.

Q. Now, you have been superintendent, I understood you to say, of other iron works before you became the superintendent of the defendant company? A. Yes, sir.

Q. How many—I ask you because I do not recall—about? A. Why, I was superintendent of the Steel Tired Wheel Co. prior to——

Q. Give us about the number? A. That is the only company that I was superintendent of. I had other positions not up to the title of superintendent in some of the other companies I mentioned.

Q. Do you know whether or not manufacturers of iron and steel generally, endeavor to keep secret some of their processes? A. I do not recall that any company that I have ever been connected with have made many efforts to keep any practices secret.

Q. Well, does not the defendant company endeavor to keep secret any processes, in any of its foundries? A. I cannot say that they do. I will say, however, if you wil lallow me, that they admit visitors very freely in all their works.

Q. I will allow you to say that, because I suppose most of the visitors would not understand anything about the processes by a mere visit, would they? A. It depends upon their previous knowledge.

Q. Women and clergymen and a good many other business men, might be turned loose, in almost any foundry?

MR. GOODE—I object to that.

Question withdrawn.

(*Mr. Lindabury.*)

Q. Ordinary business men might be safely taken through almost any foundry, without any danger

of his understanding the processes, might he not?

MR. GOODE—I object to this as not proper cross-examination.

COURT—I will take it.

A. Yes, sir.

(*Mr. Lindabury.*)

Q. Have they or not, processes which they endeavor to keep secret in any of their foundries?

MR. GOODE—I object to that as not cross-examination.

Question allowed.

A. No, sir.

(*Mr. Lindabury.*)

Q. They have none at all? A. No, sir, they haven't any at all.

Q. Are you fully prepared to swear to that? A. To the best of my knowledge, and I think I should have a knowledge, if anyone has or should have.

Q. Do you say that of all the foundries, with which you have been connected, none of them have any processes which they endeavor to keep secret? A. None, to the best of my recollection.

Q. So far as you knew about it? A. Yes, sir, so far as I know.

Q. Do I understand that you supposed, when you went to Highbridge, that they did not have any secrets? A. I did not know of any.

Q. Did you suppose they had no secrets in their factory, when you went there? A. I did not suppose anything about it.

Q. You did not think anything at all about it? A. No, sir.

Q. Did you suppose that anyone who came there would be allowed to go through the foundry? A. I expected that I would be allowed to go through the foundry on the strength of the letter I had introducing me.

Q. That is not the question—did you suppose they had no secrets there, and that they would allow anyone to go through—that is, to go through the foundry? A. Well, I thought there might be some difficulty in getting in, otherwise I would not have obtained the letter.

Q. Why, did you think there might be some difficulty in getting in there, if you supposed that they didn't have any secrets to guard? A. I did not say that I did not suppose they had no secrets, what I say is, that some companies did not make a practice of admitting visitors freely, and others do, but I did not take the chance of going there without some credentials.

Q. All the companies you have ever been connected with, did make a practice of allowing visitors in freely, did they? A. Yes, sir.

Q. And yet it is your notion that some other companies do not make the practice of letting visitors into their foundries, freely? A. Some other companies?

Q. Some other companies do not let visitors in freely—that is, some other companies, other than those you have named or been connected with? A. Yes, sir.

Q. Do they let visitors in or go through the Chicago Heights plant, freely? A. Yes, sir.

Q. Have they always done that? A. Yes, sir.

Q. And anyone who goes there to the Chicago Heights plant, can go through and walk through the plant? A. Well, not recently, but it is owing

to a strike we have had there since the first of May, we have been very reluctant to admit people into the place, but it was all because of the strike we have had there.

Q. Well, before the strike, did you allow anyone to go into the foundry and witness the process of making Manganese steel, and how you did it? A. To the best of my knowledge, yes.

Q. Well, have you any knowledge on the subject? A. Well, I will say—if you will allow me— that I do not visit Chicago Heights probably more than once a month on the average, myself personally, but I will say, if you will allow me further——

Q. I will not allow you to state your opinion; I want to know if you have any definite knowledge that you are able to swear to, from your knowledge, that they will allow anyone to go through the foundry there, and witness the making of Manganese steel, and how you do it; if you don't know, say so? A. No, sir, I cannot swear to that.

Q. Now, then, hearing of the practice of some of the manufacturers that they would not allow visitors through their foundries, you thought or concluded that you had better fortify yourself with a letter, did you? A. Yes, sir.

Q. And you concluded to get a letter from a gentleman you knew was intimate with the Taylor Iron and Steel Co.? A. Yes.

Q. Yes—now, of course you knew it made some difference whether the man admitted to the foundry was a steel maker or a mere business man, did you not? A. Yes, sir.

Q. You have just said so, haven't you? A. Yes, sir.

Q. It would be perfectly safe to admit an ordinary business man, where it would not be safe to admit a rival steel maker? A. It might be safe, and it might not be safe.

Q. Did you disclose to Mr. Christie the fact that you were a steel maker when you went there? A. I do not recollect that I did; I think I told him that I was connected with the American Brake Shoe and Foundry Company.

Q. Well, did you? A. Yes, sir.

Q. Are you sure of that? A. Yes, sir, I am quite sure of it.

Q. He says that you did not, you will observe? A. I did not observe it,

Q. That was his testimony? A. I did not hear his testimony.

Q. You did tell him that, did you? A. To the best of my knowledge, I did.

Q. And did he surprise you when he told you that they did not admit people in the foundry? A. Yes, I was surprised.

Q. You were? A. Yes, sir.

Q. You must have understood from that, that they had secrets in the foundry then, didn't you? A. Yes, I did.

Q. And that was the first time you had any idea that they had secrets in the foundry, was it? A. Well, I would have to assume there were secrets, or there must have been some reason for their reluctance to admit visitors.

Q. You wanted to go through to pick up all such information as you could gather, you say? A. Yes, sir.

Q. You made an affidavit on the application for a preliminary injunction in this cause, did you not? A. I presume so.

Q. Why didn't you say in that affidavit that you told Mr. Christie, that you were connected with the American Brake Shoe and Foundry Co. if you did? A. Because I did not think of it.

Q. Well, you went through the parts of com-

plainant's works that you were allowed to go through, you say? A. Yes, sir.

Q. Do I understand you to say that Mr. Estes suggested that you had better see Mr. Nichols? A. I believe so.

Q. And you told Mr. Estes you were looking for a superintendent, did you? A. I do not recall that I did; I possibly did, though.

Q. Don't you know whether you did or not? A. No, sir, I do not.

Q. And you did not know there was such a man in existence as Mr. Nichols, you say? A. I did not

Q. But you had been searching for several weeks or months for just such a man, hadn't you? A. Yes.

Q. And you may have made known that quest to Mr. Estes, may you not? A. Perhaps I did, I cannot say.

Q. Did you stay the night with Mr. Estes? A. No, sir.

Q. What time of the day did you arrive? A. Before lunch, I should judge before eleven o'clock.

Q. Did you take dinner with Mr. Estes? A. Yes, sir.

Q. And when did you go to Mr. Christie? A. Immediately after lunch, probably one o'clock.

Q. When did you leave Highbridge? A. I don't recall that.

Q. Late in the same day? A. Late in the afternoon, yes, sir.

Q. Of the same day? A. Yes, sir.

Q. Well, you had gotten pretty well over the part of the plant you were admitted to, when you had this conversation with Mr. Nichols, that you have described? A. Yes, sir, we had got to the time office, which was the entrance or outlet of the plant.

Q. Of course you knew from Mr. Estes that Mr. Nichols was an employee in the foundry, did you

not? A. I do not recollect that—he mentioned Mr. Nichols' name to me about the time we arrived at the time office.

Q. Well, that was after you had completed your inspection, was it not? A. Yes, sir.

Q. And then he mentioned Mr. Nichols' name to you? A. Yes, sir.

Q. And what did he say about Mr. Nichols? A. Why, he said "the assistant superintendent was a personal friend of his, an associate of his on the school board," and he asked me "if I would like to see him"?

Q. This was after you might have told him of the search you were making for a man for the position of superintendent? A. I possibly may have told him; it would have been——

Q. One moment—did he tell you where the assistant superintendent was, then? A. No, sir.

Q. That he was in the foundry—did he tell you that? A. Yes.

Q. You knew that, didn't you? A. He told me he would send for him.

Q. You were informed that he was working in this part of the works to which you were forbidden entrance? A. Yes, sir.

Q. And his proposal was that he should send for him to come out from the place where you could not go and see him? A. Yes, sir.

Q. Now, did it occur to you that the honorable thing to do was to go to Mr. Christie before you sent for Mr. Nichols? A. No, sir.

Q. And why not. A. Why I did not know why I should not meet Mr. Nichols; I did not expect to more than meet him or be introduced to him, when Mr. Estes sent for him; I did not expect to take up much of his time.

Q. You sent for a man to come out from the secret part of their works or the part you forbidden

entrance to, merely for a social introduction—is that it? A. Yes, sir, it was not my suggestion that he be sent for.

Q. No, it was Mr. Estes' suggestion—but I suppose it was after you had told Mr. Estes what you wanted? A. I didn' say that I told Mr. Estes what I wanted.

Q. Possibly you told Mr. Estes just that you were looking for a man to become the superintendent of your foundry, and possibly Mr. Estes suggested that Mr. Nichols might be able to aid you——

MR. GOODE—I object to this as not cross-examination.

COURT—Let counsel complete his question.

(*Mr. Lindabury.*)

Q. And possibly Mr. Estes suggested that he should send for him—is that it? A. No, sir.

Q. Did Mr. Estes go in for him, or did Mr. Estes send for him? A. Mr. Estes made known to some one that he would like to have Mr. Nichols come out, and he was sent for.

Q. How long was Mr. Nichols out there with you? A. I do not think over fifteen minutes.

Q. Do you think it was as much as fifteen minutes? A. I think so.

Q. So that your social colloquial conversation very soon got down to business, didn't it? A. Well, just before I left, I think in fact that Mr. Nichols had turned his back and was going out, and I called him back, and I stepped to the door and inquired if he was open to a proposition from us; that is my recollection of it.

Q. How many minutes had you lapsed before that; how many minutes of the interview, I mean?

A. If the total interview was fifteen minutes, then probably fourteen minutes had elapsed.

Q. You had the whole business conversation in which you offered him $5,000, and all that sort of thing—and you think that that only took about one minute? A. Yes, sir, the business part of the conversation was, I should say, about one minute in duration.

Q. And did you go back and tell Mr. Christie, that you had met Mr. Nichols? A. No, sir.

Q. And how well you were impressed with him? A. No, sir.

Q. And that you had made him an offer to go to Chicago Heights? A. No, sir.

Q. No—instead of that you told Mr. Nichols to say nothing about it, didn't you? A. Yes, sir.

Q. When you received the letter from Mr. Nichols on the following Thursday, what did you do with it? A. I read it, and put it in my pocket.

Q. Then what did you do with it; did you continue to carry it in your pocket? A. I do not recollect.

Q. You are not in the habit of destroying business letters, I suppose? A. No, sir.

Q. Did you destroy that one? A. No, sir.

Q. You preserved it, didn't you? A. I believe it is in existence, I did not destroy it.

Q. You received another letter from Mr. Nichols about a week later—what did you do with that? A. I think it is in existence.

Q. You did not destroy it? A. I did not.

Q. Who did you give it to? A. I kept the letters in the general files of the company.

Q. And you received another letter from Mr. Nichols in July following, didn't you? A. Yes, sir.

Q. Did you destroy that? A. No, sir.

Q. That is somewhere in existence, too, is it not? A. I should think so, yes, sir.

Q. You arranged with Mr. Nichols to go out to Chicago to look over the plant in August, did you not? A. Yes, sir, we had discussed it previously; we had discussed that in March previously.

Q. What is that? A. We had discussed that as a thing to do, in March.

Q. In that one minute's conversation? A. Oh, no, sir, in March.

Q. Oh, at the interview in New York. A. Yes, sir.

Q. When you met him at the ferry? A. Yes, sir.

Q. He swears you met him at the ferry and took him to the hotel?

MR. GOODE—This is in March, the witness speaks of, and Mr. Snow met Mr. Nichols at the ferry in July.

MR. LINDABURY—That is so, I am mistaken.

(*Mr. Lindabury.*)

Q. In March you met him at the hotel of Mr. Cutler, did you? A. Yes, sir.

Q. You had a conference at the hotel? A. Yes.

Q. That was about a week after the Highbridge interview, was it not? A. I think so, something like that.

Q. And that was arranged after the letter, after the Thursday letter was received, was it not? A. Yes, sir.

Q. Did you answer the Thursday's letter? A. I think so.

Q. You have a copy of that I suppose, in some letter-press book? A. I presume so.

Q. That book, I suppose, is not lost? A. No, sir.

Q. Well, the result was the interview at the hotel? A. Yes, sir.

Q. You were present at that interview? A. Yes, sir.

Q. And how much did you offer him there? A. Why, as I remember it, he was offered $6,000—he was not exactly offered that; that was understood to be the compensation he would receive, in case we employed him.

Q. To give him $6,000 if you took him at all? A. Yes, sir.

Q. That is right, is it? A. Yes, sir.

Q. Or rather, if he decided to go at all? A. Well, yes, sir, that is probably more the case than the other.

Q. I understand you arranged to go out to Chicago Heights with him, in August, in order that you might judge for yourself, as to his competency in the manufacture of steel; am I right? A. Yes, sir.

Q. You told him, when you were at Highbridge, you wanted him for the purpose of making these special steels, did you not? A. I told him that we had a vacancy in the superintendency of the plant, and I told him that we had both an iron and steel foundry, and inquired if he had any knowledge of the iron foundry business.

Q. Didn't you tell him that you were making special steels? A. I don't recall that I did.

Q. Mentioning Manganese? A. I don't recall that I did.

Q. Didn't he, in his letter to you on the following Thursday, refer to the fact that you wanted him to make Manganese steel and other special steels? A. I don't remember, I haven't seen the letter for a year and a half or more.

Q. You don't remember whether that is so, or not? A. I do not remember, no, sir.

Q. You say you went out there with him, and spent three days with him at the Chicago Heights plant, in going over it? A. Well, I spent very

little of those three days with Mr. Nichols; I was doing my routine work in and about the plant, principally at the brake-shoe end of the plant.

Q. I thought you said that you took him out there to judge of his capacity, of his fitness for the position? A. I expected to, but in three days the injunction was served on him, and I hadn't any or much opportunity to judge of his ability prior to that time.

Q. He spent those three days in there, did he not? A. Yes, sir.

Q. Well, what did you understand he was doing? A. Watching the operations.

Q. Did you think in that way you could ascertain as to his capabilites? A. No, sir, I expected to inform myself, or to make a judgment in the matter, by spending some days in the steel foundry with him myself.

Q. Did you know anything about the practical end of the manufacture of Manganese steel? A. Only in a very meagre way.

Q. Did you understand it enough to judge of the capability of an expert steel maker? A. Why, I think so.

Q. So you thought you knew enough about it to tell whether or not, he was an expert steel maker, after you had him out there? A. Well, I probably had in my mind satisfying myself of his general fitness for the superintendency of the plant without special reference to the steel end of it.

Q. And you did not, during that three days, attempt to inform yourself in any way on this point? A. No, sir, I don't think I did; I expected to, before I finished, but I did not, up to that time.

Q. And you had him doing nothing, during that time, you think? A. He was doing nothing.

Q. Well, how long was this—how long after the

service of this injunction was that interview when Mr. White was there? A. The following day.

Q. Was your Chicago attorney present at the interview? A. No, sir.

Q. Mr. Gallagher was there, of course? A. Yes, sir.

Q. And you were there? A. Yes.

Q. Was Mr. Cutler there? A. No, sir; Mr. Gallagher, Mr. Terbell, Mr. White and myself were all that were present.

Q. Who is Mr. Terbell? A. The second vice-president, in charge of the sales in the West.

Q. Have you got a copy of the affidavits upon which the Chicago injunction had been procured—and did you have a copy then? A. Had I a copy at that time?

Q. Yes. A. I think Mr.—no, sir, I had not seen a copy.

Q. Of course you have seen them since the Chicago injunction was served—that is, the Chicago affidavit? A. I do not recall that I have.

Q. Did not Mr. Nichols give you a copy of them the night before that interview? A. I saw a copy of the injunction, I am sure of that.

Q. Yes, and of the affidavits upon which it was procured, didn't you see those? A. I believe they were attached, but I do not recall having read them.

Q. So you had them there at the time of the interview; that is what I mean—don't you remember that now, that you had them there, at the time of the interview? A. Well, I probably did.

Q. Well, Mr. White was attending to that matter for the complainant company, was he not? A. That is my understanding.

Q. He had procured, through Chicago attorneys, this injunction that was served on Mr. Nichols? A. That is my understanding, yes, sir.

Q. And had prepared and filed the affidavits? A. I cannot say about that; I should assume, so, yes, sir.

Q. Mr. White had gotten this injunction upon a number of affidavits, in all of which it was sworn to that Mr. Nichols was possessed of secret processes of the Taylor Iron and Steel Co., hadn't he? A. I do not recall having seen the affidavits or having read them.

Q. Well, you knew that the injunction—didn't you know that the injunction was based upon the claim of the Taylor Iron and Steel Co. people that Mr. Nichols had knowledge of the secret processes of the Taylor Iron and Steel Co.? A. No, sir.

Q. When Mr. White made the statement there, you say several times over, that Mr. Nichols knew no secrets at all of the Taylor Iron and Steel Co.; did Mr. Gallagher say to him then, "Mr. White, how did you explain these affidavits you filed yesterday?" did he ay anything like that to him? A. Not that I recall.

Q. Did anyone say to him, "how in the world were you able to file these affidavits yesterday, and get this injunction?" did anyone say anything like that to him? A. No, sir, not that I recall.

Q. Well, no allusion was made to the fact when you say Mr. White made this statement, that Mr. Nichols was possessed of the secret processes of the Taylor Iron and Steel Co., that he had just filed affidavts in court, the day before, an exact contradiction of what he was then saying? A. No, sir.

Q. Now, at conference in New York, in March, at the hotel, was anything said about giving stock to Mr. Nichols? A. Yes, sir.

Q. What was said about that? A. Mr. Cutler offered him $1,000 in stock in addition to his $5,000 salary.

Q. $1,000 in stock? A. Yes, sir; I do not recollect the exact terms of his offer; I do not know even that he described the exact terms. As I remember it, he told Mr. Nichols that the company had some arrangement, by which it issued stock to certain employees, and that he would arrange for an issue of $1,000 to Mr. Nichols, under that arrangement, in addition to his salary of $5,000.

Q. By the way, what has become of Mr. Estes; do you know where he is now? A. Yes, sir.

Q. Where is he? A. Mr. Estes is employed by the American Brake Shoe and Foundry Co. at Mahwah, N. J.

Q. When did he go there? A. Oh, I should say, I do not remember exactly, but I should say some time in 1906.

Q. Cannot you come any nearer to it than that? A. No, sir, I cannot, except that it was the early part of 1906, probably January or February.

Q. Where was he before that—he is your relative, I presume you know where he was before? A. Why, yes, sir; he was employed by some electric company out at Ampere; the firm's name was Crocker Wheeler Co.

Q. How soon did he leave the Taylor Iron and Steel Co. after your visit there in March? A. Very soon after.

Q. The next day, was it not? A. I think it was.

Q. Did you procure his employment by the Crocker Wheeler Co.? A. I cannot say that I did.

Q. What can you say about it—did you? A. No, sir.

Q. You cannot say that you did, now can you say that you did not? A. Why, I assisted him.

Q. And after he got through with the Crocker Wheeler Co. and some time in the present year, he went up to the plant where you were? A. Yes, sir.

Q. Have you a man named Leonard in your employ? A. No, sir.

Q. Did you ever have? A. Yes, sir; for a short time.

Q. When did you take him into your employ? A. I think in September, 1905, or perhaps a little later.

Q. How long did you have him? A. Only a short time.

Q. Where was he employed? A. At Chicago Heights.

Q. In the steel plant there? A. Yes, sir.

Q. How did you hear of Mr. Leonard? A. Why, I don't remember how I heard of him. I met him in our New York office, I think, in August or September.

Q. He came to see you there? A. He did not come to see me, no, sir.

Q. Do you know how he happened to come there?

MR. CORBIN—I don't care anything about this evidence, but I will make the objection that it is not cross-examination.

Question allowed.

A. No, sir.

(*Mr. Lindabury.*)

Q. Who employed him? A. I don't know, sir.

Q. Who did he come to see? A. That I don't know, sir.

Q. What did you employ him to do?

MR. CORBIN—I object to this on the ground that it is not cross-examination.

COURT—I think it is quite important. One of the charges here is, the charge of bad faith on the part of this company go-

ing there and employing these men as well as your going to the works and sending in for Mr. Nichols who was called out. Now, they make the charge of bad faith—I am not saying whether it is true or not, but this is all in further proof of that bad faith that they set up, that they keep on employing this, that or the other man, and getting them away from the Taylor Iron and Steel Co.

MR. GOODE—They haven't proved that yet.

COURT—I think you had better prove that first, Mr. Lindabury.

MR. LINDABURY—Mr. Nichols admitted it on cross-examination that Mr. Leonard was in the foundry there where these processes were carried on at Highbridge, and then these other people took him out of there and made him their go-between.

COURT—Have you proved that this man was employed at Highbridge?

MR. LINDABURY—Yes; it is already proved.

MR. GOODE—Is the position to be taken here, that the American Brake Shoe and Foundry Co. are to be eternally prohibited from employing any men that the Taylor Iron and Steel Co. ever had in their employ?

COURT—That depends on the case in Court.

MR. GOODE—That is the proposition here now, it seems to me.

COURT—The charge made here is, that they got Mr. Nichols to leave the Taylor Iron

and Steel Co., that by the exercise of bad faith they got hold of him, they made an offer to him, and got him to leave their employ. Now, if Mr. Estes, their go-between, was also in the same employ, and Mr. Leonard was employed there, and Mr. Nichols says he was employed in that foundry, there may be some truth in the charge that you are trying to get their skilled labor away from them. I could not prevent you from employing Mr. Estes or Mr. Leonard, and I could not enjoin you from employing them or getting them away from the Taylor people. Of course, I cannot tell what the evidence may be, in advance, I will have to hear the evidence first—I will allow that question to be answered.

A. I did not employ him.

(*Mr. Lindabury.*)

Q. What did the company employ him to do? A. He was employed to assist the foreman of the steel foundry.

Redirect by Mr. Goode.

Q. Do you know where Mr. Leonard was employed when he left the Taylor Iron and Steel Co. to go to the American Brake Shoe and Foundry Co.? A. I think somewhere in Newark.

Q. Then he was not in the employ of the Taylor Iron and Steel Co. when he went into the employ of the American Brake Shoe and Foundry Co.? A. He was not in the employ of the Taylor Iron and Steel Co., he was in the employ of some concern in Newark, and he left them and came to the Ameri-

can Brake Shoe and Foundry Co. I understand that fully.

Q. In whose employ was Mr. Estes when you employed him? A. He was in the employ of the Crocker Wheeler Co., and regarding Mr. Estes, I can tell you what he told me about his leaving Highbridge, if it is proper that I should do so.

FREDERICK W. SHERMAN, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Park City, Utah.

Q. What is your business? A. I am mill superintendent of the Daly West Mining Co.

Q. What are your duties as milling superintendent of the Daly West Mining and Milling Co.? A. I have full charge of their milling plant.

Q. How long have you occupied that position? A. Going on eight years.

Q. What is the character of the rock or ore that you have to mill there? A. We mill ore, carrying lead and silver, carried in a quartz gangue.

Q. What machines do you use for crushing this rock or quartz, or ore? A. We first crush it with a gyratory crusher, and with sets of rolls, and then with a Huntington mill, recrushing them.

Q. Both of those rolls, are they the same degree of coarseness or fineness? A. No, sir; the first is what we call our coarse rolls, and the second the fine rolls.

Q. Of what material are these rolls made? A. These rolls, have a shell for crushing which we use, is steel.

Q. During your experience there as superintendent, what steels have you used in these rolls? A. We have used Latrobe, Midvale, Chrome, Manga-

nese steel made by the Taylor Iron and Steel Co., and Manganese steel made by the American Brake Shoe and Foundry Co.

Q. This American Brake Shoe and Foundry Co., this defendant? A. Yes, sir.

Q. What steels have you been using the last few years? A. The Manganese steel entirely, with the exception of at present we have one set of Chrome steel on now.

Q. How many rolls of the American Brake Shoe and Foundry Co.'s steels have you used? A. Two sets of shells, one on the coarse rolls, and one on the fine rolls.

Q. Is it one of your duties, as superintendent, to keep track of the durability of the rolls used in the mills? A. It is one of the things I do.

Q. Well, have you used some of the rolls of the Taylor Iron and Steel Co. lately? A. Yes, sir.

Q. Have you kept a record of the durability of those rolls? A. Yes, sir.

Q. Tell me, if you can, what has been the extent of the durability and tonnage of crushing this year, with the Taylor Iron and Steel Co.'s rolls? A. Well, in tonnage the coarse roll shells, handled from 40,000 to 46,000 tons, and the fine rolls handle—they have handled from 12,000 to 20,000 tons.

Q. Now, you have kept a record also of the durability of the rolls made by the American Brake Shoe and Foundry Co., have you not? A. Yes, sir.

Q. What has been the result of that record? A. The coarse rolled shells made by the American Brake Shoe and Foundry Co. crushed something over 46,000 tons, and the fine roll shells, 17,200 tons.

Q. Well, how do these Manganese steels compare in durability with the other steels which you have

used? A. They crush a greater tonnage per pound of steel.

Q. Well, in your judgment, from these tests, how does the Manganese steel made by the American Brake Shoe and Foundry Co. compare with that made by the Taylor Iron and Steel Co.? A. They are virtually the same.

(*Court.*)

Q. When you say 40,000 to 46,000 tons, do you mean that that is the life of the roll, or do you mean so much per pound? A. That is the tonnage of ore that it takes to wear out the shell.

Cross-examination by Mr. Lindabury.

Q. This practice, when you describe the tonnage passing over the rolls, you are giving a gauge for estimating the life of the roll? A. Yes, sir.

Q. When were these American Brake Shoe and Foundry Co. rolls put in? A. Each set of them were put in on the 18th of February of the present year.

Q. February 18th, 1906? A. Yes, sir.

Q. Have you used any American Brake Shoe and Foundry Co. rolls before that time? A. No, sir.

Q. That was the first set? A. I received a set in September, but they were not put in until then.

Q. September, 1905? A. Yes, sir.

Q. When did you give the order for them? A. In the latter part of June or the 1st of July.

Q. Was the order solicited by some one, did a salesmen call? A. I rather think I noticed their advertisement of rolled shells, and I wrote to the house in regard to it.

Q. And you were looking for—what roll were you using at the time—the Manganese steel roll? A. We were using the Taylor Company's roll.

Q. And you were looking for whose in substitution? A. Something that would not cost so much.

Q. And you found it in the American Brake Shoe and Foundry Co.'s roll, did you? A. They charged me two cents less a pound. I paid eight cents a pound a Chicago Heights, against ten cents a pound at Highbridge.

Q. When did you begin to use the Taylor Co.'s Manganese steel roll? A. I cannot tell exactly; I have used them for three or four years.

Q. And you have had several sets of them? A. Yes, sir.

Q. More than two sets? A. Oh, yes, sir; I have had nearer a dozen sets.

Q. Are you still now using the American Brake Shoe and Foundry Co.'s rolls? A. No, sir.

Q. Did you ever get more than those two sets that you have described? A. No, sir.

Q. And you got them on one order? A. No, sir; I ordered the first set in June or July, and the other one a month or six weeks later, but I put them in on the same date.

Q. Were they delivered together? A. No, sir; one was billed in September and the other in December.

Q. And those are the only two sets of the American Brake Shoe and Foundry Co.'s rolls that you had? A. Yes, sir.

Q. When did you cease using those two sets? A. The last set came off on the 1st day of November.

Q. Did one set wear longer than the other? A. The coarse rolls always wear longer than the fine rolls.

Q. When you speak of a set of rolls, you mean two rolls, do you not? A. Yes, sir; turning together, and the ore passing between them.

Q. And when you spoke about the wear, you subjected these two sets of rolls to, was one for the

coarse rolls used and one for the fine rolls used? A. Yes, sir; the coarse rolls takes the product from the rock breaker and the fine roll takes the product from the coarse rolls, after being crushed once.

Q. The difference is only in the use? A. Yes, sir.

Q. When did you cease to use the one that wore out first, which I understand was the coarse set of rolls? A. Yes; May 2d.

Q. When did you put it in? A. We put them in on the 18th of February.

Q. Then the coarse set of rolls was in operation from February 18th to the 2d of May? A. No, sir; that is the fine rolls.

Q. Well, the fine rolls were in from February 18th to May 2d, were they? A. Yes, sir.

Q. When was the other? A. Until November 1st —that is, from the 18th of February to the 1st of November.

Q. What have you used since, what did you replace the fine roll with—what have you used since, what did you replace the fine roll with—that you took out on May 2d—what did you replace that with? A. With the Taylor Iron and Steel Co.'s Manganese steel.

Q. What did you replace the roll that wore out on November 1st with? A. Well, with the Taylor Iron and Co.'s Manganese steel, too.

Redirect by Mr. Goode.

Q. Why did you replace them with the Taylor Iron and Steel Co.'s steel? A. Why, I wanted to get a trial of the American Brake Shoe and Foundry Co.'s shells before I placed any further order and I ordered the Taylor Iron and Steel Co.'s shells, while the American Brake Shoe and Foundry Co.'s shells were still in use, and I hadn't their record.

(*Court.*)

Q. What determines the life of these rolls? A. Why, the tonnage of ore. It is virtually the same class of ore.

Q. No; that determines the quantity you are going to put through, but what is there that gives way? A. There is three inches of wearing surface, and it is simply wearing off that three inches of surface.

(*Mr. Lindabury.*)

Q. Are the Taylor Iron and Steel Co.'s rolls you put in on the 2d of May still in use? A. Yes, sir.

Q. Have you replaced them? A. Yes, sir.

Q. With what? A. Chrome steel.

(*Mr. Goode.*)

Q. Whom do you expect to give your next order to?

MR. LINDABURY—I object to that as immaterial and incompetent.

Objection sustained.

(*Mr. Lindabury.*)

Q. Have you given an order to the defendant company since the first one? A. No, sir.

WINFIELD S. POTTER, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Corbin.

Q. What is your occupation? A. At present I am chief chemist of the American Brake Shoe and Foundry Co., and also have charge of the mixture

for the American Malleable Co., which is connected with the American Brake Shoe and Foundry Co. I have charge of their mixture and stock.

Q. Are you acquainted with the business of steel making and steel castings? A. Yes, sir; I have had considerable practical experience in the manufacture of steel castings.

Q. When did you first have to do with that business? A. The first plant where I have charge of such work was the American Hoist and Derrick Co., especially at St. Paul, but I had seen something of steel castings prior to that.

Q. And then where were you? A. The William Wharton, Jr., & Co. of Philadelphia.

Q. What did you do there? A. I had charge of the furnace and did the chemical work for three shops.

Q. Is that the Bessemer process? A. The Bessemer process in the Twenty-fifth street and Washington avenue shop of the William Wharton, Jr., Co.

Q. Where next did you go? A. I did after that have nearly a year's experimenting on special furnace work in Brooklyn, New York and elsewhere.

Q. When was that? A. That was in—I was at Charton Co. from, I think, April, 1901, until March, 1902, and for about the following year I was working on this special experimental work I was speaking of——

Q. In Brooklyn? A. Yes, sir; in Brooklyn and elsewhere.

Q. What was your line of experiments? A. With the agents of the Tropenas process, as engineering the installment of a steel foundry equipment.

Q. That is a manufacturing process?

A. No, sir; not manufacturing, installing and instructing employees of concerns, purchasing the equipment.

Q. The Tropenas process is a method, is it not? A. Yes, sir; it is a side-blown converter, the steel is blown from the surface at one side of the vessel, and it is really a side-blown Bessemer.

Q. It is a well-known process? A. Yes, sir; it is a well-known process.

Q. And described in the text books? A. Yes, sir; it is described in Prof. Howe's book, for example.

Q. When next did you take up employment, and where? A. My next employment was with the American Brake Shoe and Foundry Co.

Q. When was that? A. I had a three-weeks visit at the Chicago Heights plant, in which I investigated the practices there, particularly in the steel foundry, and I made a report——

Q. When was that? A. That was in April, 1904.

Q. And then what did you do next? A. Why, I finished my work with Powell & Cohn, the agents for the Tropenas process, and on the last day of May, 1904, I took charge of the Chicago Heights plant.

Q. What did you do there, what was your work? A. It was the superintendency of the plant, including the various departments, the iron foundry, the steel foundry, the crucible foundry, and the forge and press room, and the auxiliary departments, the machine shop, the cleaning, power house, etc.

Q. How long did you continue there? A. Until the 26th of June, 1905.

Q. Then where did you go? A. I came to New York.

Q. You were there then something over a year? A. Yes, sir, I was there continuously with the exception of some five or six days at odd intervals, two or three days at a time. I was away from the plant, with that exception I was there for work, a year and one month.

Q. Then you went to New York, were you out of their employ then? A. I was out of their employ during July, August and September.

Q. And then did you re-enter their employ? A. On the 1st of October I re-entered their employ.

Q. In what capacity? A. As chemist and metallurgist.

Q. There are other chemists and metallurgists in their employ, are there not? A. Yes, sir, laboratory men.

Q. Under your direction? A. Yes, sir, under my direction.

Q. Then you are the head of that department? A. Yes, sir.

Q. Where is your place of business? A. My office is at Mahwah, N. J.

Q. At Mahwah, N. J.? A. Yes, sir.

Q. The company have a foundry at that place? A. Yes, sir.

Q. Now, were you there—where is their principal laboratory? A. At Mahwah.

Q. Do you visit the plants of the company? A. Yes, sir, frequently, all of them.

Q. And have you visited the Chicago Heights plant? A. Yes, sir.

Q. How often? A. Well, after taking this new employment with the American Brake Shoe and Foundry Co., I made my first visit there I think during the last days of October.

Q. 1905? A. Yes, sir, October, 1905, and I was there in October and in November, in December, January, February, March, and I think not again until June. Recently also I think, but I am not positive, I have had two trips since June.

Q. When in charge of the Chicago Heights plant, did you manufacture steel? A. Yes, sir.

Q. By what process? A. The process was the side-blown Bessemer, or so-called Tropenas; it really

was not the Tropenas on account of the modifications in the vessels, which I made myself.

Q. It is a form of the Bessemer process, is it? A. Yes, sir.

Q. Did you enter on the manufacture of Manganese steel? A. I made my first Manganese steel there, before formally entering the employ of the company, during the three weeks I was there, to examine and report on the condition of the plant.

Q. That was when? A. In April I commenced.

Q. And when you went back, did you enter upon the manufacture of Manganese steel? A. I commenced making test-bars, and occasionally some small castings to persuade the sales department that I was prepared to make commercial Manganese steel, and within a very few weeks after I took charge of the plant, I cannot say exactly when.

Q. Did you continue that manufacture? A. Yes, sir, I did; there was no month in which we did not make Manganese steel castings from June on.

Q. June of what year? A. June, 1904.

Q. Are you acquainted with the Hadfield expired patents? A. Yes, sir, I have read them.

Q. Did you manufacture under those processes? A. Why, it was substantially the Hadfield process, yes, sir.

Q. Is it with the description given in the Hadfield patent—the Hadfield patent of 1884—is it practicable for a man skilled in metallurgy to manufacture Manganese steel? A. Not without some experimenting.

Q. But with some experimenting? A. With a few intelligent experiments, I should say yes, sir, they would have to be made with a careful and scientific manner, though.

Q. Where does the introduction of the Manganese part of a process begin? A. The Man-

ganese is introduced into the steel, as in the from of ferro-manganese, a liquid, or partially melted, and placed in the ladle, and blown steel poured upon it.

Q. Up to that period, is there any difference between the process of making ordinary Bessemer steel and Manganese steel? A. You understand, Mr. Corbin, we are not using what is ordinarily called "the Bessemer process," we are not using the standard bottom blown Bessemer, we are using metal from the converter which is similar, surface blown, and results in hotter metal at the finish of the heat.

Q. When you have that metal prepared, can you make any other steel than Manganese steel? A. Any steel you like.

Q. Up to that stage is there any difference whether you are going to make Manganese steel or common steel in the process? A. It would depend on what common steel you are to make; you would make a suitable selection of the materials, to get that bath of the proper analysis, to make good Manganese steel.

Q. The question would be one of selection of materials, would it? A. Yes, sir.

Q. Apart from that, would there be any difference in the process? A. I think not.

Q. You are familiar with the Bessemer process, are you? A. I never operated a Bessemer converter.

Q. You have not? A. No, sir, no other than a side blown.

Q. Then with the converter you did operate, that is the Tropenas? A. Yes, sir, the side-blown Bessemer.

Q. The side-blown Bessemer? A. Yes, sir.

Q. The difference is that there the air is blown

in from the bottom, or from the side, instead of being blown in vertically?

MR. LINDABURY—He didn't say that.

MR. CORBIN—I am asking him.

A. I don't understand your question.

(*Mr. Corbin.*)

Q. What is the difference between the side-blown and the ordinary Bessemer, in the application of the air? A. Why, in the ordinary Bessemer process, the blast enters through a number of small tuyeres in the bottom, underneath the metal, and is driven in under fairly heavy pressure, perhaps twenty or twenty-five pounds to the square inch. In the surface-blown vessel, the air is blown in through larger tuyeres, perhaps an inch or an inch and a quarter. These tuyeres deliver the air upon the surface of the metal at an angle of about five degrees from the horizontal. That is the air comes in almost horizontally and impinges on the surface of the metal, striking a bath very nearly its whole surface.

(*Mr. Lindabury.*)

Q. And produces a hotter metal? A. Yes, sir, it does.

(*Mr. Corbin.*)

Q. The result is to throw oxygen over the metal? A. The result is to burn the surface of the metal and produce by this combustion a surface of slag, a layer of slag lying upon the metal; this slag being largely oxide of iron is capable of communicating oxygen to the iron below, and the reactions that follow are dependent upon the renewing of the ox-

ide of iron constantly, at the surface, by continuing the blast, and the oxygen is taken up by the materials which you are burning out of the iron from this layer of slag.

Q. What is the final result as to the product you get, by that process, as compared with the product you get by the other Bessemer process? A. Well, you get in properly blowing a metal, free from oxide of iron at the finish of the heat; a cleaner and hotter metal.

Q. What you do is to blow out the carbon, the silicon and the manganese? A. Yes, sir, you blow out the carbon, silicon and manganese.

Q. That is you accomplish the same service in a better manner? A. Yes, sir, unquestionably for steel casting purposes.

Q. Have you seen the ordinary Bessemer methods? A. Many times.

Q. Are you familiar with them? A. Quite familiar with them, I have often charged them for a period of nineteen years.

Q. Are these two methods both well known? A. Very well known.

Q. Are they described in many books? A. They are described in a few books, but they are described principally in the current literature and periodicals of the trade.

Q. Now, then, the manufacture of the steel begins with the metal in the condition in which it has been purified in the converter by either process, is not that so? A. I don't understand your question.

Q. The metal is prepared by freeing it from oxygen and manganese and silicon, as in other processes? A. Yes, sir, you burn out the impurities and have a bath of metal for receiving additions.

Q. Before you use this converter, how is the

metal prepared, in the first instance, how is it heated? A. It is brought to a liquid condition by being melted in a cupola.

Q. That is the method you use, in Chicago Heights? A. Yes, sir, that is the method we use in Chicago Heights.

Q. And then it is transferred from the cupola to the converter? A. Yes, sir.

Q. After the metal is prepared in the converter, what is the next step in making the steel—first, where is what is called the "physic" prepared? A. It depends on what steel you are making. If you are making what we call dynamo or electrical steel, such metal as we pour into motor frames, or pole pieces, the steel was simply di-oxigenized with aluminum, metal aluminum, that aluminum might be put in the converter, or put into the ladle and steel poured on it. In making carbon steels there are additions of liquid pig iron sometimes metal from the cupola, and heated ferro-manganese and heated ferro-silicon with alloys according to the quality you wish to produce.

Q. Where is the ferro-silicon prepared? A. It is usually heated in crucibles.

Q. Separate crucibles? A. Crucibles in the heating furnace, in the crucible furnace.

Q. Could you heat it in a small cupola? A. It could be melted, yes, sir, I have melted it in a cupola and made the additions in the cupola.

Q. Where is the ferro-manganese melted? A. At the Chicago Heights plant, we melt it in pots, crucibles.

Q. Why don't you melt it in a cupola or converter? A. In the cupola there is a heavy and irregular melting loss after melting ferro-manganese in a cupola, I have done that, but the results are not regular or uniform.

Q. What is the advantage of melting in a cruci-

ble? A. The melting loss is very low, so that you can determine very closely the resulting analysis of the steel, when you weigh the cold ferro-manganese and put it in the pot.

Q. Now, in making the steel, what was done in regard to weighing, if anything, the various materials used? A. In making Manganese steel, we weighed the Manganese and placed it in crucibles, placed the crucibles in the furnace and heated or melted the Manganese and usually got it in splendid condition. After melting this Manganese was then put in a large ladle, the ladle having been previously weighed. Between the crane-head and the ladle there was a crane scales. When the ferro-manganese was put into the ladle, we had a second weighing of the ferro-manganese in the large ladle so that we know we had the correct amount of ferro-manganese to get our analysis. The weight on the beam of the scales, was then placed in such a position, that when fifty to one hundred pounds less of metal than was wanted, it was added in the ladle from the converter and this beam would rise so that a little metal entering the ladle, after the beam rose, would give us about the right quantity within a small amount, perhaps fifty or sixty pounds on a heat.

Q. You knew when to stop, did you? A. Yes, sir.

Q. Was there any weighing of heated metal? A. The heated metal was weighed there to within twenty-five or fifty pounds, as it flowed from the converter.

Q. And then the metal from the converter was taken away? A. The heat was usually skimmed and cleaned, and the pouring began as soon as it was at a proper temperature.

Q. That is, you skimmed the ladle of slag? A. Yes, sir, we skimmed the ladle of slag, and put

a little sand on the surface and proceeded to pour, provided it was not too hot.

Q. How do you do that? A. By pouring it over the lip of the ladle.

Q. Is there not some process of pouring it out from the bottom of the ladle? A. We never used it.

Q. Is there any objection to doing that? A. I think it is very objectionable for Manganese steel. I have had experience with stopper ladles and found them to be objectionable in pouring from them heated metal, Manganese steel being very hot, and also prone to cut linings, and we never undertook to pour them through the bottom stopper.

Q. Is that tendency to cut an objection to putting it into a small cupola for melting? A. I do not understand you.

Q. You say you melt your ferro-manganese in crucibles? A. Yes, sir.

Q. Is the objection to putting it into a small cupola, the fact that it would cut the linings? A. It will cut the linings considerably, I have melted as much as 10,000 pounds at one time in a cupola and found that it did cut rather considerably, but it is not impossible.

Q. In putting the ferro-manganese into the ladle for the making of ordinary manganese steel do you need any other physic? A. We usually add carbon in some form.

Q. In some form? A. Yes, sir.

Q. Does it make any difference what form? A. Not if the other proportions of the material containing it are all right.

Q. Can you use spiegel? A. I never used spiegel for that purpose.

Q. Do you use scrap? A. No, sir, I use either crushed coke——

Q. Do you use pig iron? A. No, sir, I have used pig iron, but I either use coke or wash metal.

Q. How is that prepared, is it heated? A. Yes, sir. Crushed coke is simply ground to a suitable size, so that it will readily dissolve in the steel, and it is dried, it is not heated.

Q. And the wash metal, is that melted? A. The wash metal is melted in pots.

Q. And that is put in along with the ferro-manganese? A. All put into the ladle together with the ferro-manganese and the blown metal poured upon it.

Q. Is it always necessary to have in any carbon beyond that which goes in with the ferro-manganese? A. You can produce a good Manganese steel when it has a carbon combined in the iron, but high carbon steel is considerably better.

Q. If you want a higher carbon, you would have to put in carbon from other sources? A. You have to have it.

Q. You have used coke and wash metal? A. Yes.

Q. And other methods are available? A. You could melt a mixture of wash metal and ferro-manganese, or of Manganese steel scrap, wash metal, ferro-manganese and a suitable low silicon pig iron in the cupola to get your carbon condition.

Q. The Manganese is obtained from ferro-manganese? A. Yes, sir.

Q. What is the percentage of Manganese in that? A. Eighty per cent.

Q. How much carbon is there in it? A. It ranges from four and a half to seven per cent, usually about five and a half per cent.

Q. The other materials you spoke of they are put in to obtain what element? A. Usually the carbon only, but I have added other elements to Manganese steel.

Q. In the course of blowing with your converter, what processes, if any, are necessary for the reduction of the heat, if it becomes too high? A. The ladle receives the scrap steel. In the making of Manganese steel, you would usually add warmed or heated or cold Manganese steel scrap, according to the amount you intend to add. If you are trying to get rid of your Manganese steel scrap, you might get that melted in your ladle, before the heat is poured in, but to cool it you add a small amount of steel scrap.

Q. In the converter? A. In the ladle.

Q. In the operation of the converter it is sometimes necessary to diminish the heat, is it not? A. I never found it necessary.

Q. How about increasing the heat? A. There are a number of methods of increasing the heat, the prior blown heats, there being no accidents, prior blown heats are usually hot enough with a side-blown vessel, for any purpose.

Q. What is the chemical that is used, if it is necessary.

MR. LINDABURY—The witness does not say that any is necessary, or any is used.

MR. CORBIN—I am asking him.

A. I have used several different methods of heating, superheating or getting hotter metal. One method, the one most used at the Chicago Heights plant, from, I think, the fall of 1905, either the summer or fall of 1904, and one which I introduced there, was to add to the converter, while the heat was being blown, a suitable amount of ferro-silicon, with say fifty per cent. of electro smelting ferro-silicon.

Q. Is ferro-silicon a heat producer? A. One of the best.

Q. In preparing the mixtures for the cupola, is the silicon content of material consideration? A. All the elements of analyses are considered in making up the charges for the cupola.

Q. Is silicon a material one of these elements? A. Silicon is one of the most important to be considered.

Q. Are these processes you have described, generally known in the trade. A. I don't think I have described anything—in fact, I am sure I have described nothing, but what I know to be used by other men in other shops in England and in this country. The use of ferro-silicon for superheating, I know has been used in heating, by several different men, who have come to this country and described it to me. I did not finish in describing the different methods of adding temperature to the heat.

Q. Continue that? A. You can turn the converter down, and take the excess of slag off of it, and add more metal from the cupola and begin blowing it again, which really reverts or puts the heat back to the starting point and virtually beginning with the original sequence of re-connection in the converter, and starting the heat over again, and you gain temperature. In that way you burn more silicon, Manganese and carbon from the iron. You can also add any other form of liquid metal, containing carbon. For example, you can add wash metal, any liquid metal containing a high per centage of silicon or carbon which would act as fuel.

Q. What is wash metal? A. Usually a very low phosphorus and low sulphur iron, which has had the bulk of the silicon and the Manganese removed from it by a washing process.

Q. Well, then, it is a pure iron? A. No, sir, it is usually high in carbon, it usually contains about four per cent. of carbon.

Q. But it is purified of the objectionable elements of phosphorus and sulphur, is it not? A. The phosphorus and sulphur is usually lowered in the washing process, and the bulk of the silicon and Manganese removed.

Q. Now, then, you say you have observed the operations of the casting in the mould? A. You mean at Chicago Heights?

Q. Yes. A. Yes, sir, I spent most of my time in the factory, nearly all the time I was there in the steel foundry.

Q. Was there any special proceedings in the moulding in the factory? A. Yes, sir, it is a very important art all the way through, and there are many precautions in the case of each and every difent kind of work made.

Q. In moulding? A. Yes, sir, the moulding is a great part of the whole business, yes, sir.

Q. It is an art by itself? A. It certainly is.

Q. I mean as applied to the making of Manganese steel castings, as compared with other castings, is there any particular difficulty? A. There are some difficulties.

Q. What are they? A. Well, to begin with, to go back to the pouring, it is necessary to use more care in avoiding slag in the moulds, to keep the slag from entering the mould with the steel, and it is necessary to pour it at a suitable temperature.

Q. How do you prevent the slag from going into the mould? A. Why, you can use either one of many methods, there are a number of methods. You make that slag so stiff that it would not follow the steel, in such a manner as to defeat your efforts. Slag is very thin, and if you do not do something to stiffen it, the oxide of Manganese makes a thin slag, a thin watery slag, which falls into the mould with the steel, unless you take suitable means to stop it.

Q. How do you stop it? A. At the Chicago Heights plant, we usually stiffen it, we usually stiffen that slag with sand, and cut the bulk of the oxide of iron and Manganese off of the ladle, and put a heavy coat of sand on the steel in the ladle, and thus oxide of silicon forming a heavy blanket protects the steel from oxidizing, and also made a slag which you might describe as silicate of Manganese plus an execess of silica.

Q. The silica comes from the sand? A. Silica is the sand, yes, sir; steel foundry sand is largely silica, ninety-five to ninety-nine per cent.

Q. That, you say, is the first object of care—what is the next?

COURT—He said that takes a great deal of care.

A. Well, the moulding of most work in Manganese steel is identical with the moulding of other steels.

Q. Is there any particular limit to the thickness of articles generally found available in moulding Manganese steel? A. In so far as obtaining a sound and perfect casting is concerned, the trouble in making a more heavy section, is something that comes later, when you attempt to get the full effect of heat treatment and quenching.

Q. You have seen the Hadfield patent? A. Yes, sir.

Q. And he describes as two to four inches, as being heavy castings, does he not? A. Yes, sir.

Q. What is the practical limit, if there is one? A. I think four inches thick was the heaviest section I ever made at the Heights. My recollection is that a point of about six feet or seven feet in diameter, say six feet in diameter, and a section four by eight inches, was the heaviest section—four inches was the heaviest section we ever made.

Q. Now, when the mould has been filled, what is the next step in the process? A. Well, sometimes you open the mould in such a way as to relieve the strain, so that the casting will not crack, as it cools.

Q. Is that true of all castings? A. It is true of certain shapes, in any steel.

Q. And then what next—go on with the description? A. You take or use suitable precautions to avoid allowing a casting to crack, after it is taken out of the mould and cooled. You either cool it in such a manner that it has not any strain or liability to crack when it is re-heated in the annealing furnace, or you transfer it to the annealing furnace when still heated.

Q. And this is the practice as to all steel castings? A. The amount of precaution necessary with Manganese steel castings is more comparable with the manufacture of white iron castings or some other low steels containing slight proportions of alloy, than it is to the practice necessary for the producing of good soft steel castings. Soft steel castings seldom crack; after it is cold, and laying on the ground for twenty-four hours for example, Manganese steel will crack. Even a Chrome steel forge or casting has been known to crack and fall to pieces after it is cold.

Q. What precautions do you take? A. You allow it to cool slowly in such a manner, that the section is not in strain, with respect to the interior, or one part pulling against another, as in the case of a wheel, for example.

Q. Are these precautions known to the trade? A. They have been generally known in connection with the car wheel manufacture for many years.

Q. Anything else? A. Yes, sir; they have been known, for example, in connection with the casting of white iron cones, like gyratory crusher iron. In white iron, that is, and the same applies to the same form in Manganese steel.

Q. Now, at what stage, do you take the castings from the mould—any particular stage of heat? A. We usually expose the necks of the heads, shrink heads on the castings, while they were hot enough to mark easily with a flogging chisel, that is, we nick these necks so that they would afterwards break readily, with say about the first exposure of the casting. That applied only to heavy work as a rule.

Q. Would that apply to other than Manganese steel castings? A. Not as a rule, because with other castings, you would be able to remove the heads in some other manner, for instance, with a cold saw..

Q. How long is it before you would remove the whole casting? A. That would depend on the convenience of the foundry, and also on the character of the casting. If it was a light wheel piece, it could be shook out as soon as it was fairly set and not apt to break at the high temperature. If it was a heavy casting, it would be allowed to cool, in the mould, or it would be taken out of the mould when very hot and cooled in dry sand and cooled in any convenient place, so as not to interfere with the moulding operations in the foundry. Or it would be taken when still hot, and put in a furnace, of a temperature suitable to proceed with the annealing.

Q. And the next process would be annealing, would it not, after taking it out of the sand or mould? A. Usually. Sometimes a portion of the cleaning work would be done before the casting was annealed.

Q. A portion of the machining work? A. Cleaning. As a rule, the Manganese steel castings were annealed, before finishing, not always.

Q. How do they come out, as a rule, as compared with other castings, as to cleanliness? A. Usually cleaner, as a rule, the skin of Manganese steel castings, is much cleaner than other steel castings.

Q. What is the annealing process? A. The annealing process is to—presuming that the castings were cold when the operation began—is to heat the furnace with great care, so that the castings which may be in strain, shall not be cracked. And this care is continued, the slow heating is continued until the castings arrive at a dull red heat, when it is generally presumed that there is no further danger of cracking.

The rate of heating the furnace will depend upon the form of the castings in the furnace at the time and also upon the thickness of the sections.

If the castings are of the form of a wheel or cone, more care would be used in slow heating than if they were, for example, in the form of flat plates, which are thin. And heavy sections would always be heated with much greater caution than thin ones.

The castings having arrived at a temperature which might be described as "a dull red heat," would be then heated a little more rapidly, but always as steadily and uniformly as possible, until they had all arrived at the maximum temperature, which would be used at this stage of the operation. And care would be used that the castings were not exposed to a cutting oxidizing blue flame, they would be preferably heated and afterwards, we preferably heat, and the effort at Chicago Heights, always was, to heat them in a rather smoky flame, which would usually give comparatively uniform temperatures through the furnace.

Fro mthis time on, there are two methods of procedure. The cheaper method is to carry the temperature up to a point, where it is considered best to quench them. This temperature is in the neighborhood of ten hundred and ten to ten hundred and sixty degrees Centigrade. The exact temperature will depend upon two things, the analysis of the steel and the decision as to whether or not the cast-

ings are to be quenched a little above or a little below the critical point, which occurs between the temperatures stated.

If the castings are not quenched immediately, the other procedure would be to allow them to cool with the furnace, and afterwards reheat, not from ordinary temperatures, but from what might be stated, as a "dull red heat," to which temperature they had been allowed to cool, from the highest preceding temperature, and then to reheat and quench.

The purpose of this cooling, is to secure a uniform condition of the steel, and is probably the best method of procedure, especially in the case of heavy irregular work.

It really consists in the annealing operation, quite similar to the annealing of ordinary castings, and then a reheating and quenching. This is the method pursued by the Edgar Allen Company, of Sheffield, England.

In quenching, care is taken that the casting is immersed in the water, when all points and parts of it are at practically one and the same temperature.

This temperature is determined preferably with pyrometers or seger cones, as the eye cannot be trusted with the determining the temperatures.

Very good toughness is obtained by quenching at heats much lower than the temperatures between ten hundred and ten and ten hundred and sixty degrees Centigrade, previously mentioned. For example, quenching in the neighborhood of seventeen hundred degrees Fahrenheit gives excellent results.

Q. That covers your answer on that point, does it? A. Yes, sir.

Q. When the metal is thus tempered, what is the next process of dealing with it? A. The castings are finished and ready to ship.

Q. What is the finishing process? A. The re-

moval of gates, heads, fins, and the grinding to a finished shape?

Q. How is that done? A. That is usually done with flogging chisels, to remove small fins, thin fins, they must be very thin, if they can be readily removed with a flogging chisel.

All the heavier gates may be nicked, with the flogging chisel, and then snapped off with the hammer.

In the case of the removal of heavy heads, the drop weight would be necessary, to break them off.

After the gates, heads and fins are all removed, the emory wheel would finish the casting to the required form.

Q. This method of tempering or annealing, is applied to other steel than Manganese steel, is it not? A. Not the quenching operation.

Q. The heating is? A. The preliminary heating or annealing, the preliminary annealing of Manganese steel castings, as previously stated, is very similar to the annealing of ordinary castings. That is not always resorted to in the case of Manganese steel castings, not always.

Q. Now, you have read Mr. Hadfield's patent—is this annealing process described there? A. I have read some of his patents, but there is quite a number of them. I have read the one I presume you refer to, the original patent covering the mixing and heat treatment of Manganese steel.

Q. I refer to the patent numbered 572,891 (handing witness paper)? A. It seems only to apply to the rate of heating, I think we have already covered that.

MR. CORBIN—You give it the seventeen hundred degrees Fahrenheit, the same as is mentioned here? A. I mentioned that I gave it 1,700 degrees Fahrenheit, and that that gave excellent results, that the

result was such that a fair degree of toughness could be obtained, but I did not mention 1,700 degrees as a question of annealing.

Q. It was then toughened in water? A. I said it ran from 1,060 to 1,750 or something like that—I haven't read the patent carefully.

Q. Can this steel be forged? A. Yes.

Q. Can it be rolled? A. Yes, sir; it can be rolled.

Q. In order to prepare it for these purposes, is it treated in the manner you have described? A. Not entirely, no, sir.

Q. Where would you stop the process, if preparing it for rolling, you would simply make ingots, would you not? A. You would cast ingots and give them such heat treatment, as to put them in good condition for rolling, and that would not be quite identical with the heat treatment of castings.

Q. Have you made Manganese steel for rolling? A. Yes, sir; I have rolled quite a number of shapes of Manganese steel.

Q. The question of manufacture up to the moulding is the same? A. Practically identical, yes, sir.

Q. These difficulties of manipulation that exist, do they exist when the metal is heated? A. Yes, sir.

Q. I mean the difficulty of cutting the surface, the machining it, is there any difficulty in machining the material? A. Oh, yes, sir; it is almost out of the question to machine Manganese steel of any ordinary analysis. A very low carbon of Manganese steel can be machined.

Q. The machining refers to the treatment of the castings cold? A. Yes, sir.

Q. And the other processes of rolling and forging, you treat it hot, do you not? A. Always hot.

Q. Well then, when heated, do these difficulties

of manipulation steel exist in the material? A. No, sir; it is possible to cut with the chisel, or even to saw it, you can saw Manganese steel very readily, while it is hot, with a suitable saw.

Q. In the process of manufacture of the steel, do you make use of aluminum? A. Sometimes, not very often.

Q. Where does that come in, where is that used? A. Why, if a heat of steel is considered to be oxidized a little bit more than it is in the usual condition, at the end of a heat, or at the end of a blow, a little aluminum may be added to the ladle. No excess of aluminum in the metal, however, is wanted, nor desirable, only enough would be used to deoxidize it a little.

Q. What becomes of the aluminum? A. It enters the slag as aluminum oxide.

Q. It does not enter the product finally, does it? A. It would, if you used an excess.

Q. It ought not to? A. It should never, no, sir.

Q. In the process of annealing can the casting be taken hot from the mould in the annealing furnace? A. Can it be taken hot from the mould to the annealing furnace?

Q. Yes. A. Oh, yes, sir; it is very often done.

Q. What is the temperature of the furnace when you put the castings in? A. It would depend on how hot you take it from the mould, it might be at 1,500 or 1,600 degrees—if the castings were, perhaps, 1,300 or 1,400 or higher, ordinarily you would put castings in the neighborhood of a red heat or a little below or above a red heat, into a furnace, which was what the furnace men would call "a black heat," what you might not have up to or just short of a red heat.

Q. You might make the temperature conform? A. You might make the temperature conform to the casting which would be put into it.

Q. Have you made experiments comparing the Manganese steels, made by different manufacturers? A. I have examined a good many Manganese steel castings, made by different manufacturers, yes, sir.

Q. And have you had tests of them made with a view to comparing them with the manufacture of the American Brake Shoe and Foundry Co.? A. Yes, a good many tests were made.

Q. Who assisted you in these tests? A. Prof. Langley and Mr. Bowen of the R. W. Hunt & Co.

Q. Did you mark these samples so that you can identify the manufactures? A. They were all marked, all specimens submitted were marked, whether of our manufacture or other manufactures.

Q. Did you at the time make a memorandum, so that you could dictate the statement? A. I dictated an affidavit.

Q. About the time you dictated it, you knew the numbers? A. I knew the numbers very well, and still remember some of them.

Q. How many of these samples were there? A. I am not sure, I think there were something over a hundred, I should say between one hundred and two hundred specimens.

Q. Refreshing your memory with the memorandum made at that time, dictated by you as you have stated, will you please tell us what the different samples were and the manufacturer?

MR. LINDABURY—I object to the question—I object to the memorandum being shown to the witness on the ground that it is not a memorandum made by himself.

(*Court.*)

Q. Did you look at it, after it was dictated and printed? A. Yes, sir.

(*Mr. Lindabury.*)

Q. Did you sign it? A. Yes, sir, I signed it.

Q. Have you the one you signed? A. Yes, sir. There are so many of these numbers you could not remember them all, without a memorandum.

COURT—You may use the memorandum.

Q. Give me the names, numbers and manufacturer and a description of the articles, using this statement which I now hand you?

MR. LINDABURY—Give the date of the tests also.

COURT—What are you trying to do now.

A. I am trying to identify some of the samples.

Q. Go ahead and give them? A. I can state that these descriptions here referred to this statement are a description of the samples.

Q. What are the marks on the samples of the American Brake Shoe and Foundry Co., and what were those samples? A. The first mentioned, are marked in series No. 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J, 3K, 3L, and 3M. And these samples were sand-cast specimens of Manganese steel, which were about sixteen inches long, five inches wide, and two and one-half inches thick, and on the under side of these blocks, the attached test-bars were about one and one-eighth inches thick, two and three-quarters inches deep, and sixteen inches long. And after being finished and ready to pull, were these various diameters at the center or pulling portion. They were fashioned in a lathe, into the form for pulling, and the specimen was turned in the lathe, and the cutting tool was the emery wheel.

Q. When was that manufacture of steel? A. It was manufactured, the bulk of it, in January, 1905.

Q. Or 1906? A. 1906, yes, sir; it was manufactured in December, 1905, and January, 1906, or the winter of 1905-1906.

Q. What was the material from which it was taken? A. It was the ordinary heats of Manganese steel, that we were putting into commercial work in every case, we made our specimens from the ordinary heats of Manganese steel from which we were pulling out commercial castings. There were several lots which were prepared in the same way that this first lot mentioned were prepared.

The steel was poured into the moulds, which consisted of a form for a rectangular block and on the under side of this block the test-bars were formed, and after the pieces had been poured, there was a shrunk head and block, below that, and we tested a piece below the block so that we had fair specimens to test. That is, they were cast in such a manner as to be properly fit, not to contain any shrink holes, and after they were cast they were annealed, not quenched. They were then taken to a shop, which was across the way from our own, a shop in which there was a heavy steam hammer. We had no power sufficient to cut these bars from the blocks, and we re-heated them over there, and cut them off with the cutter knife, under the hammer, that is, severed the bars from the blocks.

We returned the bars and the blocks to our own plant and finished them; that is, ground them to a suitable form, having re-heated and quenched them before the grinding.

Q. You have given the process of that lot—what is the next lot either your own or other steel? A. There was 2A, etc.——

Q. Give us the numbers, so that Prof. Langley's testimony will correspond with yours? A. The

first lot was 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J, 3K, 3L, and 3M.

COURT—That you have already testified to, have you not?

A. Yes, sir.

Q. What is the next lot? A. The next number in order of this affidavit the steel was made by the Taylor Iron and Steel Co., and it was marked "3N." This was cut from the casting of a dipper-tooth about tewnty-four inches in length. The bar was cut cold from this casting with an emery wheel, and care was taken that the metal was not heated, while the cutting was going on, that is, so that no change would take place in the quality or value of the metal for a test, owing to the manner in which it was cut off.

(*Mr. Corbin.*)

Q. What is the next lot? A. The next lot was number "2N to "2Q," inclusive. These were made by the American Brake Shoe and Foundry Co., under my supervision, in exactly the same manner, as the lot marked "3A to 3M," inclusive.

The next lot was made up of steel of I. G. Johnson & Co., Spuyten Duyvil, N. Y., they were sand cast bars.

Q. Did you order them from those people? A. I ordered them, yes, sir.

Q. What is the number? A. These are numbered "1A to 1B," inclusive, they were rough round sand cast bars.

(*Mr. Lindabury.*)

Q. You did not give us the date when you made that last batch which you say was submitted? A. They were made prior to the first of February, some

were made in November, some in December and some in January, these various specimens, I cannot now state the exact dates when they were made. They were all made under my immediate supervision and all marked by me, and I was very familiar with them all.

(*Mr. Corbin.*)

Q. What is the next? A. The next are numbered "13A and 13B." These were two rolled specimens, which for the purpose of information, I may say that they were not quenched in water. Those were tested in exactly the condition the metal was in, after being rolled, and allowed to cool, on a metal floor. No reheating or quenching.

Q. Made by the American Brake Shoe and Foundry Co.? A. Yes, sir, they were made by the American Brake Shoe and Foundry Co.

Q. What is the next? A. The next are bars marked numbers "5, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 5H." These bars were all cast from one heat, of ordinary Manganese steel and sand moulds. They were made in the same manner as the lots number "3A to 3M," inclusive.

Q. What are the next? A. The next are numbered "11A, 11B, 11C, 11D, 11E, 11F." These were made under my supervision by the American Brake Shoe and Foundry Co., and were cast from ordinary Manganese steel, rough sand cast bars, and tested in a rough condition without finishing.

The dimensions were about twenty-six inches long, and one and four-tenths of an inch square.

The next is numbered "14" and this is a bar made by the American Brake Shoe and Foundry Co. It was around twelve inches long, and was annealed and tested in rough form after having a light film of metal removed from the surface, with the emery wheel—they just had the sand and scale removed from it.

Another lot marked "OA, OB, OC, OD," and a second "OD," two marked "OE" and then one each marked "OF and OG." These bars were made by the American Brake Shoe and Foundry Co. They were cast in sand moulds. These bars were about one and a half inches by three-quarters of an inch by twelve inches. These bars were annealed in a furnace containing ordinary Manganese steel castings, and were tested as the same size and shape as when cast, and without finishing or grinding.

The bars marked "8A, 8B, 8C and 8D" were made by the I. G. Johnson Co. They were rough cast sand bars of a rectangular section. Their dimensions were approximately one and one-half inch by seven-tenths inch by twelve inches long. There was no grinding and finishing work done on them, they were just rough sand cast rectangular bars.

Another lot were numbered "4A, 4B and 4C." These bars were made by the Taylor Iron and Steel Co. from a dipper-tooth casting obtained by the American Brake Shoe and Foundry Co. from the Bucyrus Company, of Milwaukee, Wis. These bars were cut off from the middle of either side of a row bolt holes, in the longer shank of the dipper-tooth casting. They were cut off cold, with an emery wheel.

The next is numbered "4F, 4G," and three bars marked "PA, PB and PH." These five bars were cut from a dredger bucket side casting made by the Pennsylvania Steel Co., and obtained by the American Brake Shoe and Foundry Co. from the Bucyrus Co., of Milwaukee, Wis. These bars were cut cold from the castings, and emery wheeled and finished in the lathes, to an accurate cylindrical form.

Another lot are marked "6, 6C, 6D, 6E, 6F, 6H, and 6J." This lot of bars were made by the American Brake Shoe and Foundry Co., and were cast on blocks of the same pattern and in the same man-

ner, as lots "3" and "2," but of a different heat of ordinary Manganese steel. The bars were removed from the block and annealed and ground to form, for testing in the same way as lot number "3."

Another lot are numbered "6A" and "6B." Those two bars were rolled by the Columbia Tool Steel Co., under my direction, from an ingot cast of ordinary Manganese steel, analysis by the American Brake Shoe and Foundry Co. These two samples were cut from the same rolled bar. They were not water quenched after rolling. Their dimensions were approximately three-quarters of an inch square.

The next are two bars cut from a dipper tooth casting, and are marked "T1 and T2." These dipper tooth castings were made by the Taylor Iron and Steel Co., and obtained by the American Brake Shoe and Foundry Co., from the Bucyrus Co., of Milwaukee. These bars were cut cold from the casting and finished cold, all the cutting and finishing having been done with an emery wheel.

Another specimen are marked "M1 and M2." These two bars were rough sand cast and made by the American Brake Shoe and Foundry Co. of ordinary Manganese steel, and sand moulds. They were annealed, with commercial Manganese steel castings, and quenched therewith, at the same time. They received no other heating or treatment. These bars were in no way ground or finished, but were tested in the same shape they were cast.

Other specimens were marked "S1 and S2." These two bars wer cut cold with an emery wheel, from a concave casting, for a rock crushing machine, obtained by the American Brake Shoe and Foundry Co. from the Austin Manufacturing Co., of Harvey, Ill. They were made by the Taylor Iron and Steel Co. The concave was cut through the middle, great care being taken to frequently cool the casting while it is being cut.

The two rough bars thus formed, were then finished in the lathe, with an emery wheel, and were tested in tension, the central portion of each bar having been ground to an accurate cylindrical round.

Another specimen numbered "S3 and S4." These two bars were rough irregular rectangular bars, cut from the longer shank of a dipper tooth casting, made by the Taylor Iron and Steel Co., and obtained by the American Brake Shoe and Foundry Co. from the Bucyrus Co., of Milwaukee. Care was taken in the case of these bars, as in the case of all other bars cut from castings, to do all the grinding in such a manner, that the bars were not at any time heated to a temperature of more than 250 or 200 degrees Fahrenheit, water being used for cooling.

The next specimens were numbered "S5, S6 and S7." Thes bars were finished in a lathe, to accurate cylindrical round bars. It should be noted, that a number of smooth and accurate cylindrical round bars were previously tested which had been cut from other dipper tooth castings, made by the Taylor Iron and Steel Co. In order that an accurate comparative test might be made with these bars, we made at the works of the American Brake Shoe and Foundry Co. castings of the same size and proportions, and from a pattern made to duplicate the castings of the Taylor Iron and Steel Co. We then cut up our own castings which were of the same size and form, having given them the usual heat treatment, and formed from these pieces test bars, and subjected them to the test.

The next specimens are numbered "Z1, Z2 and Z3." In order to make an accurate comparative test with the bars cut from the concave purchased by the Austin Manufacturing Co. from the Taylor Iron and Steel Co., two concaves were taken from the stock made and carried by the American Brake

Shoe and Foundry Co., and each cut up into two bars, for the purpose of such test.

Thes bars were cut cold on the emery wheel, and as there is no time for the preparation of these bars for test, they reached the laboratory with six sharp edges on each section, thereby rendering the test much more severe than had the bars been properly rounded and finished.

The next is a bar marked "XXX." This bar was rolled by the Columbia Tool and Steel Co., shaped from an ingot made by the American Brake Shoe and Foundry Co., the metal being of ordinary Manganese steel with the exception that it was about one hundred and twenty points carbon. This bar was rolled to one inch round. It was reheated and quenched, but the bar was unfortunately overheated in the treatment, in the furnace, of the Columbia Tool Steel Co., and gave a poor test.

The next specimens are marked "XXXA, XXXB, XXXC, XXXD, XXXE." These bars were made as follows: An ingot was poured of Manganese steel, with carbon about one and two-tenths per cent. This ingot was taken to the works of the Columbia Tool Steel Co., and there reheated and rolled into a bar three-quarters of an inch square. From this bar, the four specimens were roughly forged under a tilting hammer. The bars were reheated in the forge fire, and quenched in water, and tested in this condition.

The next specimens are two specimens marked "XXXX." This lot consists of two bars rolled from an ingot, containing about one and two-tenths per cent. carbon, and an ordinary percentage of manganese for Manganese steel. The ingot was made by the American Brake Shoe and Foundry Co., and was rolled by the Columbia Tool Steel Co. The center of the pulling section of these two bars was ground in a lathe to correct cylindrical rounds. The bars were reheated and quenched in

a solution containing various salts before finishing in the lathe. The test of these bars showed they were overheated in the treatment. We found a good many difficulties in trying to save time in the making of these tests. We had quite a number of men together, and had no time to prepare suitable means for heating and quenching small specimens, and we resorted to the use of the heating furnace of the Columbia Tool Steel Co. which ran too hot for the purpose.

The next specimens are five bars marked "XXA, XXB, XXC, XXD, and XXE." These five bars were rolled by the Columbia Tool Steel Co., of ordinary Manganese steel analysis and treated after rolling.

Q. In regard to these samples, which you say were overheated, whose samples were they? A. They were our own samples.

Q. Your own manufacture? A. Yes, sir.

Q. Does that relate to those lots you refer to, that you have not included? A. I have mentioned two lots, where it was noticeable I had overheated them.

Q. You identify the ones you have overheated? A. Yes, sir.

Q. Now, go on? A. These last mentioned five bars, "XXA, XXB, XXC, XXD and XXE," were rolled by the Columbia Tool Steel Co., of ordinary Manganese steel.

Q. Where did they come from? A. I cast an ingot at the American Brake Shoe and Foundry Co., and I took it over across the road, and put it through the rolls over there, and cut off pieces from the rolled bar, and then—I forgot to mention that three of them, "XXA, XXB and XXC," were treated, after rolling, and lightly ground in the lathe in the middle of the pulling section, but were not in the grinding made small enough in the

center to prevent the break from occurring in the unfinished portion gripped by the jaws of the testing machine.

Bars marked "XXB and XXE" were made and treated in the same manner as the other three, but were ground to a smaller section in the central portion, so that the fractures occurred at the punch marks on the parallel ground portion of the bar.

Another lot of bars are marked "XXXXA, XXXXB, XXXXC, XXXXD." These samples were forged from a bar rolled by the Columbia Tool Steel Co., the bar being rolled from an ingot made by the American Brake Shoe and Foundry Co. All this rolling and forging was done under my own supervision, and I represented the American Brake Shoe and Foundry Co. in this work.

The bar was one inch square, and the specimens were forged from it, so that the central portion of the specimen was approximately round, about three-quarters of an inch in diameter. These bars were then roughly ground, to a round form on an emery wheel, but were not finished in the lathe. That is, they were not a correct cylindrical round. They were heated and quenched before testing.

Another lot of three bars, were marked with "X. X: X:." being "X" with one dot, and then the next one "X" with two dots, and the third one is "X" with three dots. This lot was made from an ingot cast of ordinary Manganese steel by the American Brake Shoe and Foundry Co., and rolled by the Columbia Tool Steel Co., to a one inch round bar. Pieces of this bar were cut off, and reheated and quenched in a solution containing various salts. The bars were then roughly ground on an emery wheel, and subsequently finished to accurate rounds in the lathe. Some of these specimens were roughly prepared, and some more carefully prepared.

The next specimen is a bar marked "10B." This specimen was cut from a two inch round rolled bar. The bar was rolled by the Columbia Tool Steel Co., from an ingot made by the American Brake Shoe and Foundry Co. The length cut off for test was reheated in a heating furnace, and quenched in water.

The test was not completed as the bar failed to break under a maximum load of the machine, three hundred thousand pounds.

There is a recitation here of the exact manner of the preparation of these specimens, I do not think it necessary to read them.

The description of Manganese steel wheels, tested by R. W. Hunt & Co.,

Wheel marked "T." This wheel was made by the Taylor Iron and Steel Co., and obtained by the American Brake Shoe and Foundry Co., from Mr. C. E. Billin.

Wheel marked "AAA." This wheel was made by the American Brake Shoe and Foundry Co., from a pattern made to produce an exact duplicate of the wheel described above marked "T." This wheel was cast at the Chicago Heights plant, of the American Brake Shoe and Foundry Co., from a heat of ordinary Manganese steel, in a sand mould containing chills, at the points of intersection of the tread with the spokes, and of the spokes with the hub. It was annealed, together with other commercial Manganese steel castings, and treated and quenched in the ordinary manner.

Wheel marked "CCC." This wheel was the same as wheel marked "AAA" and was made by the American Brake Shoe and Foundry Co.

Wheel marked "DDD." This wheel was made by the I. G. Johnson Co., at Spuyten Duyvil, N. Y., from a pattern which was a duplicate of a pattern, from which the wheel marked "AAA" was made.

Wheel marked "HHH." This wheel was made by the I. G. Johnson Co., and was the same in every respect as wheel marked "DDD."

Wheel marked "H." This wheel was made from same pattern as wheel marked "AAA," and was made by the American Brake Shoe and Foundry Co. It was cast of ordinary Manganese steel and was treated in the annealing furnace, with other commercial Manganese steel castings, and quenched in the ordinary manner. After quenching, this casting was reheated to a temperature of about 1,050 degrees Fahrenheit, and then cooled slowly.

Wheel marked "T2." This wheel was made by the Taylor Iron and Steel Co., and was obtained by the American Brake Shoe and Foundry Co., from Mr. C. E. Billin.

Wheel marked "T3." This wheel was made by the Taylor Iron and Steel Co., and was of the same size and pattern as wheel marked "T2," and was obtained by the American Brake Shoe and Foundry Co. from Mr. C. E. Billin.

Wheel marked 'T4." This wheel was he same in every respect as wheel marked "T2." This wheel was made by the Taylor Iron and Steel Co., and was obtained by the American Brake Shoe and Foundry Co. from C. E. Billin.

Wheel marked "T5." This wheel was the same in every respect as wheel marked "T2." It was made by the Taylor Iron and Steel Co., and was obtained by the American Brake Shoe and Foundry Co. from C. E. Billin.

Wheel marked "U." This wheel was made by the American Brake Shoe and Foundry Co., from the same pattern as wheel marked "AAA." It was in every respect made, annealed and treated, the same as wheel marked "AAA," except that it was treated for a longer time and at a higher temperature.

Wheels marked "W1, W2, W3 and W4." These wheels were made by the American Brake Shoe

and Foundry Co., from patterns so made as to duplicate in every respect the wheel marked T2. These wheels were cast of ordinary Manganese steel. They were annealed together with other ordinary Manganese steel castings, and were treated and quenched in every respect the same as other commercial Manganese steel castings.

Q. Were these marks placed upon these various samples, so that they could be identified? A. The castings were marked with steel stencils, and indented as deeply as possible, always at one point, and frequently in two or three points on the same casting.

Q. I think you said Prof. Langley took charge of the experiments of these samples? A. Prof. Langley had charge of the testing. I delivered all these castings and specimens to the laboratory of the D. R. Hunt Co., I carried a good many of them myself, nearly all the test bars I carried myself, and after seeing them made I carried them from Chicago Heights to Chicago and into the laboratory of D. R. Hunt & Co., in Chicago.

The wheels were taken in in express wagons, and some taken in the train and delivered by express to the laboratory, but I saw them shipped and personally tagged them and personally received them.

Mr. Corbin—I will now put in evidence these patents.

I offer in evidence the patent of Siemens improvement in converting cast iron into cast steel, number 189,273, dated April 3, 1877.

Next I offer in evidence a patent of Robert Hadfield, No. 303,150, dated August 5, 1884.

Next I offer in evidence a patent of Robert Hadfield, No. 303,151, dated August 5, 1884.

Next I offer in evidence a patent of Robert Hadfield, numbered 333,748, dated January 5, 1886.

Next I offer in evidence a patent of William W. Snow, No. 435,050, dated August 26, 1890.

Next I offer in evidence a patent of Robert Hadfield, No. 585,161, dated June 22, 1897.

Next I offer in evidence a patent of Robert Hadfield, No. 572,891, dated December 8, 1896.

Next I offer in evidence a patent of Robert Hadfield, No. 731,450, dated June 23, 1903.

And next I offer in evidence a patent of Walter Brinton, No. 812,811, dated February 20, 1906.

(*Mr. Corbin.*)

Q. How many kinds of steel works have you made? A. Do you mean how many kinds of steel have I put into castings?

Q. Yes. A. Oh, I should say——

Q. I mean the varieties of steel work? A. How many different kinds of work have I put Manganese steel into?

Q. Yes. A. Why, it is principally contract work castings, and work for mining purposes, castings for mining apparatus, crushing machinery, etc., machines for gyratory crushers, both the heads and concaves, and jaw crushers, side plates for large crushers, castings for dredges, and rolled shells, and circles, for Huntington mills, the inside lining of the outer surface, against which the crushing is done, and various switch and frog castings, and contract work castings, principally for steam work.

Q. What kind of special steels have you made,

either cast or rolled? A. At the Chicago Heights plant, we have made quite a variety of steels, frequently, ten or a dozen different analyses in one day, almost always more than four kinds of steel in one day.

Q. The order would call for different analyses? A. Sometimes the orders would call for different analyses, but more usually we would make steel of such an analysis that we believed that it would be such as to give good service in the work we understood the castings were to be used in.

Q. You made you own specifications, then? A. Generally, yes, sir.

Cross-examination by Mr. Lindabury.

Q. You did make steel on specifications, did you? A. Some steel on specifications, yes, sir.

Q. But not usually? A. Not usually.

Q. Does this apply to Manganese steel? A. No, sir; we never made Manganese steel on specifications, covering the analyses.

Q. Why not? A. We did not receive inquiries for it in that shape; we were asked to make a Manganese casting——

Q. Nobody ever specified about the ingredients to be used in the making of the Manganese steel casting, that ordered the casting, did they? A. I do not remember that anyone ever specified any item of the analysis. I do remember that certain people wanted to know the amount of Manganese we were putting in the steel, and we sometimes told them.

Q. And you sometimes did not? A. We never refused to tell them, we told them if we were asked. Sometimes we were asked to write a letter stating the amount of Manganese contained in our Manganese steel, and we always replied to it.

Q. Did you do that always? A. Yes, sir.

Q. Do you remember when, and to whom such letters have been written? A. I remember I had to write a letter of that character in connection with the manufacture of some crusher jaws, I think they were furnished to the Sterling Co. somewhere up there in—I don't remember the name of that particular shop or branch of it, all their business was done under the name of the Sterling Co. They had been told that we were not making Manganese steel, and they had been told that the castings were finished and that we could not be making the Manganese steel, that we were not furnishing it, and that they could not be Managenese steel, so we gave them letters, in reply to their inquiry telling them, what we were giving them.

Q. Who was that, you say? A. It was a concern known as the Sterling Co., I can almost remember the full title, but——

Q. You do not mean the Sterling Boiler plant, do you? A. I think it is a connection of that firm that makes the boilers, but this particular company that I have reference to, they are engaged in another branch of business.

Q. Where are they located? A. My impression is they are located somewhere in Ohio, but I am not quite sure about that.

Q. Then do you mean to say that the Sterling Co. that you refer to is the Sterling Co. that makes the boilers? A. I think it is a connection of that company, althought I am not sure.

Q. It is a very extensive company, is the Sterling Boiler Co., that is not the name exactly, but it is a Sterling Co., that makes boilers, the one I refer to? A. Yes, sir; it is, I believe, a connection of that company that makes the boilers, although as I said before, this is another branch of that same business.

Q. You do not mean to say that you sold any

Manganese steel to them, do you? A. We sold some Manganese steel crusher jaws, large ones, weighing from 300 to 600 pounds to a concern called the Sterling Co. I am a little hazy on the name, but I may remember later, and will tell you.

Q. Now, when did you begin making Manganese steel out there at Chicago Heights? A. The first that I ever made there was in April, 1904.

Q. And that you made before you went there? A. No, sir; I made it there at that plant.

Q. Before you became employed there, I mean? A. Before I took charge of the plant.

Q. It was something of a demonstration of your ability to do it, was it? A. I suppose so, yes, sir.

Q. And upon that, upon your success in the making of that Manganese steel at that time, you were engaged, I take it? A. No, sir; it was a very simple matter, which did not appear in the report at all, that I made in connection with the plant, and it was a little demonstration which was to interest Mr. McKee, who was the sales manager of the castings, he was already concerned, as to what kind of steel he had best make there, whether nickel steel, chrome steel or Manganese steel, he was talking about it to me——

Q. He was the general salesman, was he? A. Salesman, or sales manager, the only salesman they had on steel castings at that time.

Q. Where had you been before that? A. Immediately before that I was completing the installation of a converter at the Providence Steel Casting Co.

Q. I understood you to say that you had made experiments in the manufacture of Manganese steel before this time? A. Yes, sir.

Q. Covering about how long a time? A. About four years.

Q. You had been four years experimenting? A. Occasionally.

Q. Not steadily? A. No, sir.

Q. Off and on? A. Off and on for four years.

Q. And in various places? A. In several places, yes, sir.

Q. I understood you also in your direct-examination to say, that this Hadfield patent of 1884 describes what you call the Basis of Manufacture of Manganese steel? A. Yes, sir.

Q. But that anyone to make it from that description, even if a steel man, would need to make experiments, as I suppose you did? A. Yes, sir.

Q. Were you acquainted with the Hadfield patent, when you began experimenting on Manganese steel? A. No, sir; I made and shipped my first Managanese steel castings before I ever read the paper.

Q. I think Mr. Hadfield had published a book by that time, describing pretty much what he describes in his patent, hadn't he? A. Various papers appeared in the proceedings of different societies.

Q. By Mr. Hadfield? A. Some by Mr. Hadfield.

Q. And some by others? A. Yes, sir; some by others.

Q. And all giving pretty much the same description of the patent you refer to? A. Very similar, yes, sir.

Q. On that basis, that is, the basis of the description of the Hadfield patent, as contained in these papers to which you have referred, you were in three or four years experimenting able to make what you thought was a satisfactory Manganese steel? A. Yes, sir.

Q. And had you reached that satisfactory point shortly before you went to Chicago Heights? A. No, sir; I should not say that I had. I should say

that I got making first really good Manganese steel, the first really good Manganese steel that I ever made, after I was there a few months.

Q. So that your experimenting lasted not only the four preliminary years you speak of, but some little time after you got to Chicago Heights, is that so? A. Yes, sir.

Q. And your experiments were then quite constant, after you got to Chicago Heights, were they not? A. Yes.

Q. Until you got the stuff to a condition of perfection or to the condition of perfection you afterwards acknowledged it to be or thought it to be? A. Yes, sir; I did not do much steady work on the Manganese steel until I got to the heats.

Q. In the first place, the Hadfield patent did not describe what I call the primary mixture, did it? A. No, sir; it describes percentages, I believe. I do not think the paper does describe the percentages correctly though, that is, the papers containing his papers read in the proceedings of certain English societies, but I think they describe the analyses.

Q. You experimented on the mixtures all these times did you—where first? A. First at St. Paul, Minn.

Q. And did you continue as you were experimenting to experimenting with respect to the primary mixtures? A. No, sir; I took there the idea that twelve per cent. was the proper amount of Manganese, and I made castings containing twelve per cent. of Manganese right from the first.

Q. At first you assumed that twelve per cent. of the Manganese would be a proper amount in the primary mixture, did you? A. In the resulting casting, that is.

Q. I do not mean that—I mean the amount of

Manganese you put in, that is, into the primary mixture? A. You mean in the cupola furnace to melt?

Q. Yes. A. Oh, no, sir; that was something that had nothing to do with the Hadfield information.

Q. That is what I meant, I thought you misunderstood me? A. Yes; I did misunderstand you.

Q. Now, the ingredients used in what I will call the primary mixture, by that I mean in the cupola, are of consequence in the production of Manganese steel, are they not? A. Yes, sir; indeed they are.

Q. And with regard to that, you experimented, I suppose, did you not? A. No, sir; I was given some very thorough instruction on that subject by a young man who had received his instruction in several French shops, and one English shop.

Q. His name, please? A. Mr. Morat, who is now with the I. G. Johnson Co. of Spuyten Duyvil.

Q. Do you remember his first name? A. No, sir; I do not exactly, but I think it is three "J's"

Q. J. J. J. Morat, you think? A. Yes, sir, John J. Jacob, or something like that.

Q. When did he inform you as to the structures of the primary mixture for Manganese steel? A. From before we started the steel foundry there, until about four or five months after, he was with us every day in the shop, and I roomed with him, in St. Paul, Min.

Q. Did you experiment with him in St. Paul, with the idea of starting a Manganese steel plant there? A. No, sir; we already had a Manganese steel plant there, and we received an order, I think, for some rolled shells.

Q. And the experimenting was to enable you to fill that order, was it? A. There was some little talk before that, owing to some talk with Mr. Morat, about Manganese steel.

Q. And you then determined to enter into the manufacture of it, did you? A. Yes, sir.

Q. And then you got the order from the company you spoke of? A. Yes, sir.

Q. And then you began to manufacture Manganese steel? A. I didn't realize about the difficulty it would be to make it——

Q. Did you get an order for it? A. Yes, sir.

Q. Did you furnish it? A. Yes, sir.

Q. Did you continue it, that is, the manufacture? A. No, sir; we did not.

Q. Did that end it? A. That ended it as far as I was concerned.

Q. Did you make any since then? A. I believe they made a good many tons since; I know they did, because I was up there and I saw them making some for George J. Smith.

Q. A sort of second heat, was it? A. No, sir; another outbreak of Manganese steel there.

Q. How long was that after the first outbreak? A. Three years, I should say.

Q. Excepting that, have they made any other? A. Not that I know of.

Q. Now, you went from St. Paul to where? A. To William Wharton, Jr., Co. of Philadelphia.

Q. Did you experiment there? A. Yes, sir; I did experiment.

Q. Privately or for them, or on your own account—was it for them? A. Well, there was some little rivalry between myself and a Mr. Klein, who was then the superintendent, as to who could make a piece of Manganese steel first, and I learned quite a bit from Mr. Klein, and the information he possessed came from the Taylor Iron and Steel Co.

Q. Did he claim it did? A. No, sir; he rather claimed it as his own personal notion, and he tried to keep it from me as much as he could.

Q. What makes you think he got it from the Taylor Iron and Steel Co.? A. Well, he stated one time he had been in their shop.

Q. And was it an inference on your part that he had not evolved it out of his own brain, but that he had learned it there? A. No, sir; not entirely an inference. I think he told me that he had conversed with others, and that he had been in the shop, and he claimed that he had experimented and done the rest of it himself and succeeded.

Q. And you got something there from him? A. Yes, sir.

Q. And some from the Frenchman? A. Yes, sir.

Q. And it was from the Frenchman you thought that you had got what the primary mixture ought to be? A. Not as to the primary mixture, we made no change as to that. I learned from the Frenchman that there was very great care necessary in order to make any good steel out of a converter.

Q. Didn't you know that without the Frenchman's telling you that? A. Not with regard to the steel casting business.

Q. Didn't you learn from the Frenchman that you should use the same primary mixture for all kinds of Manganese work? A. I would not say that at that time Mr. Morat gave me very much information with regard to the primary mixture for Manganese steel, but he gave me a great deal of information in regard to the mixture for blowing and making a good steel.

Q. I was talking about Manganese steel—he did not teach you anything beyond what you have told us in regard to the Manganese steel? A. Not at that time.

Q. This friend of yours, in Philadlephia, who had been to the Taylor Iron and Steel Co.'s works, did he teach you anything about the primary mixture? A. No, sir; he did not know anything about it.

Q. Had you got any information about the primary mixture before you went to Chicago Heights?

A. Yes, sir; I had had a good deal of experience in the meantime, I had blown steel at four different shops.

Q. You had learned something with regard to that mixture from your own experiments, had you? A. I never learned anything with regard to the mixture for making of Manganese steel, that differed, necessarily differed, from the mixture necessary to make any other good steel.

Q. So, it was the result of your experience with the same mixture which, according to your experience, you undertood to be the proper thing for making ordinary steel, that that would be the same for the making of Manganese steel; that is, with respect to the primary mixture. A. The primary mixture that was sufficiently low in phosphorus and sulphur, to make a good carbon steel, and the carbon steel sufficiently good for the government work, I found would be a good mixture for Manganese steel.

Q. I will ask you whether or not, it was the result of your experience, that the same kind of primary mixture that should be used for the making of ordinary steel, should be used in the making of Manganese steel? A. It depends on what you mean by ordinary steel.

Q. I am using the term you used? A. Well, ordinary steel is generally low carbon steel.

Q. Well, what have you to say about it? A. Now, that low carbon steel would be either low in phosphorus or high in phosphorus, and all of that will depend on the primary mixture; and also upon the beauty of the finished work, and a good mixture for a good low carbon steel would be a good primary mixture for making Manganese steel.

Q. Is that your only answer to my question? A. I don't know how to answer it any better.

Q. I want to know whether in the making of

Manganese steel you would use the same primary mixture that you would use for the making of other steels? A. I would use such a mixture as would give me a suitable temperature, when the metal was leaving the converter, and such a mixture as would enable me to get a high quiet heat, that would blow clean.

Q. Would you use the same primary mixture without regard to the particular casting that you are going to make? A. No, sir; if I was working on very light thin work, which required very hot metal, I would use a mixture that would give me in the iron, entering the converter, more fuel, notably more silicon and more carbon——

Q. I did not ask you for a treatise upon this subject, what I asked for, was an answer yes or no to my question which was, I asked you if you used all the same mixtures for all kinds of steel including Manganese steel? A. No, sir.

Q. Would you use a particular or a different mixture if you had a number of different castings, different in size, and different in use, to which they were to be put? A. Not as a rule; I have not found it necessary to change the mixture.

Q. Well, in the whole range of the manufacture of Manganese steel, such as you manufactured at Chicago Heights, how many variations in the primary mixture, do you think you made? A. Oh, I should think possibly two or three very radical ones, and many ordinary changes.

Q. Are those described in any publication? A. Well, they are described. The matter of making up mixtures for converter practice has been described in a good many publications.

Q. I ask you if these variations in the primary mixtures are described in any book or publication? A. I would not know what book to refer to.

Q. Did you get the specifications from any book? A. No, sir.

Q. They were evolved out of your experience, were they? A. Out of my experience, and that of the men I came in contact with, who gave me instructions on the subject.

Q. Have you been in any other foundry where exactly these same mixtures were used? A. Not precisely.

Q. Has each foundry, so far as you know, its own particular or peculiar primary mixtures for its steels? A. I never knew a foundry that had a standard primary mixture, it all depended on the market.

Q. Did you decide on your own judgment in each case, or did you reach a rule of practice, which you were able to leave behind you when you left there, in regard to this mixture? A. I left very definite rules of practice behind me, which covered the whole thing.

Q. Which you had worked out? A. Which I had worked out and which I had received from others, as I have told you.

Q. Received from others and added to it, I suppose? A. Yes, sir.

Q. After you got through with the converter, you drew off the metal you say into a ladle? A. No, sir; we ran the metal from the cupola, directly into the converter through a spout.

Q. Right into the converter? A. Yes, sir; right into the converter, although we sometimes used a ladle.

Q. In general, what did you do? A. It was both; we had an equipment at two ends of the shop by which one day we would use one method and another day we would use the other way, just as the requirements called for it.

Q. Did you add anything to the mixture in the

ladle before it went into the converter? A. No, sir.

Q. Do you know whether any other foundry does that or not? A. I did it in Philadelphia occasionally, when I thought it was required, I did it once or twice at Newport News in the shipbuilding company, when I was there.

Q. Was that done experimentally? A. No, sir; it was done as a matter of judgment, as it was apparent the iron had left the cupola in an unsettled condition.

Q. Now, excepting that, do you know of any foundry that has an established practice of adding something or anything in fact, to the heat in the ladle before it goes to the converter? A. No, sir; not in the side-blown converter practice.

Q. Suppose they do not use a side-blown converter process, but use a Bessemer, what would you do then? A. Well, the side-blown converter covers all the Manganese steel process that I know anything about.

Q. You do not know anything about the manufacture of Manganese steel through the Bessemer converter? A. It is all Bessemer.

Q. Give me a name for the other converter then?

A. The bottom blown Bessemer.

Q. Now that one, the bottom blown Bessemer, and the other, the side blown Bessemer, they are quite different, are they not? A. They are different in mechanical and other respects, yes, sir.

Q. In very important respect, they are different, are they not? A. Yes, sir.

Q. What is the greatest difference in them? A. The greatest difference is that the metal leaving the bottom-blown converter is inferior to the other, very much inferior.

Q. So that the metal comes away from the con-

verter in quite a different condition, does it not? A. Yes.

Q. And the treatment is different? A. The handling of the heat is different, yes, sir.

Q. And a man who had been accustomed to handling one converter would not be apt to get along without instructions in the handling of the other? A. No, sir; he would not be able to handle the side-blown converter if he had been used to the bottom-blown converter.

Q. The matter of heating is different, is it not? A. Yes, sir; the handling of the heat is different.

Q. And your whole experience is with regard to the side-blown converter, is it not? A. That is, in the personal handling of converters?

Q. Yes. A. Yes, sir.

Q. After the heat is taken from the converter, the metal is run into a ladle, is it not? A. Yes, sir.

Q. And there the physics are put in? A. Usually in the ladle, yes, sir.

Q. Are they important in the manufacture of Manganese steel? A. Yes.

Q. Of course, without correct attention to that you would get disastrous results, would you not? A. Yes, sir.

Q. Did you experiment on the line of physic mixtures, is that one of the things you experimented on, during those four years you speak of? A. Why, I found that a very simple matter to get the analysis, in fact, I can only recall one failure.

Q. You mean one failure in the physic mixture? A. In the making of the addition or anything that pertained to the mixtures of the metal from the converter and the physic, which resulted in failure to get the proper analysis of the Manganese steel.

Q. Just where was it you were still deficient, after

the four years' experiments that you made when you went, or before you went, to Chicago Heights? A. In the heat treatment.

Q. You did not have any difficulties in the physic mixture, did you? A. No, sir; it was a very simple matter.

Q. As far as you could tell? A. I had no reason to tell that I didn't have success.

Q. You did not have a satisfactory result? A. I never failed in having a satisfactory result, the matter was a very simple matter to me.

Q. In Chicago, was it? A. In St. Paul I never failed to get a satisfactory mixture of Manganese steel; I think I got excellent Manganese steel from the first pot I ever made there.

Q. Well, in what way was the matter unsatisfactory? A. I did not get the necessary toughness that I desired; I got very good toughness, but I did not get it as tough as I desired.

Q. Did you have it sometimes hard but not tough, and other times, tough but not hard? A. No, sir; it was always hard, and it was usually tough.

Q. Well, you think you really learned what the proper mixture was that early? A. Yes, sir; that was a very simple matter indeed, I think.

Q. You found it out, did you? A. I was told to put in twelve per cent. of Manganese, and I found no trouble in doing that. I was told to put in a certain amount of carbon and I——

Q. How much? A. I think Mr. Morat said it was to run at one per cent. of carbon, that is, three-quarters of one per cent.

Q. Did you put that in? A. Yes, sir.

Q. Did you change that as a result of your experience, or why did you change it? A. I have made everything from two-tenths of one per cent. to two per cent.

Q. At random? A. No, sir.

Q. By some rule? A. By examining the results, making the same quantitative experiments, obtaining certain results from the experiments commencing with a small quantity of carbon, and I never failed to get what I wanted to get, though.

Q. You experimented as to what amount of carbon you required? A. Yes, sir.

Q. And when was it you reached a final result with regard to that? A. There has been no material change in the practice at Chicago Heights, for approximately two years.

Q. Then by two years ago, you had reached the uniform practice of putting into the ladle, twelve per cent. of Manganese and two per cent. of carbon? A. We put in more than twelve per cent. of Manganese, in order to get twelve per cent. in the product.

Q. I thought you said you put in twelve per cent.? A. No, sir; we got twelve per cent.

Q. Well, what rule did you observe, how much did you put in of ferro-manganese to get a result of twelve per cent. in the steel? A. We would put in seventeen and a half per cent. of ferro-manganese.

Q. Seventeen and a half per cent.—the percentage being on the heat? A. On the weight of the total matter in the ladle.

Q. So that seventeen and a half per cent. was ferro-manganese? A. Yes, sir.

Q. And how much carbon? A. Well, we added carbon enough to get about one per cent. in the result.

Q. How much carbon did you add? A. Well, the Manganese alone would be five-tenths, or fifty-five-one hundredths, and you had to add enough carbon, so as to have about five-tenths more.

Q. What did you put in? A. We weighed it.

Q. Five-tenths of pure carbon? A. We had to add enough to get that much in the steel.

Q. In what shape did you add it? A. Usually coke.

Q. You would add enough coke to make up that perecentage? A. Yes, sir; and we sometimes added wash metal.

Q. Well, now, that became your uniform physic, did it? A. Yes, sir.

Q. And two years ago would take us back to the autumn of 1904, would it not? A. Yes, sir.

Q. And you began, when, to make Manganese steel? A. I began making Manganese steel castings in the latter part of the summer or the early fall of 1904.

Q. And, then, by December, you had, through your experimentation, reached that rule of practice with regard to the quantity of carbon to be added, did you? A. I think we began as early as that; I am not positive of the date, but I think we made no changes, after about that time.

Q. After about how many months after you got there—that will do about as well? A. Well, it was three or four months after I got there.

Q. That you were varying these matters and experimenting with them so as to reach a rule of practice with regard to them? A. I never made but two or three changes as to the proportion of the Manganese to be added, and they were minor changes, trying seventeen per cent. and then seventeen and a half per cent., and in that way trying to see what I could get out of that percentage which I added.

Q. And you got better results, as you made the changes, did you not? A. We got nearer to the mark we were aiming at than we got with the higher mixture.

Q. Now, having got your mixture down to the

rule of practice, you poured the metal from the ladle into the moulds? A. Yes, sir.

Q. And did you use the same kind of moulds that you use in other castings? A. In most cases the same.

Q. There is more difficulty in moulding Manganese steel than there is in any other kind of steel? A. I should say it was easier in most cases.

Q. You can mould other steels, capable of being machined into more uniform sizes than you can steels which are not capable of being machined, cannot you? A. I should not say that; it depends on the existence or the question whether the steel was Manganese steel or not; it was more a question of warping due to the heat treatment, the casting is less difficult in Manganese steel than it is in other steels.

So, that in your experience in Chicago Heights, you treated your Manganese steel in the moulds just as you did all other steels, is that it? A. Well, the making of Manganese steel castings presented different casting problems. We had to consider in the manufacture of gyratory crusher pieces; we had to secure the soft steel sets, they were put in and secured them in the core, and see to it that the metal did not crack; we obtained about the same practice in making safes, it was not a uniform practice; it was a difficult casting problem, and there were great differences in it, from that of casting others steels, but that is all there was to it.

Q. In the manufacture of other steels some latitude is given to you in the moulding process because of the fact that you can machine any part or parts of the casting, if you choose, is there not?

A. Yes, sir; the customer usually orders the casting of a larger size than he wants to use it, and he machines off a part very frequently.

Q. You could not machine away any part of the Manganese steel casting, could you? A. Not very well, not cheaply.

Q. Consequently it is to be cast in the size and in the shape in which it is desired to use it? A. Yes, sir; but that is true of many common steel castings to fit it for the purposes required.

Q. That requires that there should be thick parts and thin parts in the casting, does it not? A. That is true of all castings.

Q. And does not that present peculiar difficulties in the casting of Manganese steel, because you must provide in the moulds for these differences in thicknesses and cannot control them by machining away the casting afterwards? A. We never encounter any difficulties in that way.

Q. So that you would mould the Manganese steel casting, practically the same as you mould any other steel casting, would you? A. The form being identical, the form and the section, and so forth. being the same, it would be very similar, and I think I might say identical.

Q. Does Manganese steel shrink in cooling to the same degree as other steels? A. More than other steels.

Q. How much more? A. About one-third more, roughly.

Q. How much does ordinary steel shrink? A. About three-sixteenths of an inch to the foot cast in a dry sand mould; it depends on what kind of shape or mould it is, one-eighth of an inch on a chill.

Q. How much does Manganese steel shrink? A. In dry sand moulds, one-quarter to five-sixteenths of an inch to a foot.

Q. And how much does iron shrink? A. About one-eighth of an inch to a foot or a little over sometimes.

Q. Does not this increased shrinkage of Manganese steel furnish a difficult problem in connection with the moulding of the Manganese steel? A. You have to allow for it, but the troubles you have to look out for, in the making of Manganese steel, that is, the cracking in the mould, does not occur nearly as much as it does in the case of a dead soft steel.

Q. Well, do you take any particular precautions or means to overcome the liability of cracking through shrinkage in the moulds? A. Why, castings in Manganese steel, so far as I have made them, were very simple problems as compared with those presented to us in the making of soft steels. We did use precautions when we thought them necessary, we used chills in the mould and brackets and formed the gates and the heads in such a way as to avoid cracking, etc.

Q. Now this use of chills in the moulds is something that requires considerable skill and judgment, is it not? A. Yes, sir; and all the other points of moulding do as well.

Q. Well, how did you work out the practice of locating your chills in the moulds? A. It was a matter of judgment based on experience in the manufacture of other steels?

Q. Were you a moulder? A. Why, no, sir; I never was a moulder to any great extent; I did run a little shop in Brooklyn and did a little moulding whilst I was there, although I was never a union moulder, but I have instructed men in five different shops and made a complete success of it.

Q. I did not mean to get you up against the union? A. All right, sir.

Q. You knew enough about moulding to know where to place the chills, did you? A. I think so; I started the use of chills in the Chicago Heights plant, they never used chills there until I got there.

Q. You begun out there to use chills, did you? A. Yes, sir.

Q. And you did it as a result of your own experience? A. Yes, sir.

Q. You did not discover it in any books, did you? A. No, sir; but I heard a good deal about it in St. Paul.

Q. The Frenchman taught you that, did he? A. No, sir; I worked that out myself; I heard that he was using them, and I investigated and found out all I wanted to know about it.

Q. You heard who was using them? A. I. G. Johnson & Co., of Spuyten Duyvil, and I also heard that the Taylor Iron and Steel Co. were using them.

Q. Did you hear how the I. G. Johnson Co. were using them? A. No, sir.

Q. Did you hear how the Taylor Iron and Steel Co. were using them? A. No, sir.

Q. But you heard they were using them? A. Yes, sir.

Q. And you then went to work experimenting and discovered how they did use them out there, is that it? A. No, sir; I made moulds—the first extensive experiments that I ever made, and the first experience I had, was when I was at the Newport News shop.

Q. And you got so that you could place the chill so as to run the casting? A. Yes, sir.

Q. And consequently, you must have considerable knowledge as to the manner of using them, if they are to be used beneficially to the casting? A. Yes, sir.

Q. And that knowledge, as I understand you, you acquired through your experience? A. Yes, sir.

Q. Now, the principal difficulty you had at Chicago Heights, before you went there or when you

went there, was in the matter of heating in the annealing furnace? A. Yes, sir.

Q. What kind of annealing furnace did you have out there? A. We had three. And still have three, and I think we have four in use now, though.

Q. In what kind of an annealing furnace, did you heat the Manganese steel? A. In all four of those furnaces.

Q. What kind were they? A. Well, one that we used first, was not very satisfactory, it was a furnace designed for other work.

Q. Describe it? A. It was a furnace with a car bottom, and doors were raised and lowered, and lowered in such a position that they closed the entrance to the furnace at either end, and the arch was the roof, and it stood vertically, and the sides of the furnace——

Q. Where did you build the fire? A. It was a furnace fired with oil and steam and it was built by the Rockland Engineering Co.

Q. And that furnace was not satisfactory? A. It was quite satisfactory on common steels, but it was not steady enough for Manganese steel.

Q. What did you do then? A. I then furnished a furnace, one on the floor of the factory.

Q. You made a hole in the ground? A. Yes, sir, with a brick wall, and a pit in the floor.

Q. Go on and describe it? A. Well, that first furnace in the floor had combustion chambers external to the furnace; also a vertical brick wall pit alongside the furnace proper, and that made opportunity for steadier burning of the oil that we used in that furnace, and it also made it possible to burn out all that pit slowly; before using the oil, we used a little charcoal or coke, which would enable us to heat the casting slowly and carefully, and when that was burned out we added more solid fuel, if necessary to raise the temperature

slowly, and when we got it up to such a point as we liked, we began to use the oil——

Q. Where did you find such a furnace as that in use? A. I don't know of any like that.

Q. That was your own device? A. That was my own idea, to get a steady heat.

Q. It seems to be different from the furnace described at Highbridge? A. Yes, sir; it is very different, I think.

Q. How long did you use that one? A. I used that one, and another one of a similar kind but larger, for several months.

Q. Until when? A. I used this furnace and the other two furnaces all the time I was there.

Q. Are they using them yet? A. Yes, sir.

Q. And they have another furnace, you say? A. Yes, sir.

Q. One like the Highbridge furnace, is it not? A. I don't know, sir; I never saw the Highbridge furnace.

Q. Haven't they got one like the Highbridge furnace, after Mr. Nichols went to Chicago Heights? A. Yes, sir; I think they did get one.

Q. It is like the Highbridge furnace, is it not? A. I don't know anything about that.

Q. Well, describe it? A. Well, it is a furnace of a very common type, identical with the first furnace I described, excepting that the walls are heavier, and that it is a coal fire, instead of oil, and it is very similar in all respects with one which I built for use at the Newport News and it was a very common type of furnace; it was an ordinary heating furnace, with a coal fire.

Q. It does a different kind of work, though, from the second and the third ones, which you have described, does it not? A. I do not find that it is very much superior; it is a little heavier, and cost more money.

Q. A little superiority makes all the difference in this world, does it not, sometimes? A. It is no better than other annealing furnaces I have used and seen used.

Q. But it is different from the first one? A. It is different from the one which the Rockland Engineering Co. built at Chicago Heights for a different purpose altogether.

Q. That was the first one you described, was it not? A. Yes, sir, that was the first one I described, that was the one I found out there when I went.

Q. The difficulties you found at Chicago was the heating; that you found to be the most perplexing problem there, did you not? A. It was the one that required the greatest care.

Q. It was the one that gave you the most trouble, was it not—you found that to be the most perplexing problem of any of the problems at the Chicago Heights plant? A. It was the one that required the most of my own personal labor, to get it done well.

Q. It was the one that required the most of your own personal labor and attention; now, had you known beforehand how to anneal other steels? A. Yes, sir, and I had had first class success, indeed.

Q. That you were well up to, were you? A. Yes, sir; I had had first class success in that work before I went with the American Brake Shoe and Foundry Co., but when I went there the furnaces the Brake Shoe Company had were not altogether satisfactory, and they would not pay for furnaces at Chicago that time until——

Q. I am willing that the fault shall be that of the American Brake Shoe and Foundry Co., but that is not what I am after; I want to get at the facts—now, you had been annealing Manganese steel before you went to Chicago, hadn't you? A. Yes, sir,

Q. Had you had no difficulty before that? A. I have never done enough of making Manganese steel and annealing it to be worth very much discussion.

Q. Very well, how long was it after you began operations at Chicago before you got satisfactory results in the annealing process? A. The first small quantity I ever made gave excellent tests, the first that I have tested gave as good a test as any I ever made.

Q. You said it was months before you got satisfactory tests, didn't you? A. No, sir, I did not, you put it that way.

Q. No, you put it that way; you said it was three or four months before you got satisfactory tests, or that it was several months before you got satisfactory tests, or before you got results that were satisfactory, and then when I asked you later on, in regard to in what respect they were unsatisfactory, you said it was only in the matter of heating? A. Yes, sir, the furnace I found there did not always give good results. We got excellent results out of it, but for that reason we should have been entirely successful. Now, when we got an order for the goods, then we built another furnace and the product to fill that order was manufactured with that other furnace.

Q. That was the pit furnace you described? A. Yes, sir, that was the pit furnace that I described; it was built to get out our first order.

Q. That was the pit furnace? A. Yes, sir.

Q. Would you say that you were making first class Manganese steel castings there before November or December, 1904? A. Yes, sir, we made some satisfactory castings prior to November or December, 1904.

Q. Do you mean odd lots or in sufficient quantity to indicate a product? A. We did not get any large

orders during the first few months we were filling orders.

Q. What you mean to say is, that you got something that was satisfactory, in small lots, made experimentally is that it? A. No, sir, they were not made experimentally; we got some small orders, and they were giving entire satisfaction; the first orders that we shipped gave entire satisfaction.

Adjourned to Monday, December 17th, 1906, at 10 A. M., Newark.

DECEMBER 17, 1906.

WALTER S. MCKEE, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Corbin.

Q. What is your residence? A. Chicago, Ill.

Q. What is your occupation? A. Sales manager of the steel foundry department of the American Brake Shoe and Foundry Co.

Q. Have you sold Manganese steel for that company? A. Yes, sir.

Q. For how long have you sold that steel for that company? A. About, or a little over two years.

Q. Under whose direction, as to the manufacture? A. Mr. W. S. Potter.

Q. What has been the progress of the trade? A. Do you mean has the business increased?

Q. Yes. A. Yes, sir, it has increased to quite an extent.

Q. How much per month are you making now? A. About sixty to sixty-five tons.

Q. What other dealers are engaged in the sale of

Manganese steel, what other manufacturers? A. Isaac G. Johnson & Co.

MR. HARDIN—This witness should speak of his own knowledge.

(*Mr. Corbin.*)

Q. What is your means of knowledge in regard to that? A. Well, I know some of the customers of those people.

Q. These are the men with whom you are competing in trade? A. Yes, sir.

Q. And have you seen their products? A. Yes, sir.

MR. HARDIN—I do not think he is qualified yet; he says he knows some of the customers of those people; now, I do not think that is sufficient.

COURT—The trouble is, that these people might make any steel and call it Manganese steel. That would not help me in this case. This witness, I think, does not disclose sufficient knowledge of the character of the product.

(*Mr. Corbin.*)

Q. Who are engaged in the manufacture and sale in the market, in competition with you, of Manganese steel?

MR. HARDIN—I renew my objection—this witness is not qualified. The witness testified that his source of knowledge was an acquaintance only with other customers.

MR. CORBIN—And he said he saw their products.

Question allowed.

A. Well, those that called their product Manganese steel, I. G. Johnson, and the George H. Smith Steel Casting Co.

Q. Do you know of any others who sell the article of Manganese steel?

MR. HARDIN—That question is too wide; I object to it.

COURT—What do you mean, Mr. Corbin, by that question—"do you know of any others who sell the article of Manganese steel"—does he know anything about the characteristics of the product?

(*Mr. Corbin.*)

Q. What do you know about that? A. Well, I know steel having the same characteristics are sold by two other companies.

Q. Can you recognize Manganese steel by an inspection of it? A. Not always by an inspection of it, but you can readily recognize it by certain methods.

Q. From a test of it? A. Well, it has to be tested to determine whether it is Manganese steel or whether it is ordinary steel; you have to test for that.

Q. What articls have you manufactured? A. We have manufactured safe castings, and rolled shells, crusher heads, crusher concaves, jaw plates, toggle plates, toggle bearings, cheek plates, frogs, crossing centres, switch points, gears, pinions, bucket lips, bucket bushings, shute liners, steam mill liners, miller rings, ring dies, thimbles, beater blades, roll guides, mine car wheels, charging barrow wheels—that is all I can think of at the moment.

Q. Now, to whom do you sell; who are some of your customers? A. The Victor Safe and Lock Co., the Austin Manufacturing Co., the Power and Mining Machine Co., the American Smelting & Refining Co., the Carnegie Steel Co., the Anaconda Copper Mining Co., the Boston and Montana Consolidated Smelting Co., and the Arizona Copper Co.

Q. Did you procure some samples for Mr. Potter to make tests of Manganese steel? A. Yes, sir.

Q. What samples of the Taylor Iron and Steel Co. did you get? A. There was three dipper teeth.

Q. And those you turned over to Mr. Potter? A. Yes, sir.

Q. As he has testified? A. Yes, sir.

Q. Did you get them from any other manufacturer, any other samples? A. Yes, sir, the Penn. Steel Co.

Q. You did not mention them as among your competitors? A. No, sir.

Q. Are they amog them? A. Yes, sir.

Q. Making Manganese steel? A. They do not call it Manganese; they make a grade of steel they sell for the same purpose, but they call it by another name.

Q. What was their product, what did you buy from them of their product? A. A tumbler plate.

Q. I have a memorandum, "a side plate casting"? A. Well, it is the same thing.

Q. That was turned over to Mr. Potter, was it? A. Yes, sir.

Q. And you got this from the Bucyrus Co.? A. Yes, sir.

Q. That Mr. Potter testified about? A. Yes, sir.

Cross-examination by Mr. Hardin.

Q. When did you say your company began to manufacture Manganese steel? A. little over two years ago.

Q. That would be in the fall of 1904, would it not? A. Well, I would say in the summer or fall, yes, sir.

Q. And under Mr. Potter's superintendency? A. Yes, sir.

Q. At the Chicago Heights plant? A. Yes, sir.

Q. Were you occupying your present position at that time with the company? A. Yes, sir.

Q. And prior to that time your company had not produced anywhere, any Manganese steel? A. That is right.

Q. When did you first begin to sell castings? A. Just about that time, the summer or fall, early fall of 1904.

Q. And what kind of castings did you first make? A. The first was crusher concaves, and crusher heads, for the Austin Manufacturing Co.

Q. Were you engaged before that in the manufacture of crushing machines at all? A. Well, only in the way of ordinary steel castings, parts for crushers, made of ordinary steel.

Q. Mr. Potter told us that he had some difficulty in convincing you that he could make these Manganese steel castings; is that true? A. Well, we were skeptical in a way at first about it.

Q. The Taylor Iron and Steel Co. was already in the market with Manganese steel castings at that time, were they not? A. I believe so.

Q. Don't you know it? A. Yes, sir, I know it was so.

Q. Your experience had made that known to you, had it? A. Yes, sir.

Q. And they had been in the field for some time, had they not? A. I had heard of them as making Manganese steel for some time.

Q. And you were rather glad to find an article that would take the same market, were you not? A. Yes, sir.

Q. And you had been seeking for it? A. Not a great while, no, sir.

Q. Well, you were in the summer of 1904, were you not? A. Yes, sir.

Q. And prior to the summer of 1904? A. Yes, sir.

Q. Now, you have advertised your Manganese steel, have you not? A. Yes, sir.

Q. Was that advertising conducted under your direction? A. Partly so.

Q. As the head of the sales department? A. Yes, sir, partly.

Q. You have advertised your product, to the trade, representing it that it was as good as the product of the Taylor Iron and Steel Co., have you not? A. Yes, sir, as good as the best, I believe, is the way the advertisement is worded, that could be anything, of course.

Q. Haven't you written letters to the trade in which you have used the Taylor Iron and Steel Co. in comparison? A. Yes.

Q. Stating that your product was as good as theirs? A. Yes.

Q. The Taylor Iron and Steel Co. product I take it was known to you to be a standard article in the market? A. Yes, sir, it was.

Q. And when you had something to bring to the attention of the trade, you brought it to their attention, or to the attention of the trade, by claiming that you had as good an article as that standard article, did you not? A. Only, in such cases, where they mentioned that they were using the Taylor Company's product.

Q. That is to say, when you wanted to displace the Taylor Iron and Steel Co.'s product, you said you had as good, did you? A. Yes, sir.

Q. Did you seek to introduce your goods in any other places than where the Taylor Company's

goods were already found in use? A. Yes, sir, we have done so.

Q. And you did not hesitate to make the same comparison, when you found some one that was not using the Taylor Company's goods? A. I don't know, that that was ever mentioned in a case of that kind.

Q. Did you ever bring to the attention of the jobbers in the trade, that your Manganese steel castings represented or claimed that they were as good as the Taylor Iron and Steel Co.'s steel castings? A. I cannot answer that.

Q. Or would you regard jobbers as already dealing in the Taylor Iron & Steel Co.'s steel, as users of the Taylor Co.'s steel? A. We did not sell to jobbers.

Q. Well, dealers, in the crushing machine supplies, perhaps I don't use the correct term? A. Well, if the question came up, we would say that, yes, sir.

Q. Now, you said that you were selling now from sixty to sixty-five tons a month? A. Yes, sir.

Q. Scattered over these various lines of manufacture that you have described? A. Yes, sir.

Q. What is the principal line of manufacture? A. Safe castings are the heaviest tonnage.

Q. At the present time? A. Yes, sir.

Q. That is the larger part of your product? A. Yes, sir.

Q. What is the next of importance? A. I believe crusher heads would come next, that is, for gyratory crushers.

Q. Parts of crushing machines generally come next in importance to the safe manufactory? A. Yes, sir.

Q. Do you do much railroad work? A. Very little at the present time.

Q. You say at the present time; have you ever done very much in the railroad work? A. No, sir.

Q. You are still experimenting with them, are you? A. Yes, sir.

Q. You have mentioned among your customers the Power & Mining Machine Co.; where is that located? A. At Cudahy, Wis.

Q. Have you said anything to that company during the present year? A. Yes, sir.

Q. How recently? A. I think about April.

Q. Are they buying from you, now? A. No, sir.

Q. Did they buy from you or when did they first buy from you? A. As near as I can remember, it was about a year from last April.

Q. And they continued to deal with you, for about a year? A. Yes, sir.

Q. Did they buy large amounts? A. Well, that can be considered in a great many different ways; what do you consider a large amount? I cannot say how many tons they have bought, but they have bought several tons from us at different times.

Q. Parts of crusher machinery? A. Yes, sir.

Q. And these other customers you have named, are dealing with you at the present time? A. Most of them, yes, sir.

Q. Which ones? A. The Victor Safe and Lock Co., the Austin Manufacturing Co., the American Smelting and Refining Co., the Green Consolidated Copper Co., Arizona Copper Co., the Anaconda Copper Mining Co.

Q. You say your present output of Manganese steel was from sixty to sixty-five tons a month; what was the output a year ago? A. A year ago I would judge it would be about forty tons a month.

Q. That would be December, 1905? A. Yes, sir.

Q. And what was the output in April, 1905, six months earlier than that? A. I could not answer that question from memory.

Q. Was there a substantial increase from April

to December? A. Well, there has been a steady increase since we first started.

Q. When did you reach a sale of twenty-five tons a month. A. I do not believe I could answer that question offhand.

Q. It took you some little time to introduce this article, after Mr. Potter began to manufacture it, didn' it? A. Well, no, we started in immediately to introduce it and soon were making a few tons per month, and we gradually increased it.

Q. It took a little time to convince the trade that you had a superior article, as you claimed for it? A. Well, most of the sales were made after the tests were made.

Q. And the first orders were experimental orders, I suppose? A. Not altogether.

Q. To some extent? A. To some extent.

Q. They might be called introductory orders then? A. Yes, sir.

Q. So the growth of the business was rather slow, was it not? A. It was quite satisfactory to us.

Q. That is not an answer to my question—the growth of the business was rather slow, was it not? A. We think it has been fast.

Q. Forty tons a year ago, and now sixty to sixty-five tons a month that indicates about twenty-five tons a month, in that time—what I want to know is, how rapidly you got from nothing to forty tons, a month? A. Well, it took us a little over a year, as I recall it.

Q. With constantly increasing sales? A. Yes, sir.

Q. So that, it is true, that your business had rapidly increased from April, 1905, to December, 1905, is it not? A. Well, it increased steadily; I don't know the ratio of increase there, but it in-

creased steadily from the time we started to the present time.

Q. It took you a little over a year to get to a sale of little over forty tons a month, didn't it? A. Yes, sir.

Q. Now, did you sell twenty tons the first month? A. No, sir.

Q. Were you selling twenty tons after six months expired? A. I could not say positively just how the tonnage did run there.

Q. The growth was gradual, you say, but satisfactory? A. Yes, sir.

Q. How many tons were you selling on the 1st of January, 1905? A. Well, along in and about that time, November, December and January, it ran around forty tons a month.

Q. January 1st, 1905, I am speaking of now? A. Oh, January 1st, 1905?

Q. Yes—you referred to January 1st, 1906—now, answer with reference to January 1st, 1905? A. I don't know how that tonnage does run; I cannot tell you offhand.

Q. When did you first begin to sell? A. I think the first sale was along in the early fall or summer of 1904.

Q. September, 1904? A. I cannot give you the dates.

Q. What was it, a crushing part? A. I believe these were the first castings we made, according to my recollection.

Q. For a time you made parts of crushing machines only, of Manganese steel? A. Yes, sir, and mining car-wheels.

Q. Mine car wheels, and crushing machines for a time? A. Yes, sir.

Q. For how long a time? A. I don't know just when we began to make roll shells; it was some-

where in the winter of 1904-1905, early in 1905, or something like that.

Q. Was that prior to the 1st of January, 1905; the castings of Manganese steel you were making were chiefly or exclusively crushing parts or mining car wheels? A. Yes, sir, practically that was all we were making, castings of Manganese steel for the crusher parts and for mining car wheels.

Q. And before you began to go into other lines, how many tons a month had you been selling? A. I don't know what our tonnage was there; I cannot tell you without reference to our records.

Q. You can give us some idea of it, give us an estimate of it? A. I should say somewhere between ten and fifteen tons a month.

Q. So that your recollection is, that on the 1st of January, 1905, you were selling from ten to fifteen tons a month? A. It would be very close to that, I think.

Q. Of Manganese steel? A. Yes, sir.

Q. What line did you next go into? A. The next castings we made was jaw plates, and roll shells and cheek plates.

Q. And following that, what lines did you manufacture? A. Mine car wheels came in about that time.

Q. I thought you had been making mining car wheels before the 1st of January? A. We made some, and we made more after that.

Q. You increased your output of mining car wheels? A. Yes, sir.

Q. When did you add something else? A. Well, the safe castings came in, I believe, in May, 1905, or about that time.

Q. You had made no safe castings prior to May, 1905, had you? A. No, sir.

Q. Immediately the safe castings came in, there

was a marked increase in the tonnage of your output, was there not? A. Yes, sir.

Q. The safe castings are very heavy, are they not? A. Yes, sir.

Q. And when you speak of an output of forty tons, in December, 1905, what proportion of that output is represented by safe castings? A. You are speaking of December, 1905?

Q. Yes, December, 1905; I say when you speak of the output of forty tons a month, in December, 1905, what proportion of that output is represented by safe castings; that is, when you told me you thought your output was about forty tons a month? A. I should say about half of it.

Q. So that the result of making safe castings was the doubling of your output? A. Practically, yes, sir.

Q. And that condition continues now? A. Just about, I believe, yes, sir.

Q. You began to make safe castings about the 1st of May, 1905, you say? A. That is about my recollection, it was in there, or close to that time.

Q. What was your output, in safe castings, during May, 1905? A. I cannot tell you, we started in with one casting, and gradually increased it from that on.

Q. Before you began to make safe castings, you knew that the Taylor Iron and Steel Co. were making safe castings of Manganese steel, did you not? A. Yes, sir, I believe I did; yes, sir, I have seen the advertisements.

Q. The growth of the safe castings business, I suppose, was like the other business, gradual? A. Yes, sir.

Q. And began with a single casting in May, 1905? A. Yes, sir.

Q. How many tons of safe castings were you

making in August, 1905? A. I should say fifteen or eighteen tons, that is, from memory.

Q. Now, you said you procured three dipper teeth for Mr. Potter—where did you get them? A. From the Bucyrus Co.

Q. Where is the Bucyrus Co.? A. South Milwaukee, Wis.

Q. When did you get them? A. On January 2nd, 1906, I believe it was.

Q. Do you know how long the Bucyrus Co. had had those teeth before you got them? A. No, sir, I don't know how long the Bucyrus Co. had had them when I got them.

Q. And you don't know when those teeth were made? A. No, sir.

Q. And how do you know that they were made by the Taylor Iron and Steel Co. at all? A. Well, the purchasing agent of the Bucyrus Co. told me that they were.

Q. That is the only information you had on the subject? A. Yes, sir.

(*Mr. Corbin.*)

Q. Did you order Taylor Iron and Steel Co. steel? A. Yes, sir.

(*Mr. Hardin.*)

Q. Are the Bucyrus Co. jobbers? A. They are builders of dredging machines.

Q. Do they sell in the general market, dredging parts? A. I don't think so; they sell the complete dredge; they build a dredge, and then sell it complete.

Q. How did you get those teeth from them? A. I told them I wanted them to make a test.

Q. And they gave them to you? A. No, sir, they sold them to me.

Q. Were there any marks on them to indicate that they were made by the Taylor Iron and Steel Co.? A. Yes, sir.

Q. What marks? A. Oh, I do not mean to say that there were any marks made by the Taylor Iron and Steel Co.

Q. All you said was that you wanted from the Bucyrus Co. some Taylor Iron and Steel Co.'s teeth, and these teeth were given to you? A. Yes, sir.

Q. Did you get any other samples from the Bucyrus Co. besides the three teeth you have mentioned? A. Yes, sir.

Q. Either Taylor Iron and Steel Co. samples, or samples sold to you as Taylor Iron and Steel Co. material? A. One casting before that.

Q. What was that? A. A dipper tooth.

Q. How long before that? A. About six weeks before.

Q. You got four, altogether? A. Yes, sir.

Q. Did you get any other castings from the Bucyrus Co.? A. Yes, sir.

Q. What were they? A. Castings from the Pennsylvania Steel Co.

Q. So that the Bucyrus Co. did have other kinds of castings than the Taylor Iron and Steel Co.'s castings? A. Yes, sir.

Q. And the only means of identification you had as to the castings you got from them, was what their manager told you? A. Yes, sir.

Q. You have now mentioned all the castings that you got from the Bucyrus Co. that were claimed to be Taylor Iron and Steel Co. castings? A. Yes, sir.

Q. You know, perhaps—if you do not know you can say so—that the Taylor Iron and Steel Co. make dipper teeth of steel other than Manganese steel, do you not? A. I don't know whether they do, or not.

(*Redirect by Mr. Corbin.*)

Q. You are making other steels there at Chicago Heights? A. Yes, sir.

Q. All the while? A. Yes, sir.

FRANK W. HOYER, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Little Rock, Ark.

Q. In what business are you engaged? A. In the stone crushing.

Q. What company? A. The hydraulic Sand and Stone Co.

Q. What position do you occupy in that company? A. Superintendent.

Q. What is the character of the stone, and for what purpose is it used after being crushed? A. We crush nothing but surface stone, which is admitted to be the hardest stone there is, and we crush it for concrete purposes.

Q. For paving? A. Yes, sir, concrete paving and foundations, and so on.

Q. What method do you use in crushing that stone? A. The Austin gyratory crusher.

Q. On that crusher you have concave heads? A. Yes, sir, concave heads.

Q. And that is the part subject to the greatest wear? A. Yes, sir.

Q. Out of what material is the concave heads made? A. Manganese steel.

Q. What Manganese steel are you using for the purpose now? A. We are using the American Brake Shoe and Foundry Co. Manganese steel.

Q. How long have you been using that steel? A. Since the middle of September.

Q. What Manganese steel, if any, did you use

before that time? A. We used Manganese steel made by the Taylor Iron and Steel Co.

Q. What, if any, is the difference between the two steels, as to wear, from your observation? A. From my observation, so far as I can see, I cannot see that there is any difference in the wear; the wear in the present concaves is scarcely perceptible.

Q. And you have been using them since the middle of September? A. Yes, sir.

Cross-examination by Mr. Hardin.

Q. How long before that had you been using the Taylor Iron and Steel Co.'s steel? A. Well, we had been using them since 1903.

Q. Where did you buy them? A. The first ones, the first head and concaves we bought came with the crusher, of course?.

Q. Where did the crusher come from? A. The Austin Manufacturing Co., of Chicago, Ill. And then we bought another set of concaves from the Austin Manufacturing Co., and the next set we bought we bought direct from the Taylor Iron and Steel Co., a set of concaves, also a head.

Q. When was that? A. That was some time in 1905, I think in the fall.

Q. What was the name of your company at that time, when you made that direct purchase? A. The Hydraulic Sand and Stone Co.

Q. And where located? A. Little Rock, Ark.

Q. You understand that purchase was made in the name of that company, direct from the Taylor Iron and Steel Co., do you? A. Yes, sir, that is, from their salesman.

Q. Did you buy them? A. No, sir, the manager bought them, but I was present at the time.

Q. Who was the manager, do you know? A.

Yes, sir, it was—his residence is in St. Louis—I did think of it just a moment ago—"Johann."

Q. The next set you bought in September, from the Austin Manufacturing Co.? A. Yes, sir, last September.

Q. You bought them, I understand, from the Austin Manufacturing Co.? Yes, sir.

JOHN W. LANGLEY, a witness produced in hebalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Corbin.

Q. Where do you reside? A. In Ann Harbor, Mich.

Q. What is your occupation? A. Professor of Electro-Metallurgy.

Q. How long have you been engaged in metallurgy? A. Well, for upwards of thirty-four years.

Q. Have you ever been a professor of chemistry? A. Yes, sir, in my earlier years.

Q. Where? A. At the University of Michigan, also at the Western University of Pennsylvania, in Pittsburg, and at the United States Naval Academy, in Annapolis.

Q. Were you ever engaged as metallurgist in any steel works? A. I have been, yes, sir.

Q. Where? A. At the Crescent Steel Works, in Pittsburg, besides having been acting in a consulting position for eighteen or twenty years.

Q. What connection had you with the making of steel there? A. I was in charge of the Bessemer and open hearth plants, as well as being general metallurgist of the entire works.

Q. Have you been often called an expert in matters requiring knowledge of metallurgy? A. I have.

Q. And have you any permanent employment in

such capacity? A. I am employed permanently by United States Steel corporation in such a capacity.

Q. Have you had occasion to make tests of metals? A. I have.

Q. Comparative tests? A. I have, frequently.

Q. Have you ever made Manganese steel? A. I have.

Q. When? A. In 1892.

Q. And where was that? A. At the Crescent Steel Works, in Pittsburg.

Q. What kind of steel did you use, Bessemer or open hearth steel? A. I made that Manganese steel in the open hearth furnace.

Q. Which is the better steel the Bessemer or the open hearth? A. The open hearth is usually considered to be better.

Q. Are you familiar with the Hadfield patents? A. I am.

Q. You have examined them? A. Yes, sir.

Q. Have you examined them to see whether the process of manufacture is described there? A. In the Hadfield patents?

Q. Yes. A. I have, and it is so described quite fully.

Q. Could one skilled in metallurgy manufacture Manganese steel from the processes described in those patents? A. I believe that he could.

Q. Does the working of the Bessemer process involve the use of secret processes? A. I am not aware that it does; certainly it did not in any operation for which I was responsible.

Q. What changes in the ordinary Bessemer methods are involved in the making of Manganese steel? A. There are no changes in the Bessemer process; the only changes occur in the Bessemer process after the metal is poured out from the converter and mixed in the ladle with other articles.

Q. In what is called in the preparation and use of the physic in that process? A. Yes, sir.

Q. In what way is the physic prepared according to the Hadfield process? A. In some furnace or crucible or some method of melting the physic exterior to the Bessemer converter, and, in general, to be mixed with the product of the converter after it is poured into the ladle.

Q. Is there any secret process involved in the manner of priority of putting these things in the ladle, whether you put the metal in first or whether you put the physic in first? A. Not to my knowledge.

Q. What is the usual practice? A. The usual practice is to add the so-called physic to the contents of the ladle after the Bessemer converter has delivered its product to the ladle.

Q. Is there any secret in reversing that process, and putting the physic in first? A. There is not, to my knowledge; I think it would make no difference in the final result.

Q. Do both practices prevail? A. I think the practice of adding the physic substance to the poured-out metal from the converter is the common method.

Q. Is the other a common method? A. I think the other is occasionally practiced, but I don't know of my own personal knowledge.

Q. What is there peculiar regarding Manganese steel that required any other different treatment? A. Only in the fact that the Manganese is very liable to cut the sides of the vessel in which it is melted, and that it is liable to undue waste from oxidation.

Q. And what process of melting is commonly adopted to prevent that waste.

Q. It is usually melted in crucibles or in a special furnace which melts no other article,

Q. Is the use of manganese and physic confined to the making of Manganese steel? A. By no means, it is generally added to all Bessemer and open hearth steels.

Q. So that the preparation of Manganese for use in steel is used in the making of all steels, is it not? A. Practically, yes, sir.

Q. What is the difference in the use of manganese to make Manganese steel, and in the use of manganese to make ordinary steel? A. Only in the quantity of manganese that is added.

Q. Ordinarily you would put in what percentage? A. For ordinary merchantable steel, structural steel, the amount would be less than one per cent., as a rule. For Manganese steel the amount would be upwards of twelve per cent., as a rule.

Q. What would be the effect of using a lower percentage, say, five or six per cent.? A. It would produce a Manganese steel of different properties from those now required in the practical use of that alloy, it makes a more brittle and unmanageable product.

Q. By Manganese steel, as used in the art, what do you generally understand, what percentage of Manganese does it contain? A. We understand that a percentage greater than ten per cent., and usually about fourteen per cent., from twelve to fourteen per cent., is the standard quality.

Q. Now, what is the real peculiar properties of Manganese steel, as it is defined, as compared with ordinary carbon steel? A. It has very peculiar properties, and is very strongly contrasted with ordinary carbon steel. For example, ordinary carbon steel heated to a good red heat, and plunged in water, becomes very hard indeed; and is the ordinary method of hardening carbon steel. Manganese steel treated in the same way and plunged into water at a red heat becomes tougher and a little

softer than if not so treated, thereby being in exact opposition to the treatment of carbon steel. Carbon steel, before being plunged into water, is ordinarily soft enough to be cut readily with a file.

Manganese steel is at all times so hard that it cannot be, to any appreciable extent, cut or wrought by a file or other abrasive tools.

Q. How does it compare in tensile strength with carbon steel? A. It has a tensile strength greater than ordinary low carbon steel and not quite as high as the best grades of low carbon chilled steel.

Q. This Bessemer steel is generally low-grade carbon steel, as compared with other steels, is it not? A. A low percentage of carbon steel.

Q. Yes; a low percentage of carbon steel? A. Yes, sir.

Q. It approximates more nearly to iron than the other steel, does it not? A. No, sir, not necessarily, because the low carbon steel is also made in the open-hearth process.

Q. What are the uses for which Manganese steel is specially adapted? A. The uses for which Manganese steel is specially adapted, is for crushing rolls, for apparatus in which the wear would be excessive on ordinary steel, such as dipper teeth, and it is also specially adapted for the wheels of tram-cars.

Q. When was the Manganese steel, as a useful product, discovered, and by whom? A. The first patent on the subject is by the elder Mr. Hatfield, and dates, I think, in 1883; as a commercial process it was taken up by him and also by his son, Robert A. Hadfield, somewhere in the later eighties.

Q. Is it manufactured abroad? A. It is, yes, sir.

Q. In England or on the continent? A. I think so, but I haven't any personal knowledge of its being manufactured on the continent, but I do know that it is in England.

Q. Where did you first see it? A. At the foundry of Robert A. Hadfield, in Sheffield.

Q. When was that? A. In 1889.

Q. What was your experience there then, as to observing the product? A. At that time I was a guest of Mr. Hadfield's, and he took me down to the foundry, where I saw the operation of making Manganese steel as carried on at that time by him. He personally took me through the works and pointed out the various stages of the manufacture.

Q. Was there any secret you saw? A. Apparently not; he certainly did not ask me not to speak of it.

Q. Did you see the manufacture of Manganese steel by the American Brake Shoe and Foundry Co. at Chicago Heights? A. I have.

Q. You have observed their process there? A. Yes, sir.

Q. When was that? A. In October, 1905.

Q. You saw their apparatus there, did you? A. Yes, sir.

Q. What was their converter? A. A form of converter known as the Troepenas.

Q. What would be the difference in the product from using a suitable converter of that type, as compared with the ordinary Bessemer bottom blow converter? A. There would not necessarily be any difference in the final product.

Q. Would there be any superiority in the product? A. Not in the quality.

Q. Mr. Potter thought he got a better steel from it? A. That may be his views, but I do not think there is any difference in the physical quality.

Q. Would it affect the process at all, in making Manganese steel, whether you use one or the other? A. Only that one is more convenient than the other.

Q. You mean that the one he has at Chicago Heights is more easy to use? A. The one employed at Chicago Heights, the Troepenas, is more easy to use in producing small quantities of steel.

Q. What would you say as to the difficulty of making Manganese steel, as compared with ordinary steel, from your experience in the manufacture of steel? A. In my experience I found no greater difficulty in making Manganese steel than I did in making ordinary steel.

Q. You spoke about the effect upon the product of Manganese, does that effect exist in the steel itself, as well as in the ferro-manganese, when melted? A. Yes, sir; if Manganese steel is remelted it will cut the lining of the pot or furnace more readily than ordinary steel will do it, because of the large amount of Manganese it contains.

Q. Now, in the ladle, does that raise some difficulty in the pouring into the mould, and if so, how is that obviated?

A. As I witnessed the process of making steel castings, it is customary to pour the contents of the ladle from the top of the ladle and in through a nozzle in the bottom, which is known technically as a bottom pourer.

Q. Why is that? A. Because the Manganese cuts the nozzle much worse than ordinary steel, and therefore it is difficult to keep the vessel tight.

Q. That is simply for that reason? A. I know of no other reason.

Q. That the top pourer is used? A. Yes, sir.

Q. You have mentioned the necessity of melting Manganese in a crucible to escape the oxidation, and the necessity or convenience of the top pourer, do you know of any other practical difficulties in the use of the Manganese in the manufacture?

A. No, sir, none outside of its liability to oxidation.

Q. Now, then, in the moulding process, does the subject present any special difficulties as compared with ordinary steel moulding? A. I haven't had any personal experience in moulding and casting Manganese steel in sand moulds. I can only answer, therefore, from second-hand information. It is my impression that there is no greater difficulty in the moulding than there is for ordinary steel.

MR. HARDIN—I object to that impression and also what he says on information derived second hand, and I ask that the answer be stricken out.

COURT—Yes, it may be stricken out to that extent.

(*Mr. Corbin.*)

Q. You are familiar with the literature on this subject? A. Yes, sir, I believe so.

Q. Moulding is carried on under your observation in various steel works? A. Yes, sir.

MR. CORBIN—I think your Honor is competent to give this evidence.

COURT—He says he has not seen it done.

WITNESS—I have not done it personally, but I know all about it.

COURT—I will overrule so much of the question as calls for his information obtained from other people; and what he knows himself, or any opinion he may have formed from what he has learned, he may testify to.

(*Mr. Corbin.*)

Q. Did you have tests made of the Manganese steel of the American Brake Shoe and Foundry Co. and of other steels? A. I did.

Q. Were the methods of making those tests directed by you? A. Yes, sir, they were.

Q. And what was your general plan of preparing your samples for the comparative tests? A. The samples of the various makes of steel, were made up so as to be as nearly alike as possible, they were then put into a testing machine belonging to the firm of R. H. Hunt & Co., of Chicago.

Q. I am coming now to the preliminary preparation; was that, in your judgment, so as to make the tests equal and fair tests? A. Yes, sir, it was.

Q. And you have had considerable experience in the making of such tests, have you? A. I have, yes, sir.

Q. Now, what were the different manufactures, which you tested, as you understood them to be; who were the makers? A. One lot was from the American Brake Shoe and Foundry Co.—I say one lot, but there were several lots, but they were all under one general mark—by the American Brake Shoe and Foundry Co.—and another set of samples were from the Johnson Co.

MR. HARDIN—Which one?

A. R. G. Johnson, I think it is.

(*Mr. Corbin.*)

Q. The Spuyten Duyvil concern? A. Yes, sir.

Q. Proceed. A. Anoher lot of the Taylor Iron and Steel Co., and another lot from the Penn. Steel Co.

Q. Now, where were these articles tested? A.

At the testing laboratory of R. H. Hunt & Co. of Chicago.

Q. And was it done under your supervision? A. It was.

Q. Did you see the tests of the samples, did you witness the tests personally? A. I did, of each and every one.

Q. Who did the work of testing, under your supervision? A. The actual management of the machine and testing was carried on by Mr. Bowen, an employee of that company.

Q. And what was the testing machine? A. A testing machine known as the "Riehle" testing machine.

Q. How many articles did you test? A. One hundred and twenty-two.

Q. What was the object in the tests? A. To show the relative tensile strength and elongation and such other physical properties as could be developed in a testing machine in the four lots of steel to which I have referred.

Q. Did you have any other standard besides that of those articles to compare with? A. Not at the machine, they could be compared with the standards in the general literature of the art.

Q. You were able by your tests to compare those articles with those reported in the literature on the subject relating to Manganese steel? A. Yes, sir, I was.

Q. Were those steels which you examined and which you tested all Manganese steel? A. They were.

Q. How do you know that? A. By the peculiar properties of Manganese steel, which are so unlike that of carbon steel—for instance, each one was tested by a file, or punch, so as to make sure that it was of the ordinary hardness of Manganese steel, before it was put in the testing machine,

Q. You were able to show that from your observation? A. Yes, sir.

Q. You had before you then the published tests of Manganese steel, I understand you to say? A. Yes, sir.

Q. And you tested with a view to that as well as relative comparison? A. If I understand you right, I was able to compare the results of the Chicago tests with the results of the published tests of Manganese steel in the general literature of the subject.

Q. And you had the Hadfield standard before you? A. Yes, sir, I had the Hadfield standard before me.

Q. He has published a good deal on the subject? A. He has published more than any other man on the subject.

Q. Do you remember any particular samples of the Taylor Iron & Steel Co.'s steel that you had before you, that were identified; did you have any car wheels, for instance? A. There were car wheels.

Q. How were they identified, as the Taylor Iron & Steel Co.'s steel? A. They had on the flange of the car wheel, cast in the wheels, the words "Taylor Company."

Q. As part of the original casting? A. Yes, sir.

(*Court.*)

Q. Was this a complete car wheel, this sample you refer to? A. Yes, sir, it was a complete car wheel.

(*Mr. Corbin.*)

Q. How large were these wheels? A. They were wheels of twelve and fourteen inch diameter.

Q. For mining cars? A. Yes, sir; wheels for mining cars.

Q. Is Manganese steel used for ordinary car wheels? A. Not to any extent, on account of its expense.

Q. Otherwise, is it well suited for the purpose? A. Oh, yes, sir.

(*Court.*)

Q. Do you know that, or is it your opinion only? A. It is the general opinion in the art.

Q. It is suitable for ordinary car wheels? A. Yes, sir.

Q. And it is only prohibited because of its cost? A. Yes, sir.

(*Mr. Corbin.*)

Q. The cost of Manganese is how much? A. I am not posted on the prices.

Q. Now, take up the tests detailed, what would you estimate as the standard of tenacity, that is to say, the tons or pounds per square inch of Manganese steel—you can use your own memorandum in answer to these questions? A. I was going to ask permission to do that, as there are several thousand figures, and you cannot carry those in your head.

Q. Yes, get your documents and use them while testifying?

MR. HARDIN—May I know, Professor, what it is that you have before you?

WITNESS—Certainly; it is the result of all these tests, that is, each and every test.

(*Mr. Corbin.*)

Q. What is your standard of tenactity for Manganese steel?

COURT—When were these tests made?

MR. CORBIN—I will get at that in a moment, your Honor.

MR. HARDIN—I would like to have it established first where he gets his standard.

A. I am about to give it. In a publication by R. A. Hadfield, in the Journal of the British Institute of Iron and Steel, Vol. II., pages 41 to 70, he makes one statement as follows: "That forged and quenched Manganese steel has a tensile strength ranging from forty-six to fifty-three tons," which would be converted into pounds, 103,400 to 118,720 pounds.

And in another place in the same reference he gives "sixty-one tons as the maximum."

(*Mr. Hardin.*)

Q. Maximum tenacity? A. Yes, sir, which would be in pounds, 136,640.

In the transactions of the American Institute of Mining Engineers, Vol. 23, in a paper by R. A. Hadfield, he gives another determination of the tensile strength of forged and quenched samples, as high as 73.8 tons, which would be in pounds, 165,312.

The average of all the records which I have found in the publications of the two journals, just referred to, is, in pounds, 126,475.

(*Mr. Corbin.*)

Q. How about cast steel?

COURT—He has not answered the question yet—you asked him for the standard—is that the standard?

(*Mr. Corbin.*)

Q. Did you accept that as a standard? A. I accepted that as a standard for wrought Manganese steel.

Q. Now, for cast Manganese steel, have you the standard for that? A. I find here a record of cast Manganese steel——

MR. CORBIN—I will refresh your memory from an affidavit which is your own affidavit and prepared by yourself from your own memoranda——

MR. HARDIN—I object to his using any such memoranda—it is not a fair examination.

(*Court.*)

Q. Won't you tell us the standard you used? A. The standard is from 32 to 34 tons.

(*Mr. Corbin.*)

Q. Where did you get that standard from? A. From an article by Mr. Hadfield.

Q. Do you accept that as the standard for cast Manganese steel? A. Yes, sir.

(*Mr. Hardin.*)

Q. What is the Hadfield reference?

MR. CORBIN—Do you want the book and page?

MR. HARDIN—Yes.

MR. CORBIN—It is Vol. 23, and printed in the Transactions of the American Institute of Mining Engineers for 1894, and is found on page 161.

Q. When were these tests made? A. You mean the tests at Chicago?

Q. Yes. A. In January, 1906.

Q. Last January? A. Yes, sir.

Q. How long did they continue? A. Something over two weeks.

Q. Give us in detail those tests, describe the test and give us the result?

MR. HARDEN—I want, if your Honor please, that this testimony should be taken subject to a motion to strike out the evidence, if it should hereafter appear that there was a failure to identify the articles under the tests. Mr. Potter is under cross-examination, and we do not know just where this examination may lead us. We have ascertained that three of these pieces or samples which are referred to by the professor were purchased from the Bucyrus Company, and, therefore, all that the witness can say about them is what he has been told with regard to them. He knows nothing about them except as he has been told by the manager of that concern, that they came from the Taylor Iron and Steel Company.

MR. CORBIN—They are comparative tests of steel as found in the market.

COURT—The evidence will be taken subject to any proper motion to be hereafter made.

(*Mr. Corbin.*)

Q. Proceed. A. There were thirty-six samples made by the American Brake Shoe and Foundry

Co. of cast bars which had subsequently been ground to a uniform cross section. The average tensile strength of these thirty-six bars was 81,425 pounds.

Now, from the Taylor Iron & Steel Co. there were eight samples of the same shape as those previously referred to, which were also cast and ground, and their average tensile strength was 65,844 pounds.

From the Pennsylvania Steel Co. there were five samples of the same general shape as the above, which also had been cast and ground, and the average tensile strength was 29,056 pounds.

(*Mr. Corbin.*)

Q. Did you give the thousandths of a foot? A. Not yet, I am coming to it.

Another set of tests was made on straight one-inch round cast bars, which had not been ground.

Of these, four samples were from the I. G. Johnson Co. of Spuyten Duyvil. Two of these samples broke in the act of testing. The average of these samples was 78,938 pounds.

From the American Brake Shoe and Foundry Co. there were two samples of the same form and size as the above, giving an average of 63,400 pounds.

Rectangular cast bars not ground, of the American Brake Shoe and Foundry Co., five samples gave an average of 64,608 pounds.

Of the I. G. Johnson Co. samples of the same size and shape, two samples gave the average of 82,475 pounds.

Square bars of irregular section, from the American Brake Shoe and Foundry Co., nine samples gave the average of 73,459 pounds.

From the Taylor Iron and Steel Co., bars of

the same general size and shape as the above two samples gave the average of 62,215 pounds.

In another test, complete Manganese steel wheels were subjected to a crushing test.

Four wheels from the American Brake Shoe and Foundry Co. bore an average load before becoming materially distorted, of 144,202 pounds.

From the I. G. Johnson Co. two wheels were subjected to and stood a crushing load of 158,185 pounds.

From the Taylor Iron and Steel Co., one wheel standing a crushing load of 125,590 pounds.

All of the wheels to which I have referred had a diameter of twelve inches.

Another crushing test was made on wheels of fourteen inches in diameter.

Of these, four wheels were of the Taylor Iron and Steel Co. make; they stood a crushing load of 114,822 pounds.

A lot of the same size, fourteen-inch wheels, made by the American Brake Shoe and Foundry Co., four in number, stood a crushing load of 146,337 pounds.

Another set of tests was made to determine the strength of these wheels under what is known as the "bending test." These bending tests were made on bars of square or rectangular cross-section.

Two of these bars were from the American Brake Shoe and Foundry Co. and they stood a bending load of 45,785 pounds.

From the Johnson Co. two bars standing a bending stress of 10,200 pounds.

Another lot from the American Brake Shoe & Foundry Co. of the same shape and cross-section as those of the Johnson Co. stood a bending test or bending load of 8,285 pounds.

(*Mr. Hardin.*)

Q. How many were there in that lot? A. Four bars. All of the samples to which I have referred hitherto were cast samples.

I now take up a set of samples which have been rolled or forged. These were all made by the American Brake Shoe and Foundry Co.

(*Mr. Corbin.*)

Q. What do you compare them with? A. With the literature of the art.

There were twenty-six of these bars and the average tensile strength was 103,203 pounds. That completes the record.

Q. Have you your tables there, showing the result of these examinations or tests? A. Yes, sir (handing papers to counsel.)

Q. These sheets are produced here and marked A to H, and they show the details of the examinations or tests? A. They are marked "A, B, C. D, E, F, and H"—there was no "G" at any time.

Q. These show the details of these tests, do they? A. They do, yes, sir.

MR. CORBIN—I offer these sheets in evidence.

MR. HARDIN—I suppose these are all taken subject to the motion to strike out that was reserved with reference to the testimony of Prof. Langley?

COURT—Yes.

Marked Exhibits D 4, to D 10, inclusive.

(*Mr. Corbin.*)

Q. These are in your own handwriting? A. No, sir; they were copied under my immediate super-

vision and most carefully compared with my original.

Q. It is a correct statement of the result of those tests, is it? A. Yes, sir.

Q. Have you prepared any other exhibit showing the comparison of these different samples? A. I have.

Q. What have you got there? A. I have three sheets marked "No. 1, No. 2 and No. 3," in which the general results of the tests have been plotted to scale, or graphically.

Q. What do they show? A. Sheet No. 1 shows the record of the best single specimen of each maker of cast Manganese steel of these tests. It also shows the record of the averages of all the samples from each of the four makers referred to in my testimony.

Q. And the next one shows what? A. Sheet No. 3 shows a comparison of the rolled and hammered bars of these samples, previously testified to.

Sheet No. 2 shows the record of the best samples, and also of the average samples of the wheels which were tested.

Q. I did not understand that you gave us that wheel test? A. Yes, sir; I did.

MR. CORBIN—I offer these papers in evidence.

MR. HARDIN—I suppose they will be taken subject to the same objection and motion as the other.

COURT—Yes.

Marked respectively Exhibits D 11, D 12 and D 13.

(*Mr. Corbin.*)

Q. Why did you take a different number of these samples of these different specimens? A. Because

we were not able to get as many different samples as the American Brake Shoe and Foundry Co. made at their own foundry.

Q. And they furnished you with the samples? A. Yes, sir.

Q. I am not sure that we got the load which the wheels bear on the test—did you give us that? A. Oh, yes, sir; I think I did.

COURT—Yes, he gave us that.

(*Mr. Corbin.*)

Q. Now, as to the general result—how did you find that the Manganese steel made by the American Brake Shoe and Foundry Co. compared with the Hadfield standard?

MR. HARDIN—I object to the question—the tests have been produced and they speak for themselves. They are testified to, and they are in evidence, and the average figures are in evidence—they must speak for themselves.

COURT—I suppose that is so—we have the patents and we have his expert evidence—you are asking him now to tell us the result of what he testified to. We do not need an expert to do that. We can get at that result ourselves—I shall sustain the objection.

(*Mr. Corbin.*)

Q. What would be the quality of the steel made by the American Brake Shoe and Foundry Co. as indicated by these tests—as compared with the standard from literature, and as compared with the other material which you examined? A. The

record of the test of the cast samples made by the American Brake Shoe and Foundry Co. in my opinion, show that their quality and strength is superior to the standard for cast samples even in the Hadfield article previously testified to.

For the wrought and forged samples, the best product of the American Brake Shoe and Foundry Co. is superior to the standard set up in literature.

That in general the product of the American Brake Shoe and Foundry Co. is superior to those of the other three makers, whose samples we tested, with the exception of the Johnson Co., in which the tensile strength of the latter slightly exceeds that of the American Brake Shoe and Foundry Co.

Cross-examination by Mr. Hardin.

Q. Have you been at the Hadfield foundry in Sheffield, since 1889? A. I have not.

Q. I understood you to say that you yourself had made some Manganese steel, by the open-hearth process, at Pittsburg 1892? A. Yes.

Q. At the Crescent works there? A. Yes.

Q. How much Manganese steel did you make there? A. Not a very large amount, perhaps fifteen or twenty tons.

Q. Experimental work? A. Experimental work on a manufacturing scale, however.

Q. Was it experimental work? A. It was experimental work on a manufacturing scale.

Q. How long were you with the Crescent works? A. I have been with them as consulting metallurgist for twenty years, and as resident metallurgist, in charge of the operations of their plant, for three years.

Q. What was your relations to them in 1892, at the time you made this Manganese steel by the open-hearth process there? A. Resident metallurgist.

Q. How long had you been such resident metallurgist, at that time? A. Since 1889—no, 1888, it was.

Q. And how long did you continue resident metallurgist after that? A. I left in 1892.

Q. How shortly after this making of this Manganese steel by the open-hearth process there, did you leave? A. Some few months, some three, four or five months after.

Q. Now, was this a continuous manufacture, or was it on several occasions? A. On a number of occasions.

Q. Fifteen or twenty tons altogether, you made? A. Yes, sir.

Q. For what purpose was the steel used? A. The steel was cast in ingot moulds, for the purpose of seeing whether tool steel for certain special purposes could be advantageously manufactured from it.

Q. And you found that it could not be done, didn't you? A. We found that the manufacture of tool steel from it for the purposes we desired to use it was not practicable.

Q. What did you do with the Manganese steel you manufactured there, did you throw it into the scrap heap, finally? A. It went into the scrap heap finally I think.

Q. It never got into the market? A. I think not.

Q. So after all, it was all for the purpose of determining whether you could get a Manganese steel for the purpose of making tool steels for certain special purposes? A. For two purposes.

Q. For two purposes only? A. To that extent, yes.

Q. Before that I understood you to say that the Manganese steel you made was cast into ingots? A. It was.

Q. Now, after that ingot was made, did you

make it into any other special form? A. Other than ingots, no, sir.

Q. Were those ingots cast in iron moulds as ordinary ingots are cast, or were they cast in sand moulds? A. In iron moulds.

Q. Iron moulds? A. Yes, sir.

Q. Did you make any tests at that time for any other purpose than to determine whether this Manganese steel you were trying to make by the open-hearth process was fit for two purposes or not? A. No, sir; no other tests.

Q. What percentage of Manganese did you put in that steel you made out there? A. My best recollection is, that I ranged from five to fourteen per cent.

Q. And on the different occasions, when you made these experiments producing as the case may be, five or fourteen per cent. or some point in between? A. Yes, sir.

Q. And when you refer to the manufacture on different occasions, you mean that on different occasions you were making a Manganese steel, with a different proportion of Manganese in it? A. Yes.

Q. So that, after you had made one casting, of five per cent. Manganese for instance, the next casting was not an effort to duplicate that, but an effort to make something else, was it not? A. A different percentage, yes, sir.

Q. Did you make any tests of the tensile strength of that steel you produced out there? A. No.

Q. What tests did you make? A. The determination of whether it was suitable for tool making; the purpose was carried on in another department, and not altogether under my immediate charge.

Q. And all you know then is, that it turned out not to be suitable for that purpose? A. Yes, sir.

Q. You have not any information then on which you could base any judgment to-day, whether that

article which you made in 1892, at Pittsburg, was a good article of Manganese steel or not—all you know is, that it was an article that had a certain proportion of Manganese in it, and that you found it was not suitable for the purposes for which it was made? A. Yes, sir; I did not know by experimentation whether it would be suitable for castings or not.

Q. And you could not tell by the looks of it? A. No, sir.

Q. How long did you spend in an inspection at Sheffield, of the Hadfield works, when you were Mr. Hadfield's guest in 1889, and when you were taken by Mr. Hadfield to his foundry? A. A portion of one day.

Q. The law does not take into account portions of days, unless the portion of the day is defined? A. Oh, well, perhaps two or three hours; I do not remember exactly now, the time.

Q. Is the Hadfield works a large and extensive works? A. It was not at that time, at least not the Manganese steel foundry.

Q. A small foundry? A. Yes, sir.

Q. Did you go through the rest of his works besides the Manganese steel portion? A. I went through a portion of them.

Q. You say the works were small, that is the Manganese steel portion of his works were small—now what have you to say as to the rest of his works? A. They were fairly large.

Q. What other portion of the works did you go through? A. I went through the Manganese steel and the Chrome steel portions of the works.

Q. Do you pretend to say that you brought away from those works, with you, all that there was to know about the manufacture of Manganese steel? A. I did not say so.

Q. Well, do you say so now? A. No, sir.

Q. Did you consider yourself competent to have immediately undertaken the manufacture of Manganese steel, without any further instruction at that time, after that visit to Sheffield? A. Yes, sir.

Q. And produce the same article with the same physical properties that Mr. Hadfield produced? A. No, sir; I do not feel sure of that.

Q. Do you mean to say that you could have come away from the Hadfield works in Sheffield, after that inspection, and gone right to work and made Manganese steel, in the sense that you could have made a steel that had Manganese in it? A. Yes, sir; and it would have been a good steel.

Q. And yet it might not have had the properties necessary for a given use, is not that so? A. Yes, it might not have had the properties necessary for a given use.

Q. Now, the next place that you saw Manganese steel made, was at Chicago Heights plant of the American Brake Shoe and Foundry Co. in 1896, you say? A. Yes, sir; that is correct.

Q. Now, during the interval from 1889 until 1906, you had not seen Manganese steel manufactured anywhere, had you? A. No, sir.

Q. Now, how much time did you spend at the American Brake Shoe and Foundry's plant in 1906? Portions of three days.

Q. What part of the plant did you spend it in? A. Probably in the part devoted to the manufacture of Manganese steel.

Q. Watching the operation of making Manganese steel? A. Yes, sir.

Q. What particular portions of the process? A. All of it.

Q. From the cupola to the sand mould and beyond? A. Yes, sir.

Q. All the way through? A. Yes.

Q. When was that visit? A. That was in October, 1905.

Q. That is a little over a year ago then? A. Yes, sir.

Q. Did you take part in the operation of making Manganese steel while you were there? A. Not other than as a witness.

Q. In whose company were you there? A. Mr. Potter's chiefly.

Q. Did you see the steel blown? A. I did.

Q. You did not blow any yourself? A. No, sir.

Q. And you have not any information about the making of Manganese steel practically, except from your general knowledge of the Bessemer process, have you? A. Yes, sir, from what I saw at the Hadfield foundry, and my own experimentation in making it.

Q. And your observation at the Chicago Heights plant? A. Yes.

Q. And you say there is nothing in making Manganese steel until after the moulten metal reaches the steel ladle? A. I do not say so.

Q. Then I misunderstood you. A. I did not say there was nothing in it.

Q. Didn't you say in response to a question by Mr. Corbin, that the process was the ordinary Bessemer process until the molten metal was poured into the steel ladle? A. Well, that is not saying that there was nothing in it, until it got into the ladle.

Q. I know that the impression that was conveyed to my mind as a listener was just as I asked you—but I may have been mistaken—anyhow, will you please tell me what you mean? A. I mean that the process for the making of Manganese steel is not so very different from the making of ordinary steel, that the difference in making Manganese steel is after the contents of the converter are

poured into the ladle; that is what I said I think, and what I mean.

Q. Now, then, in the making of steel by the ordinary Bessemer process, is it true or not, that there are no differences in the methods employed in different steel making plants, before you reach the steel ladle? A. There are minor differences, there are not any important differences.

Q. And there are special methods in every plant, are there not? A. Special methods of blowing, yes, sir.

Q. And special methods of mixing? A. Mixing the charge for the converter?

Q. Yes? A. Yes, sir.

Q. And are there not special methods for the mixing of the charge for the cupola? A. Only special in the sense that they determine the certain brand or kind of iron to be mixed together.

Q. Are they known? A. Yes, sir; they are generally known.

Q. And do you mean to say that you can tell by the steel coming into the steel ladle from the converter, what the original mixture in the cupola was? A. Not what particular brand of irons were employed, no sir.

Q. And is it not true, that different steel makers have very pronounced ideas on the effect of the original mixtures put into the converter? A. No, sir, that is not true; there is very little variation of opinion as to what the mixtures ought to be.

Q. Would you call a Manganese steel a special steel? A. Yes.

Q. Well, does that modify your answer any? A. Not materially, because I have already testified that the principal variations in the making of Manganese steel is after the contents are poured into the ladle.

Q. Do you mean that whether it is a fire of wood

or a fire of coal, it is a fire all the same, without regard to the fact as to whether it is a fire from wood or a fire from coal? A. No, sir; it is very like the principles followed in the making of a cup of coffee, the question of how much milk or how much sugar you should put into it.

Q. Then the coffee does not make any difference? A. Oh, yes, sir, it does; you want a good brand of coffee.

Q. Some grains of sand might have something to do with the quality of the coffee, might it not? A. Yes, sir.

Q. And is not that the same in the making of steel, that the chemical properties of the iron that goes into the product has a great deal to do with the resulting product? A. Yes, sir.

Q. And every plant has its own notion as to the best product to secure a good article, economically, has it not? A. I presume so, yes, sir.

Q. You would not undertake to say that steel founders that you have any acquaintance with have not certain methods peculiar to themselves, which methods they regard as of value in the making of their product? A. I don't know of any such in the manufacture of ordinary merchantable steel and rolled steel, the only difference is in the kind of iron they purchase to make it with.

Q. We will eliminate ordinary steel from our talk, and talk about the places where they make special steel—do they not have methods peculiar to themselves, which they regard of special value in the making of their products? A. Well, I presume makers of special steels have their preference for certain grades of iron.

Q. And do they not have their processes, special processes, by which they endeavor to get the result which they do get in their product? A. If we were

speaking of a special steel, as a class, I should say yes to that.

Q. And the only special steel that that is in a sense true of, is the Manganese steel, is it not? A. Well, it is much less important in Manganese steel, I think.

Q. Manganese steel then is something that there is no secret processes, or special methods employed or in use in any particular places of manufacture; all the world knows all there is to be known about the making of Manganese steel, there are no secret processes in the making of Manganese steel—do you say that? A. No, sir; I do not say that there is no secrets, but I do say that there is no utility or sense in having those secrets.

Q. Then people may have those secrets, and special methods, in steel plants, may they? A. Yes, sir; they may.

Q. Then as I understand you, they are of no utility; that is what you wish to impress upon us, that the secrets are of no utility? A. No, sir; they are of no utility at all, as far as I can see, and I think that there is enough in the general literature on the subject to enable anyone to make good Manganese steel.

Q. That does not answer my question; my question was, that although you say that people may have these secret processes of methods, yet that they are of no utility; do you say that there may not be methods, or there may not be processes, in the application of these things, which you speak about as being of common knowledge, that may be peculiar to these places that have these secret processes or methods? A. Yes, sir; if you mean simply the details of the shop manipulation, then I say that every shop has a little different method of this kind, but they are not radical.

Q. Are they published as a rule? A. No, sir; they are not.

Q. They are generally confined to the knowledge of the men in charge of the work in the plant, are they not? A. Yes, sir, generally.

Q. Of course then you don't know what these processes or secrets were, if you merely walked through a plant, do you? A. I might or I might not.

Q. It would depend upon their character, would it not? A. Yes.

Q. Then all I understand you to say is, that there is enough published on the subject of making Manganese steel to inform anyone how to produce an article, which will contain a high enough percentage of Manganese, to make Manganese steel? A. Anyone skillful in that art could.

Q. It needs no previous experience in the making of Manganese steel, do you say that? A. No, sir; I don't say that.

Q. What do you say then? A. I say that there is enough published in the Hadfield patent, and in the general literature on the subject, to enable any man already skilled in the art of making steel, to produce a good Manganese steel.

Q. Without experiment? A. Yes, sir; without experiment, I think.

Q. And the first heat he would produce, having obtained this general knowledge from the books and from the patents, etc., and being a skilled steel maker, his first effort is as likely to be as successful as his fiftieth? A. No, sir; I don't say that, because you know we all improve.

Q. What do you mean? A. What I mean is, to say, that he could produce good Manganese steel.

Q. That he could produce a good Manganese steel casting? A. That he could produce a casting that could serve a useful purpose; I don't say

that he could make the best Manganese steel castings, I don't mean to say that.

Q. Then you think that the experimentation and the constant work on the making of Manganese steel, is a good thing? A. Yes.

Q. And from that experimentation and that experience generally comes certain methods and processes that are a peculiarity of that plant in which these experiments take place? A. The small details, not usually the large operations.

Q. And you cannot tell by the chemical analyses of the product, what methods has been pursued to get that product, even though it be by a chemical analysis shown to be the same grade of Manganese steel that is produced somewhere else by some other manufacturer? A. You cannot tell the details of the process by analysis. You can tell the quality of the product though.

Q. You mean, when speaking of good Manganese steel, that you are speaking of the result that is secured without reference to the methods that may be pursued in the manufacturing of the material to get that result? A. I say that the methods followed according to the Hadfield patents and the literature published on the subject, would enable a man skilled in the manufacture of steel, to produce a steel which would be a good result—if I understand your question.

Q. Well, is "good" a relative term? A. It does not mean absolutely the very best.

Q. Does it mean "good" for all purposes? A. Good for most of the purposes for which Manganese steel is employed, not all purposes, no, sir.

Q. And without reference to the shape or the use of the article? A. That is another matter entirely, you bring in the art of moulding, which is another thing altogether.

Q. That is what I am trying to get at; are you

talking when you speak of good Manganese steel, do you mean a steel which being subjected to a chemical anaylsis, will disclose a proportion of Manganese, high enough to make a Manganese steel as distinguished from other steel, is that what you mean? A. That and when tested with other steels, will show a fair tensile strength and elongation.

Q. In what shape? A. Any shape suitable for testing.

Q. A bar for instance? A. A bar or a wheel.

Q. Or an ingot? A. A bar or a wheel.

Q. You do not pretend to say that these various establishments that you have mentioned as making Manganese steel, have not these methods and details, if you want to call them that, peculiar to themselves, that you say is to be found in almost every manufacturing plant? A. My impression is that they have not, because they did not say anything to me in regard to their having secrets, and did not ask me to refrain from telling anything and everything that I saw in this plant.

Q. Where was that you refer to now? A. At the American Brake Shoe and Foundry Co.

Q. Then, you think there is nothing peculiar there, do you? A. No, sir; I haven't any reason to think that they have anything peculiar there; they did not mention it, and I did not discover it.

Q. And because they did not tell you not to divulge anything that you saw there, or as you put it, did not ask you to refrain from telling anything and everything that you saw there, you have concluded that what they have there, is exactly like what they have in other places where Manganese steel is manufactured? A. No, sir; I don't say that; I say they apparently haven't any secrets, and that they do produce a good article of steel.

Q. It does not follow that other people that pro-

duce a good article of steel, produce it as they do it, does it? A. No, sir; but I haven't any personal knowledge or evidence that they make any better steel with their secrets, than the American Brake Shoe and Foundry Co. does, without their secrets.

Q. That is not an answer to my question—it does not prove, that other people that produce a good article of steel, produce it as they do it, does it? A. No, sir.

Q. And you don't know the methods pursued by the Taylor Iron and Steel Co. beyond what might be disclosed, if they use those disclosures in the Hadfield patent? A. And another patent.

Q. You don't know what their practice may be, outside of what they get from the patents? A. No, sir.

RECESS.

(At the request of Mr. Corbin, the further cross-examination of Prof. Langley suspended for the purpose of examining a witness who desires to leave early.)

Mr. Hardin having no objection.

CHARLES E. BILLIN, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Chicago, Ill.

Q. What is your business? A. A manufacturer of car wheels and axles and for mining machinery.

Q. In connection with that business, did you handle Manganese steel car wheels? A. Occasionally.

Q. Have you purchased during the course of your business Manganese steel wheels from the

New Jersey State Library

American Brake Shoe and Foundry Co.? A. Yes, sir.

Q. State whether or not during the month of October, 1905, you had an order from the American Brake Shoe and Foundry Co. for any such mining car wheels? A. We had an order for two twelve-inch wheels.

Q. Did you fill that order? A. Yes, sir, we filled that order.

Q. They were two mining car wheels that you had previously purchased from the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Were there any others—in January? A. Later, in December, I think, they asked us to furnish some more Manganese steel wheels, and we had not anything on hand but fourteen-inch wheels, and we sent them four fourteen-inch wheels.

Q. That you had purchased from the Taylor Iron and Steel Co.? A. Yes, sir.

Q. Were they all perfect wheels? A. No, sir, one of the twelve-inch wheels the hub was cracked.

Q. Did you see any of these wheels at any time after that? A. I saw them after they had been destroyed by a test and forced out of shape.

Q. Can you tell how they were marked? A. The twelve-inch wheels was marked "T 1," the cracked twelve-inch wheel I did not see again. The fourteen-inch wheels were marked respectively "T 2, T 3, T 4 and T 5."

Q. The wheels thus marked were the same wheels that you had sold to the American Brake Shoe and Foundry Co., and which you had purchased from the Taylor Iron and Steel Co.? A. Yes, sir.

Cross-examination by Mr. Hardin.

Q. When did you sell these wheels? A. The two twelve-inch wheels were sold in October, and

the four fourteen-inch wheels were sold in December, 1905.

Q. When did you buy them? A. About a year and a half before that, I should judge, in 1903.

Q. Were you a general dealer in car wheels? A. No, sir, at the time they were bought I was the manager of the American Engineering Works, and they were making mining cars.

Q. And you bought these for the American Engineering Works, did you? A. Yes, sir.

Q. Where were they until you sold them to the American Brake Shoe and Foundry Co.? A. In the yard, or in the shop.

Q. To whom did they belong when you sold them to the American Brake Shoe and Foundry Co.? A. They belonged to me.

Q. When did you purchase them? A. I purchased them from the American Engineering Works when they went out of business.

Q. Which one of the wheels had the broken hub? A. One of the twelve-inch wheels, the hub was cracked.

Q. Did you mark those wheels, when you sold them? A. Yes.

Q. How did you mark them? A. With a cold chisel, in the bushing of the hub. The wheels were of the Anaconda pattern and with a cast iron bushing in the hub, and the wheels were marked "Taylor Manganese."

Q. Were the fourteen-inch wheels marked the same way? A. I think they were.

Q. I mean, did you mark them? A. Yes, sir.

Q. When they left your possession? A. Yes, sir.

Q. And the way you know that they are the same wheels that you subsequently saw, was by the identification of the marks you yourself put on the wheels? A. No, sir.

Q. How do you know the wheels you saw after-

wards were the same wheels you sold to the American Brake Shoe and Foundry Co.? A. The bushings were out of the wheels when I saw them again, but they had the same markings on the inside of the flange, with a slightly indented letter "Taylor Manganese."

Q. Did they have on them anywhere the name or the initial of the Taylor Iron and Steel Co.? A. I think they merely had the word "Taylor"—the letters were very indistinct, though.

Q. How much of those wheels were of manganese? A. All except the bushing and the little babbitt in some of them, holding the bushing in place.

Q. Have you used a good many of the steels of the Taylor Iron and Steel Co.? A. I have used both their Manganese steel and their Lahlatang.

Q. Have you sold these wheels in large quantities? A. Several hundreds.

Q. Beginning when? A. Probably about 1901, or, maybe, 1900.

Q. Down to what time? A. Down to 1904, or the end of 1903.

Q. Are you still in business? A. Yes, sir.

Q. You are not handling any of the Taylor Iron and Steel Co.'s wheels now? A. I have not been able to get others, or I would have handled them.

Q. You consider them a good article? A. I consider them a very good article, yes, sir.

Q. What use were these wheels you have been describing put to? A. The particular wheels?

Q. Yes, the type of wheel that you sold the American Brake Shoe and Foundry Co.? A. They were used for mining cars.

Q. On the surface, or on grades, or in the mine? A. Both underground and on the surface.

Q. These wheels that you sold to the American Brake Shoe and Foundry Co. were made for the purpose of being resold or reused by you, in service

in the mines, were they? A. We did the machine work on them, and we sold them, in connection with cars, to the mining companies.

Q. And these wheels were intended to be so used, when you got them, were they? A. Yes, sir, we ordered more than we actually needed on the last order, and they were some that were over, that the American Brake Shoe and Foundry Co. got.

Q. And they were kept out of that use because of this disposition, were they? A. Not at all.

Q. How long were they kept in the yard? A. I think for a year, or a year and a half, they were in the shed in the yard.

Q. They had never been in the cars? A. No, sir.

Q. Just exactly as you bought them, were they? A. Yes, sir, they were just exactly as when we bought them.

Q. What do you do with them? A. When we use the wheels, we bore the bushing, and put the axle in. Now, these wheels had never been machined, and they were just as they came from the Taylor Iron and Steel Co. works to us.

Q. With no bushings in them? A. They cast the bushings in them, they were not bored.

Q. Were they bored when you sold them? A. No, sir, we never bored them until they were ready to put them on the axles.

Q. Did this broken hub prevent that particular wheel from being used, put in service? A. Yes, the wheel was cracked.

Q. And that wheel could not have been used in service, could it? A. No, sir.

Q. Was that crack there when you bought it? A. It was there when we received it, we bought it, when we ordered it, and it was there when we received it. It had not been noticed when we received it, and it had not been returned.

Q. Possibly it was made after you bought it? A.

Possibly, but not probably, it was probably a shrink crack.

Q. Did you have to keep such wheels in your dealings with the foundry? A. Well, if we had noticed it, when we received it, we would probably have sent it back to the foundry.

Q. That wheel you could have returned, then? A. Yes, sir, we could have returned that wheel.

Q. To whom did you deliver these wheels? A. We delivered the two twelve-inch wheels; they were delivered to the office of the American Brake Shoe and Foundry Co., in the Western Union Building.

Q. At what place? A. In Chicago.

Q. How about the fourteen-inch wheels? A. I think they were shipped by freight to the Chicago Heights plant of the American Brake Shoe and Foundry Co.

Q. And where did you next see them? A. I saw one of them in the office of the American Brake Shoe and Foundry Co., after it had been crushed in the test.

Q. Where did you see the other three? A. I do not remember.

Q. Did you ever see the other three? A. I could not swear whether I saw them or not?

Q. Which one was it you did see? A. The twelve-inch wheel.

Q. The broken one? A. No, sir.

Q. Have you any way of identifying that wheel, except that it had the words "Taylor Manganese" on the rim? A. On the inside of the flange.

Q. Well, on the inside of the flange? A. Except the inside, where it was broken, I saw the number "T 1" stamped on it.

Q. Did you see that put on it? A. No, sir.

Q. Was that your mark? A. No, sir.

Q. You put your mark in the bushing? A. Yes.

Q. And the bushing was gone when you saw it again? A. Yes.

Q. And you do not know whether it was the same wheel or not then? A. Except the mark "Taylor Manganese."

Q. You had seen that on several hundred wheels, hadn't you? A. Yes, sir.

Q. And all you could tell is that you saw it on one wheel in the office of the American Brake Shoe and Foundry Co., in Chicago—it might have been some other wheel that you had sold and marked, might it not? A. It might have been any other Taylor wheel.

Q. Did you go to the office specially to see that wheel? A. No, sir, not specially. I was there one day, and it was shown to me, the way that it had been broken.

JOHN W. LANGLEY, recalled for further cross-examination, saith:

Cross-examined by Mr. Hardin.

Q. The first radical difference you told us of, in the making of Manganese steel, was found in the introduction of the physic? A. Yes.

Q. You told us there were two methods—that the usual process was to add the physic after the metal was poured from the converter into the ladle, did you not? A. I did.

Q. And that the other was occasionally practiced? A. Yes, sir.

Q. By the other, I mean the introduction of the physic before the heated metal was poured into the steel ladle? A. Yes, sir.

Q. What is your actual knowledge about that practice, from personal observation? A. I think in the cases in which I saw it employed, outside of my own work, the physic was put into the ladle

before the contents of the converter were poured upon it.

Q. That does not answer my question—my question was, "What is your actual knowledge about that practice, from personal observation?"—that is the practice of introducing the physic before the hot metal is poured into the steel ladle? A. I have just stated what my knowledge was, where I have seen it done, it was done by putting the physic in the ladle, and putting the molten metal into the physic in the ladle.

Q. Where did you see that done? A. At Chicago heights.

Q. Is that the only place you saw it done? A. Yes, sir.

Q. And that was in October, 1905? A. Yes, sir.

Q. Now, it is true, is it not, that the steel works, whether Manganese steel works or makers of other kinds of steel, have physics of their own composition, have they not? A. No, sir, it is not true.

Q. Then all steel works use exactly the same physic, the same chemical constituents, and exactly the same quantities, do they? A. Not at all; they purchase various ingredients in the market and use them in making their steel; they did not make the physic themselves.

Q. Do they go into the market and buy the physics already made? A. Yes, sir, usually.

Q. Is that the custom where they make special steels? A. Yes, sir.

Q. Do you mean they buy the materials for the making of the physic, or they buy the physic actually chemically combined? A. They buy the materials which they add to the steel, for the purpose of attaining certain results in the steel.

Q. And they add these various materials for the making of this physic, do they? A. The word

"physic" does not mean anything to me outside of its application in this suit. In this suit the word "physic" is employed to indicate various additions, whether one or many, added to the steel in the converter to change it into Manganese steel.

Q. You never heard the term "physic" until your association in this suit, did you? A. I have read of the term physic, but I never heard it used outside of this suit.

Q. Did you know what it meant when you read about it? A. I did.

Q. You have never known of the practice of introducing the elements which are in this suit introduced, through what we have termed "physics," into the iron after it left the converter before this suit? A. Yes; I have known of that practice.

Q. Then what did you call the practice as known to you? A. I generally call them "additions."

Q. Now, these "additions" then, if you like that term better, are precisely the same in all steel works, are they not? A. No, sir; they are not.

Q. Then they vary in steel works, do they? A. They do.

Q. And each steel maker has his own kind of "additions" and quantity and quality? A. The differences are chiefly in quantities employed.

Q. And the particular quantities of these "additions" in use at different steel works vary according to the notions of the steel makers using them, do they? A. Yes, sir.

Q. There is no rule that you know of laid down in the books applicable to every kind of steel that is to be made? A. There are rules which govern the general conditions of these modifying elements.

Q. But in the manufacture of steel, is it not the constant practice to vary these known quantities? A. They vary them usually only as a result of the

variation of the pig metal which they may be employed in.

Q. Yes; so that the particular steel to be made, or the needs of the raw material in the cupola, call for different "additions"? A. They do, but that is a well-recognized scientific analysis, and the amount to be added is indicated by the scientific analysis of the steel, it is not governed by whim.

Q. You do not mean to tell us that the preparation of these "additions" are not made in different works according to the usages and practices of that particular works, do you? A. No, sir; I do not mean to deny that.

Q. And you do not pretend to say that a steel works in Pittsburg, for instance, would necessarily use the same "additions" or "physic" that a steel works in Massachusetts would use, do you? A. If they were to produce the same commercial article they would have to use identically the same physic, if they were making the same kind of special steels they would use pretty nearly the same additions.

Q. You say "pretty nearly"? A. Yes, sir.

Q. Is there not some definite understanding as to the quantities to be used? A. Yes, sir; and these quantities would vary in being determined by the cost of the operation, and the amount of oxidation.

Q. And the amount of cost has something to do with it then, has it? A. Yes, sir.

Q. And there are differences in these additions in different works, are there not? A. There are some variations, yes, sir.

Q. Are these variations important in reference to the result intended to be secured in the manufacture of special steels? A. Why, yes, sir; they are important.

Q. What is the composition of the physic you saw

used at Chicago Heights? A. I did not analyze that material.

Q. And you could not tell from looking at it? A. I can tell in a general way by looking at it.

Q. What was it then? A. Ferro-manganese.

Q. Anything else? A. That is all that I saw.

Q. How much ferro-manganese? A. Enough to produce fourteen per cent. or thereabouts of manganese in the final steel.

Q. How much is that? A. That is enough ferro-manganese usually to allow for a certain amount of oxidation in the melting, approximately about five per cent. or less.

Q. How much ferro-manganese does that require? A. Allow me to figure it out.

Q. I want your memory on it? A. It is a matter of direct calculation.

Q. What is the formula? A. From seventeen to eighteen per cent. of the weight of the steel will be the required weight of the ferro-manganese.

Q. Does it make any difference whether you have seventeen or eighteen per cent? A. The difference would be in that case, you would have merely in the one instance a little less manganese in the fininshed steel.

Q. Now, do you know what percentage of ferro-manganese was being used for the business at Chicago Heights from the observation that you made, without opportunity fore chemical analysis, or only what they told you there? A. I do not know from personal observation.

Q. They told you about it? A. Yes, sir.

Q. Do you know whether there was anything else in this physic besides the ferro-manganese? A. Not of my own knowledge; no, sir.

Q. So that after all you did not know just what was in the physic used at Chicago Heights, even

from your own personal observation? A. Not from personal observation, no, sir.

Q. Or from experiments made by yourself? A. No, sir.

Q. The quantity of manganese that you secure in the steel is of great importance in the quality of the castings, is it not? A. The quality of the steel is determined largely by the quantity of manganese which it contains, whether it is used for the purposes of casting or any other purpose whatsoever.

Q. And for different uses you need different quantities of manganese, do you not? A. Will counsel kindly define what the different uses are before I answer that question?

Q. Steel manufactured for different uses? A. I cannot answer that without knowing what uses you have in mind.

Q. You have told us that all steel containing more that ten per cent. of manganese is called Manganese steel, do you recollect that? A. Yes.

Q. Now, does it not make any difference whether you have ten per cent. or eighteen per cent. of Manganese steel for an intended use? A. It does.

Q. It makes a lot of difference, doesn't it? A. Yes, sir.

Q. And the result as to quantity of manganese in the casting is usually due to the physic, is it not? A. It is largely due to the "additions" which are employed, yes, sir.

Q. You and I mean alike, when you say "additions" and I say "physic," do we not? A. It means the same thing then, I suppose.

Q. In your work at Pittsburg, to which you referred, you had to experiment in the additions of different quantities of manganese to secure different quantities of manganese in the casting, did you not? A. It was a matter of very simple experimentation.

Q. But it requires experimentation? A. Of a very slight order, yes, sir.

Q. You told us that in your experience there was no greater difficulty in making Manganese steel than there was in making ordinary steel? A. I said so, yes, sir.

Q. Do you mean by that that there is no more difficulty in making steel containing a percentage of manganese exceeding ten per cent. than in making a steel with a less percentage of manganese, or do you mean that there is no more difficulty about making Manganese steel for a special particular use in the form of a casting than there is in making a steel casting of any other steel? A. I mean to say that the production of Manganese steel for the purpose of making a casting is, in my opinion, no more difficult than it is to produce ordinary steel for making a special casting.

Q. Is that opinion based on your personal experience? A. So far as making ingot castings are concerned, yes, sir.

Q. Ingot castings of Manganese steel and ingot castings of common steel are of the same type, shape, thickness and length, are they? A. Oh, yes, sir; they run into ingot moulds and of course they take whatever the shape of the mould is.

Q. They are substantially alike? A. They are substantially alike generally, yes, sir.

Q. I think you told us Manganese steel is too hard to machine? A. It is too hard to machine, yes, sir.

Q. Ordinary steel you can machine without any difficulty, can you? A. Yes, sir.

Q. Is it not more difficult to produce a casting which must originate in the form in which it is ultimately to be used, than to produce a casting which you can put into a machine and shape up afterwards? A. I have already stated that I

have had no personal knowledge of casting Manganese steel in sand moulds, therefore I cannot answer that question.

Q. With reference to these tests that you made at the Hunt Co.'s plant in Chicago, from whom did you receive these various pieces of castings that were subject to the tests? A. They came through the hands of Mr. Potter.

Q. Where did you receive them? A. At the mechanical laboratory of R. W. Hunt & Co.

Q. Can you tell from the appearance of these castings that you received for the purposes of these tests, whether they were originally cast in the shape and size in which they came to you, or whether they had been cut from castings, larger castings of another shape and size? A. Many of them I can tell by a simple inspection that they came directly from the sand without further modification; others showed marks of machining.

Q. Some of the castings you referred to as being ground and some as not being ground, was there any difficult in ascertaining whether they were originally cast or whether they were parts cut from other castings—now, this is in those that were ground and those that were not ground? A. No, sir; they showed the sand marks at the end.

Q. Can you tell us from these tables which of these samples were originally castings and which were cut from other castings? A. On Sheet "B" the first nine samples were rough castings, which had not been machined.

On the same sheet there are five samples of which I am not positive whether they were cut after cast or not.

On Sheet "H" all of the samples had been machined or ruled.

On Sheet "D" all of the samples were originally castings and had not been machined to any greater

extent than was necessary than to insert a hub in the wheel.

Q. That sheet refers solely to wheels, does it? A. Yes, sir; that is Sheet "D.'

In Sheet "A" the bars were in general sand cast and were ground only in their centres. But in some of these samples, my recollection is that they had been cut from larger pieces of metal.

(*Court.*)

Q. What do you mean by saying that they were machined? A. I mean that they were ground in the lathe, with an emery wheel, that is the only way they can work the metal.

(*Mr. Hardin.*)

Q. These pieces cut from the larger castings were not cut by a tool that could cut ordinary steel, were they? A. I don't know how they were cut, I did not see it done.

Q. Was there any more difficulty about cutting them than in cutting ordinary steel? A. Oh, unquestionably.

Q. You did not see them cut, you say? A. I did not.

Q. You do not know what care was taken to prevent the heating of the adjacent parts while the cutting was going on, do you? A. I did not see the cutting, and I do not know how it was done.

Q. If the adjacent parts were heated in the process of cutting, it would affect the steel for the tests you made or might affect them? A. No, sir; I do not imagine that the heating was very great, not more than is done in the ordinary use of an emery wheel.

Q. It makes no difference whether the casting is heated up or not, you think? A. No more than

is done in the ordinary use of an emery wheel; that would make no difference, I think.

Q. But you did not do it? A. No, sir.

Q. And you don't know but that the heating arising from what was done to these castings would be sufficient to effect the tests or not? A. Well, I don't know about that. If the cutting of the specimen was improperly performed then it would affect them, in so far as our tests were concerned, but I have no reason to think that any such improper work was done on them.

Q. Are all points of these castings from the standards in these tests that you made alike? A. No, sir.

Q. A section of a casting cut from one place might show a different result from a section of a casting cut from another part of the same casting? A. It might, yes, sir.

Q. In the same casting? A. Yes, sir.

Q. And is it not also true that the form of a casting might have some effect on the character or on the result of the test such as you were making from which the parts may have been taken? A. Yes, sir; but in the majority of these samples——

Q. Never mind that; answer my question, please, yes or not—is it not also true that the form of a casting might have some effect on the character or on the result of the test such as you were making, from which the parts may have been taken? A. Yes, sir.

Q. For instance, if you had a casting, an original casting of the dimensions of these ground bars which you used in this test, and also a section cut from a casting of an irregular shape and form, that the tests might show different results, even though the chemical analysis of the steels might be the same? A. The result might be a little different, yes, sir.

Q. Might it not be substantially different? A. No, sir; I think not.

Q. So that the form of the casting makes no difference you think? A. I do not say it makes no difference.

Q. Well, does it make any difference? A. It makes a difference.

Q. Not much difference? A. Not much; not very much; no, sir.

Q. So that it is just as easy to make a Manganese steel casting, for instance, of one form as another, is it? A. I have not said that.

Q. You were testing Manganese steel exclusively, were you not? A. Yes, sir.

Q. I am talking now about this Manganese steel and discussing these tests that you made—do you understand that? A. Yes, sir.

Q. Now, I want to know whether or not, as a fact, that a section cut from a casting of one shape might not show a different result in a test to a section cut from a casting of another shape? A. I have already said it might.

Q. It might also show a different result in an original casting in another section of the same sample? A. It might.

Q. And that difference might be considerable, might it not? A. No, sir; I think not considerable.

Q. Are all the parts of a Manganese steel casting a good casting, likely to show the same result, the same tensile strength, for instance? A. There will be slight difference, but not very marked differences in different parts of it.

Q. And are not these differences greater or less as the castings might be larger or smaller, or of an intricate shape? A. The differences are small because the castings are, or should be annealed, after they are cast, which tends to a diminution

or entirely abolish the differences due to inequality of thickness and shapes in the sand mould.

Q. Is it just as easy to anneal a Manganese steel casting of large dimensions and intricate shape as to anneal a plain straight bar of the size of the bars you tested? A. Naturally, yes, sir; it takes more time to anneal a big casting than it does to anneal a little one, to heat it up, rather, and it requires more skill in doing it.

Q. And different parts of a larger casting, intricate in form, would need an annealing process got in a condition where a different tensile strength would result in the examination of a different section? A. The object of annealing is to equalize the casting throughout.

Q. That is the object, but is it accomplished through a large casting? A. Not with absolute uniformity, but with approximate uniformity.

Q. That is the reason that you get the different results from different sections of the same casting, is it? A. Yes, sir.

Q. Now, coming to this Sheet "A" headed "Summary of casting samples, ground bars, casting cut from castings for tensile strength, the first line contains first the mark on the casting, next the mark of the American Brake Shoe & Foundry Co., then the highest tensile strength, is that? A. Yes, sir, per square inch.

Q. Then average tensile strength also per square inch, and the elongation percentage? A. Yes, sir.

Q. Following that first line is a note which says "thirteen samples," so that I understand you that that particular test or record covers thirteen different samples of American Brake Shoe & Foundry Co.'s castings, of which the highest showed a percentage of tensile strength of 105.030 and an average of 77.350 pounds—have you got the de-

tails of those thirteen samples with you? A. What do you mean by "details"?

Q. That is the average—have you got the result of the individual tests of each sample? A. I have not.

Q. Was a record kept? A. Yes, sir; and very correct and careful one.

Q. Showing widely divergent results? A. These records were kept by Mr. Harrison S. Bowen.

COURT—That is not an answer to the question; counsel asks if it shows widely divergent results?

A. Not very widely divergent results; they were not all of the same tensile strength; of course, some were low and some were high.

Q. The highest were how much? A. 105.030.

Q. And the average? A. 77.350.

Q. Do you mean that when you got that average, there was not some showing divergence? A. Of course, there must have been to produce the average.

(*Mr. Hardin.*)

Q. How much was the least? A. I haven't it here.

Q. How many of them show the 105.030? A. Only one of them.

Q. How many show the average? A. I don't know, sir.

Q. It must have been quite a number of them under the average? A. Yes.

Q. How many? A. I cannot tell you.

Q. Now, the difference between the tensile strength of 105.030 and the average 77.350 between the highest and the average here is what you refer to as "slight" variations in different castings of

Manganese steel? A. No, sir; that is mor than a "slight" variation; no, sir, I would not call that a slight variation.

Q. And between the highest that you find in these thirteen samples of 105.030 and the lowest, the record of which you have not with you, there was a very wide variation, was there not? A. I cannot recall the individual figures now, but there must have been enough, of course, to have produced that average.

Q. And in tests of special steels, such as Manganese steel of this character, that divergence is quite frequent, is it not? A. It is, yes, sir.

Q. You expect to find it? A. Yes, sir.

MR. CORBIN—We have these figures here, and we expect to put them in with another witness, but you can use this sheet on cross-examination, if you desire (handing papers to Mr. Hardin).

(*Mr. Hardin.*)

Q. Was this record made in your presence (handing papers to witness)? A. Yes, sir.

MR. HARDIN—Will you have the witness identify that, Mr. Corbin?

MR. CORBIN—We can do so by another witness, but you can use it on your cross-examination, and we will prove it by Mr. Bowen later.

MR. FALLOWS—Mr. Bowen was not here this morning when we gave the names of our witnesses that we would be likely to call to-day, but he has arrived, and he is here this afternoon, and can give this identification if it would be proper

to interrupt the cross-examination of Prof. Langley.

MR. CORBIN—We will put Mr. Bowen on the stand now.

(The further cross-examination of this witness suspended at this point by consent for the purpose of examining Mr. Bowen.)

HARRISON S. BOWEN, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Corbin.

Q. Where do you reside and what is your occupation? A. Mechanical Engineer, residing at Wellman, Ill.

Q. In whose employ are you? A. Robert W. Hunt Company.

Q. What is their business? A. Inspecting and consulting engineers.

Q. What has been your technical education? A. I was educated at the State College of Iowa and finished at Cornell University.

Q. And you took mechanical engineering? A. At both places.

Q. What has been your business with R. W. Hunt & Co.? A. I have been inspecting and testing materials as well as consulting engineering work for the last ten years.

Q. What facilities have Hunt & Co. for doing that work? A. We now have a three hundred thousand pound Riehle testing machine.

Q. And can you make accurate tests with your machine? A. This machine is accurate to within ten pounds and reads on a scale to within five pounds.

Q. Did you make tests for Professor Langley last January? A. Yes, sir.

Q. Between what dates? A. Between the 3d and the 13th of January, 1906.

Q. Were those tests made under his supervision? A. Yes, sir.

Q. What was the preparation of the material for the tests, was it such as to make the tests comparatively fair? A. I considered it, so far as I had any knowledge of where the materials came from, entirely fair.

Q. Did you know at the time you made the tests where the particular materials did come from? A. No, sir.

Q. Did you make a record of those tests? A. I did.

Q. This record shows the marks on the particular articles, does it not? A. Yes.

Q. And you have given the results of the tests in these tables? A. The data and the result.

Q. Please examine these tables and see if these are the tests made by you, and if that is a correct record of them (handing witness papers)? A. It is.

MR. CORBIN—I offer these documents showing the tests, each document being signed by "Robert W. Hunt Co."

MR. HARDIN—It does not appear what it was that he tested yet.

(*Mr. Corbin.*)

Q. These were articles made of Manganese steel, were they not? A. They were called Manganese steel.

Q. Are those all the articles that were tested for Prof. Langley at that time? A. At that time, yes, sir.

MR. CORBIN—I think that identifies them in connection with his testimony.

Cross-examination by Mr. Hardin.

Q. From whom did you receive these samples? A. From Mr. Potter.

Q. Mr. W. S. Potter of the American Brake Shoe & Foundry Co.? A. Yes, sir.

Q. And how were they marked when you received them? A. The majority of them were marked with some letters or figures, at the time they were received, some, I believe, were marked after they were received, but before being tested they were marked with some combination of letters and figures.

Q. Where were the marks put? A. The marks were put in some cases on the end of the test bars; in some cases near the end on the side; in the case of some of the wheels, they were placed on the hubs, that is all I think.

Q. Were they cut in? A. They were marked with a steel stamp.

Q. How many were marked after they came there to your place? A. I do not remember that.

Q. Can you give us any idea how many there were altogether? A. I think there were one hundred and two tensile tests and fifteen or sixteen wheels, and eight transverse tests or bending tests.

Q. Involving then as many different articles as you have named, of tests—one hundred and twenty-eight or one hundred and thirty different samples? A. Yes, sir.

Q. How many of them were marked, after they got there, approximately? A. Perhaps ten per cent.

Q. Did you give a receipt for them when they came? A. No, sir.

Q. Did you compare the marks with anybody? A. No, sir.

Q. How did you identify those that were marked before, and those that were marked after? A. Those that were marked, or all that were marked, they were marked before I put them in the testing machine.

Q. I mean before or after they were received at the R. W. Hunt & Co.'s place? A. I do not believe I understand your question?

Q. How do you distinguish, or how do you identify those that were marked when they came there, and those that were marked after they came there? A. I never tried to identify them because they were not delivered to me until I was ready to put them in the machine for testing.

Q. Where were they from the time they reached the Hunt & Co.'s plant until you took hold of them? A. They were on the floors of the testing machine room.

Q. Who had their custody from the time they arrived at the Hunt & Co. plant until you began to test them? A. Mr. Potter, I should presume; I do not know that there was any particular watch kept of them.

Q. Did Mr. Potter live at your plant? A. No, sir.

Q. How many days were they there before they were subjected to the tests? A. Some of them were there probably a week or ten days.

Q. And were some of them arriving while the tests were going on? A. Yes, sir.

Q. How do you identify any particular casting among these 108 or 109 samples, that one of them was delivered, for instance, two weeks before the work began? A. I never tried to identify any of them.

Q. This list you have is a list of the samples

with the marks on them as they were delivered to you to test? A. Yes, sir; when they were delivered to me to be tested, they had those marks on them.

Q. And that was some time after they arrived at the R. W. Hunt Co.'s plant? A. Yes, sir; some of them.

Q. And you do not know whether they bore the same marks after you tested them as they did when they came to the Hunt & Co. plant? A. Yes, sir; I know that.

Q. Well, how do you know that? A. Because there was no signs to show that any of the marks had been hammered out, or that new marks had been put on them.

Q. How do you identify those that were marked after they got there to your plant from those that were there before? A. All that were marked there, at the testing machine, were marked in my presence, because I was there all the time.

Q. You told us some of these articles were marked after they came to the plant, and before you began your tests, when was the marking done on such castings? A. Before the castings were delivered to me for testing.

Q. Were they marked in your presence? A. Yes, sir.

Q. You say you gave no receipt for these things when they came there? A. No, sir.

Q. When was your attention first directed to these castings, the subject of these tests? A. The latter part of 1905, I believe about September.

Q. I don't mean when the arrangements were made, I mean when did they first come under your personal supervision in the Hunt & Co. plant? A. Just before they were ready for testing.

Q. And these marks on this table correspond with the marks that you found on all the castings

whether put there before or after the arrival at your plant? A. Yes, sir.

Q. What do you mean by the first column, the figures ".924" original dimensions? A. That is the diameter in thousandths of an inch.

Q. Of what? A. Of the specimens.

Q. That indicates that that specimen was a round specimen? A. It indicated that is was a specimen of that diameter at the ground point, as the last above states that they were cast and ground.

Q. Well, they might be cast and ground, but not be round—I want to know whether that section of casting was round or not? A. Yes, sir, it was.

Q. What is the next decimal opposite the words "dimension after fracture"? A. That is the diameter of the specimen at the point of fracture, after test had been completed.

Q. And what does the decimal ".670" opposite the words "original area in square inches," what does that mean? A. That is square inches of section of the specimen corresponding to the original diameter ".924."

Q. That is the original area of the cross section? A. The original area of the cross section.

Q. And not of the surface of the casting? A. The cross-section.

Q. And what is "612" after fracture area in square inches mean? A. That is area of the fractured end of the specimen at the point of fracture, after testing.

Q. You have no sheets of averages made up from those figures? A. No, sir.

Q. And on these various sheets we will find a report with all the details specified in the margin of the various sheets of every piece, every one of these one hundred and odd castings, that were subjected to test at that time? A. Yes, sir.

Q. What does the term "maximum load points actual" mean? A. It is the maximum load that the tested piece sustained as indicated on the beam of the testing machine.

Q. At what point? A. The maximum load.

Q. That means just before fracture? A. Not necessarily.

Q. Well, when—remember, please, I am not an expert, I want you to give me what assistance you can? A. Some materials do not break until after the maximum load is past, they elongate, keep on stretching, but the load on the piece is less than the maximum load.

Q. When it breaks? A. When it breaks.

Q. You keep on increasing the maximum load until the fracture takes place? A. The load is increased from zero to the maximum by the resistance of the piece itself.

Q. And for some materials, you get up to the maximum load, and then it becomes less itself? A. And then the resistance becomes less, until the point of fracture is reached and it becomes zero again.

Q. Is that true of Manganese steel? A. It is true of the rolled and hammered steels, and, in some cases, of the cast steel.

Q. But, generally, not of the cast steel? A. You cannot say "generally not," because, when it is not, it is generally due to defects in the casting itself.

Q. Now, what is the elastic limit? A. The elastic limit is the load sustained by the test piece at which elongation occurs, so that there is a permanent set in the test piece.

Q. And without returning to its original dimensions? A. At that point and beyond, the test will not return to its original dimensions.

Q. Now, when you talk for the purpose of illustration, the casting carried a maximum load,

pounds actual, 35,100, the same casting shows a tensile strength, per square inch, 52,390 pounds—can you explain the relation of the maximum load test to the tensile strength? A. The maximum load is sustained by the test piece whose area is given, and the tensile strength per square inch is the result of this maximum load being divided by the area in square inches, thus giving the tensile strength in pounds per square inch.

(*Court.*)

Q. That is a matter of calculation, then? A. Yes, sir, it is a matter of calculation.

(*Mr. Hardin.*)

Q. So you figure the tensile strength from the maximum load, do you? A. Yes, sir.

Q. Will you run over these sheets and call my attention to the first one that changes in data? A. You mean in this data?

Q. Yes? A. Here is the first change, elongation six inches in one specimen, and here is an elongation in five and a half inches.

Q. That merely means another test? A. That merely means that that test piece either was not long enough, or did not have sufficient straight surface to obtain six inches in length; such data as that occurs at several places.

Q. Now, I direct your attention to the sheet beginning "report of transverse test of Manganese steel submitted by American Brake Shoe and Foundry Co. January 5th, 1906"—what is the character of the transverse test? A. The transverse test is performed on a test piece by supporting the piece on what are known as "knife edges" with a measured distance apart and applying a load in the centre between the two knife edges, and measuring the deflection of the test piece under different loads.

Q. What are those "knife edges" made of? A. Cast iron with a steel bar set in the edge.

Q. And coming as near to a——? A. No, sir, a knife edge, it is a partly rounded edge, partly rounded surface, so that there is no cutting effect.

Q. Then "knife edge" is a misnomer, is it? A. A. I said "so-called knife edges."

Q. What is the purpose of the transverse test? A. To determine the amount that the test piece will bend under, and the stiffness of the test piece under load.

Q. Is this record of the test that Prof. Langley referred to as the "bending test"? A. I presume it is, I did not hear his testimony.

Q. Now, you tell us, or I understand you do not know, whence this piece came at the time of the test? A. No, sir.

Q. So that the lead pencil initials on this report, "A.B.S," and "Johnson, etc.," are not of your making? A. No, sir, they are not of my making.

MR. CORBIN—That is a memorandum I made myself.

(*Mr. Hardin.*)

Q. They were not on there when you made your test? A. No, sir.

Q. Will you go on and show me if there is any other data there, after the bending test? A. The crushing tests of wheels.

Q. Is there anything shown on these tables of the crushing test beyond the load under which the wheels broke down, I suppose? A. At the end of those tests, there is a table of dimensions of the different wheels tested, and the tests themselves show how much the wheels compressed under different loads.

Q. By compression, what do you mean? A. I

believe it is listed there as deflection, that is, the amount with the vertical diameter of the wheel reduced, under the different loads noted.

Q. For these tests the wheel is set up vertically, and crushing weights applied on the top? A. The wheel was set as it would be in actual work, vertical at its tread, and the load applied diametrically opposite the point of support.

Q. On the other tread? A. Yes, sir, on the other tread.

Q. What are these figures, relating to the dimensions in inches, what do they cover? A. They cover the design of the wheels tested, in that they give the width of tread, the width of flange, the diameter of the journal, the diameter of the hub, the thickness and width of the spokes, the thickness of the tread or rim, and the thickness of the hub.

Q. Were these various dimensions and their own letters there indicating the different dimensions you refer to? A. The sketch shows the letters instead of dimensions, and a table will show what dimensions for each class of wheel tested should be, applied for that wheel.

Q. For instance, that sketch is a vertical section of a wheel, is it not? A. A cross-section of a wheel.

Q. As though it were standing on the track, and cut through the metal? A. Yes, sir, as though it were cut through the metal.

Q. What does the letter "D" mean there? A. "D" is the mark on the wheel, and the dimension or the figures "two fifteen-sixteenths" is the dimension on the wheel "B" represented in the sketch by the figure "A."

Q. Every letter indicated on the sketch has its equivalent in the table, has it? A. Every letter

indicated on the sketch has its equivalent for the different styles of wheels tested.

Q. And where we haven't a letter at the head of the column and the same letter on the side, the letter on the head indicates the mark on the wheel? A. Yes, sir, it indicates the mark on the wheel as it is shown on the table.

Q. And the letter on the left-hand side refers to the sketch? A. Yes, sir, that refers to the sketch.

Q. Is there anything else following that? A. No, sir.

Q. Will you describe the test for elongation? A. The elongation of the test piece is obtained by placing on the test piece, before it is put in the test machine, two marks at a pre-determined distance apart.

In testing, care is taken that these two marks are inside of the portions of the test piece gripped by the jaws of the machine. After the test has been performed, the two pieces of the test piece are put end to end, and the distance between the two marks measured. This last measurement, minus the first measurement, divided by the original measurement, is the percentage of elongation, and the difference between the first and the second measurements is the actual elongation in the prescribed distance.

Q. How do you know when you have reached the elastic limit? A. The elastic limit, as tested commercially, is shown by what we call the "drop of the beam." In testing material, the moving jaw of the testing machine runs at a constant rate of speed, which indicates the load on the piece itself, and this load is indicated on the beam of the testing machine. We endeavor to keep this beam floating by moving the poise, and when a load is applied slow enough, it can be floating absolutely. When the elastic limit is reached, there is a short space

of time in which there is no increase of load on the beam, or on the test piece; consequently the beam drops and sets down for a short space of time.

Q. That is to say, your machine indicates the point when there ceases to be a tendency in the material to return to its original dimensions? A. Yes, sir. Another method that is sometimes used is to put a pair of calipers on the two marks that are used for measuring elongation, and when it is seen that these two marks are moving away from each other, that indicates also the elastic limit.

Q. Would you have to take off the load to accomplish that last method? A. No, sir, because the elongation up to the elastic limit is so very slight that it requires a very gradual and evenly adjusted instrument for measuring the elongations up to this point; but as soon as the elastic limit is reached, then the elongation is very perceptible, and can be detected by the eye, provided you have some movable point to compare it with.

Q. Practically, then, the elongation begins at the elastic limit? A. Permanent elongation begins at the elastic limit.

Q. And the visible elongation within an elastic limit is very slight? A. Very slight indeed.

Q. You spoke of some of these tables having a less elongation, or rather having the elongation figures of a less length of six inches, giving as a reason for it, that the pieces were not that long, or you could not get a sufficiently long straight surface—do you need a straight surface for these tests? A. As far as it can be obtained, it is better, for the reason that if the section changes in area, the load per square inch is of some consequence; the elongation would not be the same, and for that reason we take the elongation to a section which is of the same sectional area.

Q. So that, if I understand you correctly, the

elongation in a straight casting, and in a curved casting, notwithstanding the material might be the same, would be different? A. Not unless the sectional area was different and the load per square inch was different.

Q. I don't know that I understand the answer which you made to my last question—I understand you to say that your need for the use of straight pieces was because in the curved piece the elongation was different—I would like to understand that? A. I do not think I said curved piece, I said a piece whose sectional area was different, at different points. A test piece which has a different sectional area at different points will only stand, when the piece was perfect, a load which will break the specimen at the smallest section.

Now, this smaller load applied to this old plate, to a larger section, will not give the same tensile strength, or will not give the same load per square inch, in the larger section, that it did on the smaller section, consequently that larger section has not stretched as much as the smaller section.

Q. Suppose you had a perfectly straight casting, and with exactly the same steel, the curved casting equal in length but bent in form, to what it should be made, would the elongation of the two castings be the same? A. No, sir, because the tests would not be the same kind of a test. The straight piece would be a straight tensile test on the material, while with a bent piece, there would be not only straight tensile tests, but there would be a bending test, both applied at the same time, and on the same piece.

Q. And the straight casting would be the stronger from the standard of elongation, on the —I mean, it may not be the stronger for some other purposes? A. No, sir, the bent piece would show the greater elongation, provided the original meas-

urement was made in a straight line. If the original measurement was made in a line conforming to the curve, then the elongation would probably be the same in both cases.

Q. That is, if you could apply the stretching with the same uniformity to the curved casting that that you could to a straight piece? A. Yes, sir.

Q. But that is impossible, is it not? A. Yes, sir.

Q. So, consequently, for the purpose of elongation, a straight casting will stand a higher elongation test than the other? A. Probably.

Q. Were all these pieces that you have described as having been tested for the American Brake Shoe and Foundry Co. straight pieces, except the wheels, of course? A. Yes, sir, they were all straight pieces.

Q. Some of them were round and some square? A. Some were round, some were square, some were rectangular, and some were irregular.

Q. I notice that you have in all these sheets the original dimensions in diameter—where is the measurement taken of the original dimensions in diameter of a square piece? A. There is no diameter to a square piece.

Q. What do you mean by that figure, then—the first sheet you told me the use of the term "diameter" indicated that the sample was round—I simply want to understand these tables? A. Where one dimension appears as the original dimension, that indicates that the specimen is round. Where two dimensions appear, that indicates that the piece is either square, or rectangular, in cross section.

Q. Will you illustrate that by a reference to your answer? A. Test specimen 3A. has but the one figure for the original "dimension .924," which indicates that this specimen is round.

Specimen 6A has two figures for the original

dimensions ".748" by ".742," which indicates that the piece is practically square.

Q. Is that in inches? A. Thousandths of an inch, or in inches.

A square piece will not pull out, and break into a round one. There are some tables in which there is no original dimension given, but it is noted as of an irregular shape. These were neither square nor round, but were measured as carefully as could be, and plotted and then measured with a planimeter.

Q. And another section nearly round, but straight? A. But straight.

Q. And on these tables, wherever we find but one dimension, we may know that the sample was round? A. Yes, sir.

Q. What is the sign of the maximum load in the wheel test; I notice that you have stated in these tables the deflection as the weights increase, and finally you say "maximum load"? A. That is the maximum indicated on the beam of the test machine.

Q. And how in the casting itself, at what point? A. In the casting itself, it was generally somewhat beyond, in fact quite a great deal beyond the joint of first fracture.

Q. That is the first crack in the hub? A. Yes, sir.

Q. By first fracture you mean first cracked in the hub? A. In almost all cases, it means the first crack in the hub.

Q. At what point did the application of force or weight on the wheels cease? A. In some cases, in a few cases, when the crack appears, and extended nearly across the tread, in other cases the tests were stopped before the spokes and hub became so closely pressed together that the wheel

after that would have been in practically straight compression.

Q. For instance, taking this test of the first wheel, made on January 5th, 1906, and marked "AAA," you have indicated at a weight of 165,580 pounds maximum load, cracked in hub—that means under that weight the hub cracked? A. Yes, sir.

Q. And after testing the maximum load, the wheel flattened to a height of seven and five-eighths inches; was that under a still increasing load? A. No, sir, as soon as the hub cracked, in that case the load sustained by the wheel was relieved, by the the giving of the wheel itself, but the moving head of the machine was brought down further, until the treads were close together, as indicated in that report.

Q. That is, that flattening took place under the same weight? A. No, sir, not under the same weight, because the weight on the wheel itself is only that, due to what the wheel will sustain.

Q. So that when the wheel was weakened by the crack of the hub, then you crush it under conditions that would have been impossible before? A. Yes, sir.

Q. And under what load? A. Those loads beyond the maximum we never measure them; they would have increased to the limit of the testing machine had we gone on that far, because the centre of the wheel then would have been a solid mass of metal.

Q. After each test you have noted, in addition to the data about the maximum load and increasing weights, the flattening of the wheel, additional flattening; what is the object of that report? A. To show that the different wheels did or did not have the same amount of ductility in the tread, in all cases, I believe nearly if not every one of the spokes were broken before the test was finished,

but in no case was the test carried to a point where a crack in the tread extended clear through the tread, except in one perhaps.

Q. And these figures indicate the flattening of the wheel? A. Yes, sir.

Q. Notwithstanding the fact that the spokes were broken? A. Notwithstanding that the spokes were broken.

Q. Does the report show that the spokes were broken? A. I do not believe so.

Q. What guide did you have as to the point of stopping—you say you stopped for a time before the tread of the wheel was actually severed? A. In several cases I stopped for the safety of our testing machine, as in one or two cases the wheels had a tendency to roll to one side, and it pulled the large operating screws and bent them, but the majority of the tests were stopped at a point where it became apparent that the hub and the spokes were going to be a solid mass of metal between the two tires, the two treads.

Q. And did you select the point when the pressure ceased, or was that under some one else's instruction? A. No, sir, I did not select that.

Q. You stopped whenever you felt like it? A. Yes, sir.

Q. Now, in testing the straight pieces, when did you cease to apply the pull? A. As soon as they broke?

Q. In all cases you continued until they broke? A. Yes, sir, excepting one, where the test piece was two inches in diameter, and our three hundred thousand pound testing machine refused to break it.

Q. I thought I understood you, but it seems not; to be clear, in testing these wheels, after they had attained the maximum load, as indicated in the check in the hub, you continued to apply pressure

for the purpose of flattening the wheel—was that with a greater load than a maximum load? A. You cannot have a greater load than the maximum.

Q. The wheel had been broken down? A. Yes, sir; the wheel had been broken down, and after that the only load showing on the testing machine is due to the resistance of the wheel itself, and until the metal is almost solid by the hubs and the spokes coming together, there was not as much load on the wheel at any one time as is shown by the maximum.

Q. The maximum load is the load at which the wheel leaves its original shape? A. Generally, at which the hub cracks.

Q. And up to that point the circumference of the wheel retained its original shape, did it? A. Practically so.

Q. Beyond is the point we are interested in, when the wheel goes down and flattens out to the extent of six inches—

COURT—Then it takes less, because the resistance is gone.

(*Mr. Hardin.*)

Q. I understand that it takes less then because the resistance is gone, but I want to know whether they continue the same pressure, or is it increased? A. There is no load applied at all, that is no greater load, the only load indicated in any test is the load that the specimen itself will withstand.

MR. CORBIN—I offer that paper in evidence.

Marked Exhibit D 14.

(*Mr. Hardin.*)

Q. What is the make of the testing machine? A. The Riehle, made by the Riehle people, of Philadelphia.

Adjourned to December 20th, 1906, at 10 A. M.

DECEMBER 20, 1906.

JOHN W. LANGLEY, recalled for further cross-examination, saith:

Cross-examined by Mr. Hardin.

Q. In making these tests for tensile strength, the strain is continued until fracture ordinarily, is it not? A. It is.

Q. And where does the fracture ordinarily take place? A. It ordinarily takes place in that portion of the test bar which is included between the upper jaw and lower jaw of the machine.

Q. And at what point in the test piece? A. It is usually near the middle of the link of the test piece, taken between the two jaws.

Q. If the diameter is uniform, or if the dimension is uniform? A. Yes, sir.

Q. If the diameter varies, where does the fracture usually take place? A. The fracture usually takes place where the diameter is the least.

Q. Now, in making these tests, you found wide ranges in tensile strength in test pieces, taken from the same heat, did you not? A. If you are referring to the tests made at Chicago?

Q. No, I am referring generally now to the subject of testing? A. You will find differences in material from the same heat, but these differences are not large, provided that the samples have been similarly treated.

COURT—What do you refer to, plates or bars or what?

MR. HARDIN—Plates or bars or anything that is subjected to tensile strength.

COURT—You think there is not much difference?

A. No, sir, except where there is obviously a flaw or cavity which reveals itself on breaking.

(*Mr. Lindabury.*)

Q. It makes very little difference whether it is obvious or not? A. I mean obvious after breaking.

(*Mr. Hardin.*)

Q. You spoke a minute ago about an obvious flaw, a flaw so small as not to be apparent to the naked eye, might result in a rupture under your test, earlier than otherwise would be the case? A. If there were such a flaw it would reveal itself in the fracture.

Q. That does not answer the question—a flaw so small as not to be apparent to the naked eye might result in a rupture under your test earlier than otherwise would be the case—that is you were speaking about an obvious flaw—might not that be the case? A. It might, yes, sir, but I do not see what evidence we would have that it existed, if we could not see it.

Q. Then flaws that are not obvious in the sense that they are visible would affect the castings and tests for tensile strength, would they not? A. Oh, it is conceivable that they might, yes, sir.

Q. And even flaws, even slight in the casting, might do so? A. They might, yes, sir.

Q. And is it not true that such flaws are not infrequent in castings? A. I have already stated that I was not familiar with the processes of casting; I can only answer in general that I think those flaws occasionally occur.

Q. In these individual test reports, verified by Mr. Bowen, are set forth, as I understand, the tests which you have tabulated on the sheets marked "A, B, C, D, E and H"? A. Yes, sir.

Q. Now, I notice in these individual tests, you have items of information that you have not included in the summaries—in the first place, have you included in these summaries all of the individual articles that are described in the detailed report of Mr. Bowen? A. I believe that I have, my intention was to do so.

Q. In making up your averages, everyone of the articles are included? A. That is my intention.

Q. I notice that in some of these cases, in the individual reports, the test pieces are referred to as having broken, sometimes broken within the measured limit, and sometimes without the measured limit, and sometimes at the jaw—will you kindly explain what these reports mean when they state that the casting is broken at the jaw, for instance? A. The sample is caught by the jaws of the machine, one of which is on the moving head, and the other is on the fixed head of the machine. The compression on the sample by these jaws is, of course, very great, and it occasionally happens that instead of the sample breaking between the fixed jaw and the movable jaw, it breaks inside of the jaw. It is not a common occurrence, but as the record shows, it happened on one or two occasions. The second part of your question refers to——

Q. That break then is the result of compression, and not of tension? A. Oh, of both.

Q. And such a break, where the test piece has been rounded for the purpose of the test, is without the rounded part, is it not? A. Yes, sir, exterior to the rounded part.

Q. And not at the point of least diameter? A. If it happened on a specimen which had been rounded, then it would have occurred in the part not of the least diameter.

Q. The break then, when it occurs in the jaws, is

not between the jaws, it is within the jaws? A. Yes, sir, within the jaws——

Q. At first I had the impression from the examination here that it was at the point where the jaw was fastened on the test piece—but you say it is within the jaw? A. To remove all possibility of ambiguity, I will say that the moving head contains two wedge-shaped pieces called "jaws," and the fixed head contains also two wedge-shape pieces called "jaws," making four wedged-shaped pieces altogether. Now, in the case you refer to, my answer relates to that circumstance where the test piece breaks between the two of these wedge-shape pieces, in either the moving head of the machine or the fixed head of the machine, but not in the intervals between the fixed head and the moving head.

Q. In every such case, the test does not give you the real tensile strength of the test piece, does it? A. It does not, and is not used in making up the record of the averages.

Q. Do I understand you that you have omitted from the summaries you have tabulated here the pieces which were so broken? A. I have.

Q. In all cases? A. Yes, sir.

Q. As to all makes? A. Yes, sir.

Q. Now, I find other pieces broken, outside the small section—what does that mean? A. It means that they have broken in the interval between the fixed head and the moving head of the machine, but outside of the section of the test bar, which had been reduced to a measured diameter previous to test.

Q. And do you agree with Mr. Bowen, who told us the other day that that could only take place when there was a flaw in the casting? A. I do.

Q. Did you include those castings which broke outside the small section, as just described in the

averages that you have tabulated? A. No, sir, they were rejected.

Q. And omitted? A. Yes, sir.

Q. Now, I find others that broke in the "fillet"—what does that mean? A. In turning down a bar to a smaller cross section, there is a curve necessarily produced in passing from the small diameter to the larger diameter, or to the rectangular cross section; this is referred to frequently as the "fillet."

Q. Does a break at that point give you a test of true tensile strength? A. If it is outside of the original punch marks, put on the bar before testing, to determine its elongation, such a break of that character is rejected in making up the averages.

Q. And then I understand that the particular samples which are described as "broken in fillet," have been rejected in making up the averages? A. That was my intention in making up the averages, to reject all such imperfect tests.

Q. You made these tables up yourself? A. I did.

Q. And you rejected those articles that broke in the "fillet," because they would necessarily have a flaw in the point of fracture, did you? A. Yes, sir.

Q. Defective castings, in other words? A. Yes, sir.

Q. I find other pieces that "broke outside measured section"—what do you mean by that? A. Before the test piece is put into the machine, two marks are made at a predetermined distance apart, in order that if the specimen stretches during the test that a remeasurement of the distance between those two marks may show the amount of the stretch of the specimen. Where a specimen has broken outside of a measured distance, no record of elongation can be made, and the observation is, therefore, to be rejected in making up the average.

Q. You exclude the figures entirely, or do you

simply in such case fail to get a condition which enables you to measure the elongation? A. If it breaks outside of a measured distance, on a bar which has a uniform diameter, we can then take the tensile strength as being correct, but the elongation must be rejected.

Q. I refer you to the test table "T 1"; you will note there at the foot of that column that the test piece broke "outside the measured section"; was that piece rejected in getting at your averages? A. If you will let me see one of my tables I can tell you.

Q. Which one? A. I cannot tell you in which one "T 1" will be found.

Q. It is found on that one (handing witness Exhibit D 4? A. The tensile strength is included in the average made up, the elongation is taken on only one of the specimens, which did not so break.

Q. Was that "T 1" a piece that had been reduced to uniform diameter? A. I do not remember from looking at this whether it had been or not, but I presume from the record made here that it had been reduced to a uniform diameter.

Q. And in such case you took the figures even if the break be outside the measured limit, provided it is within that part of the test bar which has been made of uniform diameter? A. We kept the tensile strength, but not the elongation.

Q. I call your attention to the report as to the sample "4C," you will note that that also broke? A. Yes, sir.

Q. Was that included in your figures or not? A. I can tell you if I can see my averages.

Q. I hand you the sheet marked "Exhibit D4." A. The same case as before the tensile strength has been used in making up the averages, and the elongation has been rejected.

Q. Where is the break in that case stated by the

report to have occurred? A. It broke outside of the small section.

Q. Why did you include the tensile strength when you told us that a break under such conditions indicated a flaw in the casting, and that you were accustomed to reject such test figures for that reason? A. Because his gave the maximum tensile strength which this sample possessed.

Q. Didn't you tell us that in making up this table of averages you had rejected the samples that had been broken in that manner? A. Where they broke outside of the small diameter, taken for the measurement, my intention was to reject every sample of that kind.

Q. And under that intention, that particular sample "4C" should have been rejected? A. It is rejected. You will notice that there are two different lengths of sample there, that it is on the short three and one-half inch piece that the note which you refer to occurs, and that sample is rejected, and the average is made up from the other.

Q. The three and a half inch piece evidently refers to "4G," does it not—look at your table and tell us? A. No, sir, it refers to all of them.

Q. Three and a half inch, ten; three and a half inch, 285—in both cases on the upper lines; now the sample which was three and a half inches in length was on "4G," was it not? A. Elongation, six inches—elongation, not the tensile strength—the tensile strength is not given on this line. Where the note is "broken outside the measured limit" the tensile strength is absent on the record.

Q. The figures as to tensile strength are included in the average, are they not? A. Not in the one that broke, no, sir; in these others—there is a double set of records on that sheet, you will observe.

Q. Will you take a piece of paper and average the three tensile strengths shown on that paper, as

to samples "4A," "4B" and "4C"—what do you get for the tensile strength? A. 53,200.

Q. Is not that the average tensile strength shown for "4A, 4B and 4C" on your table "A"? A. It is.

Q. You did include the defective casting "4C" in getting at that average of tensile strength then? A. I included the tensile strength, but you will notice that the elongation is not included in that.

Q. I notice that—I understood you to say that in making up these averages you had rejected castings which had been broken in the manner indicated there, as to "4C," because it was apparent those castings were defective, and you stated that it was your intention to have rejected a casting broken as "4C" was broken, on that table? A. Yes, sir; where there was any evidence where the break occurred, through a flaw, or any other cause than the natural stretch of the material.

Q. So that, as to the sample "4C," that should have been rejected from your average of tensile strength, should it not? A. I cannot say positively in regard to that without seeing the sample, and without ascertaining what other cause, if there was any, why that tensile strength was recorded.

Q. That report was written for the purpose of enabling you and others to know the result of the tests, was it not? A. I call your attention to this fact, that in this sample the elastic limit is stated as 30,800; that the tensile strength per square inch is stated at 30,800, indicating that the record taken from the machine was the record of the elastic limit, as being——

Q. Indicating also that the piece broke under a strain of 30,800 pounds? A. It broke beyond that; you could not have had that record if it had broken at that point.

Q. Just beyond? A. Yes, sir; it broke just beyond that point, and therefore the tensile strengh

given in making up the averages is less than the average tensile strength of the sample, because it was taken on the elastic limit, and shortly after passing that limit it broke outside of the small section.

Q. And having broken outside of the small section that indicated that it was a defective casting, did it not? A. Yes, sir, that indicated that it was a defective casting.

Q. And under the rule you have laid down, and which you told us of a while ago, and under which your tables were made up, the figures for defective castings should have been rejected? A. Yes, sir.

Q. Then why did you include that defective record in your average of these three samples "4A, 4B and 4C"? A. I cannot go back of that record, without inspecting the sample, or seeing it. In that sample there was something about that sample which convinces me that the tensile strength there recorded was the tensile strength of the sample at or about the time of breaking.

Q. But you did not put that reason down on that paper, did you? A. This paper is made up by Mr. Bowen, not by me; I haven't put any figures on that paper.

Q. Would you have us believe that that is not a correct record of the tests? A. No, sir, I think it is correct.

Q. What was there about the test of value to you, in determining the elastic limit or the tensile strength that was not put down on this report? A. Nothing in the way of figures obtained from the action of the machine.

Q. On the face of that report, without anything else, and the rule which you have laid down, it would exclude those figures from your averages, would it not? A. It would exclude it only for the reason that this sample had a flaw.

Q. And you told us a while ago that you intended to exclude all samples that had flaws in them, didn't you? A. I certainly did.

Q. And under that rule that sample "4C" should have been rejected, should it not? A. Yes, sir.

Q. And yet it was included? A. Yes, sir.

(*Mr. Hardin.*)

Q. I call your attention to the individual test of the sample "S2." I note that in the table that sample "broke outside the small section"—is that to be included under your rule in the figures for tensile strength (handing witness paper)? A. Will you let me see my sheet?

Q. Under your rule—is it to be included or excluded under the rule you have laid down?

(*Court.*)

Q. Cannot you answer the question—the question is not whether it has been excluded or not, but is it to be excluded or not? A. The note here, of "outside of the small section" refers to the portion of the sample between the measured distance points. If it is included here as having broken "outside of the small section," it means that it broke outside of a space between the two distance points. It does not mean necessarily that the section beyond that was different in diameter from what it it noted here, as the "small section." Therefore I hold that this is not to be rejected, unless it can be shown that the point at which it broke was larger in cross-section than the diameter between the two distance marks.

Q. And that is the answer you can make to the question "whether that should have been excluded or included under your rule," is it? A. The fact that it is included indicates to me that that was the condition of the sample.

(*Mr. Hardin.*)

Q. Why is it that in some of the cases you put down "broke without the measured points"? A. Why, it is one of the notes made of the tests.

Q. Is it not a fact that every time that the break occurred, where that part of the casting which had been reduced to uniform diameter and "without the measured marks" it was noted? A. Where there is no note of the point of fracture on the test record, it is understood that the piece breaks within the measured distance, and that is confirmed if there is given the percentage of elongation, because the elongation can only be ascertained when the fracture is within the measured limit.

Q. Yes, I understand that, and you have already told us that when the break was "without the measured section" that it was noted on these reports—there are three different notes here, "broke in the jaw," "broke outside the measured section" and 'broke outside the small section"—and they mean three different things, do they not? A. Yes, sir.

Q. I call your attention to "T 1"—where did that break occur, according to the report? A. It broke outside of the measured section.

Q. That is on that part of the casting, "outside of the measured section," where the casting had been reduced to a uniform diameter, and where you were able to get from the test the tensile strength, but not the elongation? A. Yes.

Q. Now, go back to "S2"—where does your report say that broke? A. It was broke "outside of the small section."

Q. Do you mean to tell us that that means the same thing as the note made as to the breaking of "T1"? A. Those terms are Mr. Bowen's terms, and I am not able to say exactly what he had in mind, but I will say there is no important or es-

sential difference between the two terms "broke outside the measured section" and "broke outside the small section."

Q. Do you recall telling me a little while ago that when it "broke outside the small section" that that was an indication that it was a defective casting? A. Yes, sir, because I had in my mind then that it was in the case of a sample breaking in a portion of the diameter greater than that of the measured section.

(*Court.*)

Q. Do I understand you hen to say that every record there that has no note is to be considered as a perfect specimen? A. Yes, sir.

Q. And when it has a note, for some reason it is not a perfect specimen—is that correct? A. That is correct, yes, sir—do you care for me to explain the point?

Q. Yes, certainly, I would like you to do so? A. This is the general shape of the samples which are to be pulled; the jaws of the machine catch in here on each side (indicating). This so-called "fillet" it is turned down with a uniform cross-section between the two "fillets," and then two very fine punch marks are made on the sample, before it goes into the machine. Then when it is tested, and after it breaks, of course it is longer after breaking. Then, this distance is again measured and the difference between the two distances is the amount of the elongation of the sample.

Where it breaks in here between the measured parts (indicating), the observation is perfect, giving both the tensile strength and the elongation.

Where it breaks outside of the measured section, or outside of the small section as Mr. Bowen calls it, if the diameter at that point is the same as it is at this point (indicating), then the tensile strength

is correctly determined, but the elongation cannot be determined, because we have no longer the scratch between the original punch marks to measure from. Therefore, the observation in which the sample breaks outside of the measured section, or outside of the small section, and at the same time the diameter is not any greater at this point than it is within the measured section, gives a correct measurement of the tensile strength, but it gives us no knowledge of the elongation of the bar.

(*Mr. Hardin.*)

Q. Is that all? A. Yes, sir.

Q. Now, do these notes which you use in making up your report indicate at what point outside of the measured distance the break occurs? A. Not on that record, no, sir; it does not say where except that it occurred outside the measured section.

(*Court.*)

Q. When you make up your charge, how do you determine whether it is at a point where the diameter is the same or not? A. Because at the time of breaking each sample, it was carefully examined by myself and by Mr. Bowen and others, and where the break was obviously in a portion of the cross-section, greater than the measured cross-section, the record was rejected altogether.

Q. It was not put in here at all? A. No, sir, the tensile strength was not put in here at all.

Q. The test was put on the sheet, though? A. The test was put on before you pull it with the machine, but the tensile strength was not figured out in this case, but where we were satisfied that the cross-section was the same as within the measured section, the tensile strength was figured out and put down in the tables.

Q. But there is nothing on the record to indicate

where the break occurred outside the measured limit, except the fact that you, at the time, determined that it was in such a point where you ought to determine the tensile strength? A. Yes, sir.

(*Mr. Hardin.*)

Q. Do I understand you to say from your answers to the questions of the court, that you tested samples on this occasion that were not recorded on the sheets you have made up and produced here? A. No, sir, everything was recorded that was tested.

Q. Wherever a sample has tensile strength you thought the test indicated fairly the real tensile strength? A. Yes.

Q. Some of these samples broke in the jaws—now, that break in the jaws is due as well to compression as to stretch, is it no? A. Yes, sir.

Q. Do you think a test piece broken in the jaws is fairly represented on this sheet as to tensile strength? A. I have no recollection of including any such in my averages.

Q. They are down on these sheets, though? A. Is the tensile strength there?

Q. Yes; I will show you one of them. Take "11D" for instance—that says "break in the jaws," does it not? A. Yes.

Q. And then you get a tensile strength for that sample, do you not? A. Yes.

Q. And an elastic limit? A. Yes, but no elongation.

Q. So that the reply you made to the questions of the court was not quite correct, that you did not put down the figures of tensile strength where the sample broke outside the measured section? A. I did not include that because—will you let me see my average?

Q. which sheet do you want? A. I don't know which one it is on.

Q. I will hand them all to you (handing papers to witness).

COURT—I understood the witness to say that when the break occurred on the outside of the measured points, that whether it was at a point that ought to be included in his estimates or not, could only be determined by the fact that he had so estimated it; that is referring to his record—in other words, he has now no recollection of where the point of breakage was, whether it was at the same diameter, or whether it was where the diameter was larger or small, except that he appears to have estimated the tensile strength——

Q. Is that correct, Professor? A. If I understand your question, it is not quite correct.

Q. Then correct it? A. I have stated that where the diameter was unimpaired, whether inside or outside of the measured section, and the fracture took place, that the fracture was considered to represent the true tensile strength of the sample. But where the fracture took place in a portion of the diameter which was larger than that of the measured section, that in that case the tensile srength was not taken as a correct representation of the proper figure for the sample, and was not included in my averages.

Q. How do you now from your record determine the point of breakage, when it is outside of the measured limit? A. I determine it in this way, your Honor. This very question which Mr. Hardin asked me a month ago, in regard to "11D" is a sample made——

Q. I don't want that—answer the question

please—how did you determine in making up your charge, the point of breakage, either by reference to a record or by your recollection? A. This record shows that these were bars of uniform cross-section. Therefore if they broke inside of the measured part or outside of the measured part, it was breaking on the uniform cross-section.

Q. How can you determine the point of breakage outside of the measured limits, in making up your charge; how do you determine where that point of breakage was? A. I determine it is outside of the measured point.

Q. Where—in the jaws or where? A. No, sir, if it was in the jaws the record would say so.

Q. How do you determine the point of breakage, outside of the measured limit, in making up your charge, how do you determine where that point of breakage was—you say if it was in the jaws the record would say so, where is the break? A. It is outside the measured section and between that and the jaws.

Q. But how do you determine that? A. Because when it occurs in the jaws, it is so noted on the record, and when it occurs outside the measured section it is so noted on the record, and therefore it must occur between the two points.

(*Mr. Hardin.*)

Q. That is two cases—what do you mean by this statement as to the other case "breaking outside the smaller section," what do you mean by that? A. I understand the small section referred to there is the part included between the punch marks.

(*Court.*)

Q. Between what? A. The small section included there is between the small punch marks.

Q. What do you mean by the words "I understand"—do you know it as a fact, or are you only guessing at it? If you don't know, then you should say so. A. I understand that that is Mr. Bowen's notation; it is not my notation, it is his notation.

Q. Then you don't know what it means? A. Not otherwise than as I have stated.

(*Mr. Hardin.*)

Q. These tables show in the case of average samples that was round the diameter of the smaller section, do they not? A. Yes, called the "small section," the part that was turned down.

Q. And that the smallest section was always included within the measured distance, was it not? A. Yes, sir; but it extended outside of it also.

Q. I understand that; and you now say that the smallest section means between the punch marks, do you? A. And the portion of the sample beyond that.

(*Mr. Corbin.*)

Q. The measured distances are between the punch marks? A. Yes, sir, of course, and outside of that region also.

(*Mr. Hardin.*)

Q. These reports show a uniform smallest diameter of the test pieces that were turned round, do they not? A. They intend to, yes, sir.

Q. And when these reports say that the thing broke outside the smallest section, what would it naturally mean? A. That it is outside of the smallest section.

Q. No, "outside the small section"? A. I understand it means that it broke outside the portion between the punch marks which was taken for registration.

Q. So that the small section and the measured section mean the same thing, do they? A. Substantially, yes, sir.

(*Court.*)

Q. What do you mean by "substanially"—this is a plain definite question, and you answer "substantially"—why don't you answer the question direct—now, you have proved that there were two punch marks to indicate the measured distances, and Mr. Hardin asked you if the smal section and the measured section mean the same thing, and you say "substantially"—now, are they the same thing? A. Yes, sir.

Q. Then what do you mean by "substantially"? A. I mean that it is impossible for any human being to take two measurements of anything and have absolutely the same result, absolutely; it is impossible that in making two or more measurements of a diameter, it is impossible to have absolutely the same result.

Q. That does not answer the question; you are measuring between certain points, certain distance marks, suppose there were three feet between the two points, you could measure that distance and say that there were three feet between those two points—now Mr. Hardin wants to know whether that three feet mentioned is exactly the same in the small section as it was in the measured section; sameyou can answer that, cannot you? A. I did answer it.

Q. What is your answer? A. It is the same thing.

Mr. Corbin—Suppose you made a length one foot——

Court—He says the small section and the measured distance are the same.

MR. CORBIN—My understanding of that is——

COURT—Let the witness explain what he means by the small section then.

(*Mr. Hardin.*)

Q. What do you mean by "the small section"? A. I understand the small section to mean the portion of the sample turned or ground down in the lathe, to have as nearly as possible a uniform diameter and that in the testing, preparing the sample for testing, a portion of this between two punch marks is taken as the part from which the elongation is to be determined.

Q. So that when you find in this report a description of one casting that it "broke outside the small section" and the description on another casting, that it "broke outside the measured distance," you understand it to be exactly the same thing, do you? A. Yes, sir.

Q. What do you understand when you use an expression like this, "broke outside the smallest section"? A. If there is such a notation on the record I understand that that means that it broke outside of the smallest diameter, if it was a round object.

Q. If it was not a round object, what would you say? A. That it broke in the cross-section, which was greater than the smallest section.

Q. Then as to sample "84," for instance, which is stated "broke outside the smallest section"; the break occurred in such case not only outside the measured distance, but in the jaws or near the jaws? A. I don't know whether it was the jaws or not, but it broke outside, according to this record "outside of the smallest cross-section."

Q. Within or without the measured distance? A. I don't know, sir.

Q. Now, the elastic limit and the tensile strength are never exactly the same, are they, in Manganese steel? A. Well, they are totally different properties, no, sir; I beg your pardon, I thought you were speaking of "elongation"; they are not totally different properties, but they do distinguish properties, which are somewhat dissimilar.

Q. You have not answered my question—my question was "now the elastic limit and the tensile strength are never exactly the same, as they, in Manganese steel"? A. They are generally not the same.

Q. Are they ever the same? A. They may be.

Q. When? A. When a sample breaks at the elastic limit.

Q. Does that often happen? A. Not often; it does sometimes.

Q. The elastic limit is generally considerably less than the tensile strength, is it not? A. Usually, yes, sir.

Q. When the elastic limit and the tensile strength are shown to be the same in points, per square inch, on this report of yours, does it indicate anything to you? A. It does.

Q. What does it indicate? A. It indicates that in that case the sample broke at the "elastic limit."

Q. Is that the necessary and only inference? A. I do not see any other inference.

Q. At the elastic limit of the metal or at the elastic limit of the casting? A. At the elastic limit of the metal.

Q. A flaw in the casting, for instance, might reduce both the elastic limit and the tensile strength, might it not? A. It would reduce both of them, yes, sir.

Q. So that when you find the tensile strength equal the elastic limit, knowing that they are ordinarily different, is it ever to be inferred that the

equality of the tensile strength to the elastic limit is due to any defect in the casting? A. Not necessarily, no, sir.

Q. Is it ever to be so inferred? A. No, sir, I think not.

Q. A test piece will often break in the jaws, after the elastic limit has been determined, will it not? A. Sometimes, yes, sir.

Q. Why did you take the elastic limit in making these tests? A. Because it was a recognized portion of the making of a mechanical test of metal.

Q. Why did you not include your elastic limit in the table of averages that you made up? A. Because a proper comparison of the various samples could be made from the tensile strength and the elongation, and because in published reports of Manganese steel the tensile strength is more frequently given than the elastic limit.

Q. You think the elastic limit is important, however, in determining the quality of steels? A. Yes, sir, it is important.

Q. Is there any advantage or disadvantage in having the elastic limit nearer or further away from the tensile strength? A. It would depend somewhat upon the purposes for which the steel is to be used.

Q. For the purposes of these tests you have not considered, in any way, for what the steel is to be used, have you? A. We have in the case of the wheels.

Q. Well, eliminating the wheels? A. No, sir, the other samples do not refer to the purposes to which the material is to be used.

Q. All that you have undertaken to determine, in your tables at least, is the tensile strength? A. Yes, sir, and the elongation.

Q. Yes, the elongation—these tests that you have made as recorded in these tables show a very wide

range of difference between the elastic limit and the tensile strength, do they not? A. In some cases, yes, sir.

Q. You have ignored that in determining your figures as to tensile strength, have you not? A. I have not included the elastic limit in the tables at all.

Q. And in determining whether the steel is good or not, for a given purpose, the elastic limit is of great importance, is it not? A. The difference between the elastic limit and the tensile strength is of importance, yes, sir.

Q. So that a steel having a wide range of difference, between the elastic limit and the tensile strength for one purpose, might be very valuable for that one purpose, and not valuable for another? A. Not equally valuable for another.

Q. Which indicates the better article, a narrow difference between an elastic limit and a tensile strength or a wide difference? A. If there is a wide difference it indicates a large degree of toughness, and if the difference is small it indicates rigidity in the metal.

Q. And whether these qualities are or are not desirable, depends solely on the use to which the article is to be put? A. Yes, sir.

Q. Has chilled cast iron a high tensile strength? A. Not notably high as compared to other things. Q. How does the elastic limit of chilled cast iron compare with its tensile strength? A. They are somewhat near together.

Q. Chilled cast iron is very brittle stuff, and from a metallurgist standpoint, rather an inferior and poorer article, is it not? A. It is a very valuable article.

Q. I understand so, but not of a high grade? A. No, sir, not a high grade for building purposes.

Q. Famous though for its surface wearing quali-

ties, is it not? A. And resistance to compression.
Q. Especially valuable——

MR. CORBIN—What have we got to do with chilled iron?

MR. HARDIN—I think it will be plainly apparent if the court and counsel will bear with me a moment, they will see its pertinency. We are discussing tensile strength, and I want to make a few comparisons of tensile strength as indicating the value of the article.

COURT—You may proceed.

(*Mr. Hamlin.*)

Q. Especially valuable for uses where the surface is exposed to wear, is it not?

MR. CORBIN—I object to the question and to any inquiries as to chilled irons on two grounds. First, because it is not cross-examination, and secondly because it is not relevant.

Question allowed.

A. Yes, sir, it is valuable for purposes where resistance to abrasion is important.

(*Mr. Hardin.*)

Q. Chilled cast iron has almost no elongation? A. The elongation is very small.
Q. And very little ductility? A. Very little.
Q. Has it any ductility? A. Practically not, it has a little microscopic amount.
Q. Is it large enough to be determined? A. Not to be of any commercial or practical importance.

Q. That does not answer my question—is it large enough to be determined? A. Yes, sir, it can be determined.

Q. Has it ever been? A. I don't know, sir.

Q. Has it any more elongation than glass?

MR. CORBIN—I object to the question on the same grounds heretofore stated.

Question allowed.

A. It is of about the same order as glass, whether more or less, I do not know.

(*Mr. Hardin.*)

Q. Next to Manganese steel, chilled cast iron is about the best article known for jaw crushers, or articles or that sort, requiring heavy wearing surfaces?

MR. CORBIN—I object to that question also for the same reason.

COURT—What is the object of this question?

MR. HARDIN—To show that the tests offered here of tensile strength have nothing to do in the determination of the quality of Manganese steel for the uses and purposes for which it is ordinarily manufactured.

Question allowed.

A. Chiled cast iron is largely used for the purposes you mention.

(*Mr. Hardin.*)

Q. And until Manganese steel was discovered, chilled cast iron was regarded as the best for those

purposes, was it not? A. I am not sure about that, there were a great many special alloys employed, particularly a material called "franklinite," which for many years was held to be the best material for jaw crushers, before then chilled cast iron was used.

Q. Chilled cast iron was, however, largely used? A. Yes, sir.

Q. Franklinite was equally brittle with cast iron, was it not? A. Yes, sir, I believe so.

Q. And it had a low tensile strength? A. I never remember seeing a record of the tensile strength of franklinite.

Q. It had very slight elongation? A. Probably.

Q. And no ductility, had it? A. Probably not.

Q. You are not able to tell us then, by knowing the tensile strength of Manganese steel, its elastic limit and its elongation, what the wearing properties of the article may be, in a casting? A. If you know the tensile strength and you know the elongation, you can form a very close estimate of its wearing quality, and you know the chemical analysis also.

Q. Is it true, then, that articles, all articles of high tensile strength and considerable elongation and of high elastic limit, have fine wearing surfaces, when used for parts of machines demanding wearing qualities? A. I don't know whether all such substances are suitable or not.

Q. Chilled cast iron and franklinite certainly have not those properties? A. What properties?

Q. High tensile strength and high elastic limit and high percentage of elongation? A. No, sir, they have not a high percentage of elongation, or high tensile strength.

Q. And yet they are recognized as high grade articles in the manufacture of parts of machines in use for wearing surfaces? A. Yes.

Q. Chilled cast iron is also largely used for car wheels, is it not? A. Only the tread is chilled.

Q. And that stands up, does it not, under crushing tests and even stronger than Manganese steel? A. I don't know, sir.

Q. Did you ever make any such tests? A. Not on chilled cast iron.

Q. Did you ever make any such comparisons? A. Not on chilled cast iron.

Q. Do you know of any material other than Manganese steel and nickel steel possessing high ductility that offers resistance to wear in parts of machine requiring special qualities for wear? A. If the wear is of the nature of abrasion, required to withstand crushing stress, I don't know of any alloy which is superior to them.

Q. I did not ask you about what is superior; I asked you if you knew of any, other than Manganese steel and nickel steel, possessing high ductility that offered resistance to wear, by abrasion, to the same extent? A. I think you said nothing about ductility in your former question.

Q. Read the first question, please—(question read as follows) "Do you know of any material, other than Manganese steel and nickel steel, possessing high ductility, that offers resistance to wear, in parts of machines, requiring special qualities for wear?" A. I beg your pardon, I did not hear the word ductility—it will modify my answer then.

Q. Now, understanding the question, please answer it—"do you know of any material, other than Manganese steel and nickel steel, possessing high ductility, that offered resistance to wear, by abrasion, to the same extent? A. I don't know of any material other than the two you have mentioned, which possesses to the same extent the ability to withstand abrasive wear and possesses at the same time a high ductility.

Q. That does not exactly answer the question? A. Will you read the question again?

Q. You have made a comparison—I asked you if you knew of any material, other than Manganese steel and nickel steel, possessing high ductility that offered resistance to wear, by abrasion to the same extent? A. I say I do not, other than the two you have mentioned or outide of the two you have mentioned.

Q. Just by way of curiosity I wish you would tell me with reference to the sample without a name in the column, next to "10B," what the thing at the bottom of that column means, with reference to tensile strength of that sample? A. The sample here referred to was much larger than the other samples we had been operating upon, and was so large that the machine was not able to break it, and that has been entered at the bottom.

Q. I notice that it is translated, that it says, "test to limit of machine, 300,000 pounds, or 95,500 pounds per square inch, without fracture"—what do you mean by 95,500 pounds per square inch without fracture? A. You will notice that the original dimensions are put on there as two inches. The 300,000 pounds is applied over the entire area, corresponding to that two inches in diameter. When the entire load of 300,000 pounds is divided by the area in square inches, it gives the number of pounds per square inch, which is noted here 95,500 pounds.

Q. And the tensile strength of that sample then, was in the language of the other individual tests, 95,500 per square inch? A. No, sir, it was greater than that, some unknown amount greater than that, it did not break.

Q. The ability of the machine to examine as to the tensile strength of a test piece of the dimensions of that test piece, would not measure beyond 95,500

pounds per square inch of tensile strength? A. According to that record, yes, sir.

Q. The reason I ask you this question is, because as to the other samples, a very much higher tensile strength than 95,500 pounds is recorded? A. Yes, but they had a very much larger sample to work upon, the size of this sample was such that the ability of the machine would not go beyond the 95,500 pounds to the square inch.

Q. The fact that this sample went to the limit of the machine does not indicate that with other samples the machine would not go beyond that figure, but that that was the capacity of the machine for a sample of that size? A. That particular sample.

Q. What you mean is, then, that the ability of the machine was limited by the size of the test piece? A. Yes, sir, that is it.

Q. What is the usual length of a test piece, when testing for tensile strength? A. There is no rule about it, except that you should obtain a test piece long enough to give you pulls at either end of sufficient length so as to be embraced by the jaws of the machine, and to have between the fixed head and the moving head of the machine a sufficient length on each side to measure a distance from which the elongation could be computed.

Q. Does a very short piece interfere with the correct ascertainment of results? A. It will as to the elongation, but not materially affecting the tensile strength.

Q. As to tensile strength and the elastic limit, there is no advantage or disadvantage in having a shorter or longer test piece? A. Yes, sir, it is better to have it moderately long than too short.

Q. Why? A. Because if the pull on the test piece is not exactly central, there is a very slight bending action, which on a piece of moderate

length becomes negligible, but in a piece of two or three inches long might be of importance.

Q. You told us the other day the only objection that you know of, to the use of Manganese steel, for the making of steam car wheels, was the expense—do you recall that? A. Yes, sir.

Q. Do you know whether experiments have been made as to the use of Manganese steel for steam car wheels or not, and whether those experiments have been successful or not? A. I do not know of my own knowledge, no, sir.

Q. Your notion about that is only based upon your general knowledge of the metal, and from the knowledge of the metal you assume that it would be good for steam car wheels? A. My reply was based on my general knowledge only.

Q. And the inference drawn from that knowledge? A. Yes, sir.

COURT—Do you mean that they would make good car wheels, but that they are too expensive?

A. Yes, sir, that is my opinion.

Q. What is your opinion based on? A. My opinion is based on the fact that they make excellent mining car wheels, and that I see no reason, therefore, why they would not make a larger wheel, suitable for trolley cars and steam cars.

Q. Is there not a difference between the uses to which a mine car wheel is put and a steam car wheel? A. Why, only that one is used in mines, and is subject to more or less corrosion from mine water and the other is out of doors, and not subject to that corrosion, so far as holding the load and being able to turn round, there is no difference.

Q. But the rate of speed is different, is it not? A. Yes, sir, the rate of speed is different.

Q. Would that have any effect on the wheel? A. It would have some effect, yes, sir, it would have some effect on the wheel, it would wear out faster.

(*Mr. Hardin.*)

Q. Are you able to tell us from this paper how many of these samples were original castings and how many were cut from other castings? A. I cannot.

Q. Did you know when you were testing which of the test pieces were original castings and which were pieces cut from other castings? A. I was informed of that fact by Mr. Potter, I knew nothing back of that information.

Q. To reheat Manganese steel castings that have been once treated, it takes the toughness out of them, does it not? A. Treated how?

Q. Well, take a good grade of Manganese steel casting, toughened, and of a high-grade article, and subject them to reheating, it deprives them of their quality of toughness, does it not? A. It depends on how they were toughened.

Q. Do you know whether these tests pieces that you had before you in these tests had been subjected to reheating or not? A. I understood from Mr. Potter——

Q. Not what you understood—do you know? A. I do not know, as I have already testified I did not know anything back of Mr. Potter's statements in regard to the origin of these samples.

Q. Whether or not reheating would destroy their toughness would depend on how they were originally treated, would it not? A. Yes, sir, in a great measure.

Q. What do you mean by "great measure"? A. I mean by "in a great measure" an important

change would depend on the way they had been originally toughened.

Q. I do not understand the answer—what do you mean by "in a great measure"? A. The customary way is to plunge the heated casting into water, if toughened by that method; reheating them without toughening them by plunging them into water would tend to make them less tough.

Q. Substantially less tough, would it not? A. Yes, sir, substantially less tough, if not requenched in water.

Q. It would tend to make them substantially less tough if not requenched in water, that is, it withdraws the toughness altogether, does it not? A. I don't know, sir.

Q. Don't you know that it withdraws toughness at all, or to the extent it withdraws the toughness? A. To exactly what extent of toughness it withdraws it, I do not know, sir.

Q. It substantially affects the casting for toughness, would it not? A. It would, yes, sir.

Q. There are other methods of toughening than by plunging into water, that you know of, are there not? A. Yes, sir.

Q. Such as, for instance—give us an illustration? A. Cooling in a blast of air will produce a partial toughening.

Q. A partial toughening—is there any other method of toughening to the same degree of excellence than plunging a casting into water, that you know of? A. I don't know of any.

Q. That is the best method known to you, is it? A. Yes, sir, I think so.

Q. Then why did you say "if they had been toughened by plunging into water, that by reheating them the toughness would be largely withdrawn"? A. Because it is a fact.

Q. Why did you put the "if" in? A. I said "if

they had not been reheated and plunged into water their toughness would be diminished."

Q. Well, perhaps I misunderstood you—you then say without qualification that a Manganese steel casting which is reheated loses in a large degree its toughness? A. No, sir; I don't say that it loses in a large degree its toughness, unless plunged into water, I say it depends on how it is cooled the second time, after it is reheated.

Q. Suppose it has not been cooled in any other way except by the air? A. The ordinary cooling would tend to diminish the toughness of the Manganese steel castings.

Q. So that a Manganese steel casting once toughened and then reheated and allowed to cool naturally would be without that quality of toughness that it had originally? A. It would have lost that quality of toughness that it orginally had, yes, sir.

Q. Substantially lost it? A. Yes, sir, I don't know how much the toughness would be reduced, but it would be reduced.

Q. Have you experimented on this subject? A. Not on the particular point which you have asked me about.

Q. I suppose you don't know to what extent toughness is removed, it may be that the toughness is entirely gone? A. I say I don't know to what extent it is removed.

Q. It might be, by such reheating and natural cooling that the toughness is entirely removed? A. I think not entirely removed by such reheating, because even the original first casting has some toughness.

Q. You probably understand what I mean—a casting that breaks in cooling, tears itself apart, has some toughness, has it not? A. Yes, sir.

Q. But it is a very small degree of toughness, is

it not? A. The amount or degree, I do not know.

Q. Slight toughness? A. I should assume it was slight, yes, sir.

Q. Who were the proprietors of the Crescent Steel Works when you were at Pittsburg? A. During the interval between 1888 and 1892 it was an incorporated company.

Q. Under what name? A. "The Crescent Steel Co."

Q. Prior to that time, what had been the name of the works? A. "The Crescent Steel Works," and the principal owners were Messrs. Miller, Metcalf and Parker.

Q. And when it was formed into a corporation, was it an incorporation of their business, that is Miller, Metcalf and Parker? A. Yes, sir.

Q. You were there, I think you told us, prior to and up to some time in 1892? A. Yes, sir.

Q. Kindly give us the date when you were there first, I have forgotten? A. I was there as resident metallurgist from the latter part of 1888 to the latter part of 1892.

Q. And you knew while there that Messrs. Miller, Metcalf and Parker had a license from Hadfield did you not? A. I did not know it; no, sir.

Q. You never heard that? A. I never heard it.

Q. In the bending tests that you have recorded, there are no samples of the Manganese steel of the Taylor Iron and Steel Co., are there? A. I presume not, if the record does not say that they were present.

Q. I hand you the sheets—please answer the question (handing witness papers)? A. There were no samples of the Taylor Iron & Steel Co. which were included on the summary of card "E."

Q. Were there any other bending tests than

those summarized on that card "E"? A. I do not remember that there were any.

Redirect by Mr. Corbin.

Q. You have referred to some of the car wheels as having the name "Taylor" on them—do you recall the precise inscription? A. I have consulted my memorandum and I find that the inscription on the wheel is, "Taylor Manganese."

Q. You referred to one car wheel of the "Taylor" lot as defective, was that used in your tests? A. I think not, but I can be sure by looking at the record.

Q. I hand you the sheets. A. I think that was not used.

Q. In conducting these tensile strength tests, does the fact that the fracture takes place outside of the ground section deprive the tests of its value, as showing tensile strength of the ground section? A. In my opinion it does not where the diameter has not been changed.

Q. That is the ground section would have at least the tensile strength at which the fracture took place, and you could not tell how much more? A. Yes, sir, that is correct.

Q. Is the elastic limit a point of importance in determining the value of Manganese steel? A. It is of minor importance, for most of the purposes for which Manganese steel is employed.

Q. Suppose it were used, for example, in the matter involving lateral strain, as well as abrasion, would it then be important? A. It is not particularly important except for uses in which the steel is to be subjected to a pulling force.

Q. Suppose, for example, you take the case of dipper teeth, or the jaws of a dredge, in which there would be a lateral strain, would there not be upon the teeth? A. Yes.

Q. Would it be important there? A. I think not.

Q. Would it not be less likely to break if there was elasticity in it? A. Yes, if there is elasticity in it.

Q. Do you recall any cases of reheating Manganese stel after it had been quenched in the course of these experiments with a view to note the effect? A. None to my knowledge.

Q. Take the case of one of the American Brake Shoe and Foundry Co. car wheels, do you recall them? A. I have no personal knowledge as I have already stated, behind Mr. Potter's statements. There were certain no such reheatings performed in my presence, or by my direction.

Q. Then you don't know whether one of the samples of the American Brake Shoe and Foundry Co.'s car wheels was prepared in that manner for the purposes of experimentation? A. I do not remember, no, sir.

Q. One of them did show considerable less strength than the others, did it not, one sample? A. Yes, sir.

Q. With a knowledge of the chemical constituents of a given manufacture or sample of Manganese steel, could you reproduce steel having those chemical constituents? A. You can very accurately.

Q. Now, then, can you determine the critical point at which the steel has been quenched by an examination of the sample? A. To a large degree, yes, sir.

Q. In what way—what is the critical point first? A. The critical point in steel generally is a point at which it undergoes very great changes in the character of its grain, and also changes in its degree of hardness.

Q. That is the temperature? A. And it has a particular temperature, yes, sir.

Q. Then how would you ascertain at what point the quenching of the given sample had taken place? A. If you heat the given sample up to the critical point, or higher than the critical point, and then break it after cooling, the grain will have one character. If you perform the same operation and do not heat it up to the critical point, the grain will have a different character. Therefore, any sample can be tested in that way by breaking it and observing the fracture, and then carrying it up to the critical point and then again observing the fracture, you can tell very closely to what limit of temperature it was originally heated.

Q. Well, then, could you in this way reproduce a given physical condition, as well as a a chemical analysis? A. I think it would be possible to reproduce it to a very close degree of approximation.

Further Cross-examination by Mr. Hardin:

Q. You can determine, if I understand you rightly, from the fracture, the grain of the fracture, the critical point to which the heat was raised in its treatment? A. You can determine whether the sample had been heated and cooled at a temperature materially above the critical point, or at a temperature materially below the critical point.

Q. How often would you quench it, in your operation? A. As many times as would be necessary to determine the character of the fracture, probably only once.

Q. What did you think I asked you then? A. I thought you asked me how many times I would quench the sample.

Q. Yes, that is what I did ask you—from the grain then of the fracture, you can get a pretty good idea about the temperature to which the cast-

ing has been raised in its treatment, you say? A. You can.

Q. And is the quality of the casting dependent on its grain? A. To a considerable degree, yes, sir.

Q. Explain what you mean by "to a considerable degree"? A. I mean that if the grain is fine, the casting will, as a rule, have a different set of mechanical properties, from what it will have if the grain is coarse.

Q. And yet I notice in these tests you made that the fracture of the casting showed sometimes a coarse grain, sometimes a light color, and sometimes gray, without any apparent difference in tensile strength, or elastic limit? A. Yes, sir.

Q. Explain that, if the character of the casting depended on the grain as shown at the fracture? A. The note on the tables there record the grain as it appears under the naked eye, and the study of the grain requires the use of a microscope.

Q. Does the coarse grain become finer under the magnifying glass? A. You magnify everything, of course, under the magnifying glass.

Q. And does the grain under the magnifying glass become finer or coarser? A. It means just the same, but you can see it more distinctly.

Q. Are these notes then of no importance about the appearance of these test pieces, under the fracture—sometimes you say the grain is coarser, sometimes you have it that it is a light grain, and sometimes a lead color, and sometimes it is of a gray color; there are all sorts of notes here? A. They are not of fundamental importance, no, sir.

Q. Are they of any importance? A. Yes, sir, they are.

Q. Of what importance are they? A. Chiefly to the man who wishes to produce that article.

Q. That is, if you have a certain casting and

you fracture it, and you see that it is of a light gray color, the fact that it is of a light gray color is of interest only to the man who wants to make a similar casting? A. Principally to him, yes, sir.

Q. And has nothing to do with the quality of the article? A. It is the result of the quality of the article, yes, sir.

Q. Its being of a coarser or lighter grain makes no difference, a coarser or a finer grain? A. It does make a difference, yes, sir.

Q. Which is the better article? A. It depends on what it is to be used for, if it is a forged and hammered sample——

Q. Forging and hammering improves the toughness, does it? A. Yes, sir.

Q. But a casting breaking and showing a lighter or a darker color, that has nothing to do with the quality, has it? A. They are connected with the quality, but not in such way that the quality can be shown entirely by the color of the grain.

Q. A coarser or finer grain, is it indicative of quality in a Manganese steel casting? A. Yes, sir, but not to the same extent as it is of ordinary carbon steel.

Q. And to what extent does it aid in determining the quality? A. I cannot tell you.

Q. To any extent? A. Yes, sir.

Q. Apparently from your tables here the coarser grain may have no greater tensile strength than the fine grain, or the fine grain than the coarser grain? A. Apparently, yes, sir.

Q. And yet you told us a little while ago, that tensile strength was an important thing in determining the quality of Manganese steel? A. For certain purposes, I was careful to add, not for every purpose.

Q. Then after all, we get down to this, that the quality of Manganese steel is determined by its

capacity to stand up under the use for which it is intended or designed? A. Yes, sir.

Q. And not by its tensile strength or by its elastic limit or by its color of fracture or by its grain after fracture? A. No, sir; those qualities indicate the behavior of the metal under commercial use.

Q. From the structure of the fracture, you have said that you could determine the temperature to which the casting had been brought under treatment—have you ever made experiments, with a view to such determination? A. I have.

Q. Where—with Manganese steel I mean? A. Not with Manganese steel, no, sir.

Q. Have you made any experiments with Manganese steel? A. Oh, yes, sir.

Q. Other than those you have described to us as having been made at Pittsburg in the Crescent Steel Works in 1892? A. No, sir, not outside of that.

Q. And that was made to determine whether Manganese steel was fit for ~~two~~ Loof purposes or not? A. Yes, sir.

Q. And have you made any experiments in the use of Manganese steel to be subjected to lateral pressure? A. Not outside of the present set of tests.

Q. Or have you made any experiments in the use of Manganese steel to be subjected to a vertical pressure? A. Not outside of the present set of tests.

Q. What is the basis of your statements to Mr. Corbin, that this tensile strength was an important matter, when the steel was subjected to lateral pressure—you made no experiments at all on which to base that answer, have you? A. It is a matter of common knowledge that a steel which is ductile, whether it be Manganese steel or any

other steel, is less likely to break than a steel which is not ductile, and which has not high tensile strength.

Q. Is it any more likely to break under lateral strain than any other kind of strain? A. I depends on the degree of strain.

Q. And on the use to which it is subjected? A. Yes.

Q. Then you get back to that again, do you? A. Yes, sir.

Q. What grounds have you for inferring that the same indications which led you to know the temperature from a fracture to which carbon steel has been raised applies to Manganese steel? A. Because the fracture in all the commercial metals is a more or less accurate indication of the physical condition of the metal, a general law.

Q. And that is the only reason you have? A. Yes, sir.

Q. You never applied that to Manganese steel? A. I have not applied that to Manganese steel.

Q. And yet you say you know that, as to combining toughness with ductility, Manganese steel and nickel steel are peculiar? A. I do.

Q. May they not be peculiar in other respects also? A. They may.

Q. Steels generally are good conductors of electricity or steel is generally magnetic, is it not? A. Carbon steel is magnetic.

Q. Manganese steel is not? A. Very, very faintly magnetic, not appreciably.

Q. It is not true that the effect of the suddenly cooling of Manganese steel is the exact opposite of suddenly cooling any other kind of steel? A. Yes, sir, I have already said that.

WINFIELD S. POTTER, recalled for further cross-examination:

Cross-Examined by Mr. Lindabury:

Q. Is the treatment in the making of Manganese steel an important part or important element in the production? A. Yes, sir.

Q. One of the most important, is it not? A. Yes, sir.

Q. Do you pursue it at Chicago Heights now, the same treatment that you did in the beginning? A. There have been two methods pursued there, both of which I described as one being preferable to the other, but slower and more expensive—both methods have been pursued.

Q. Have both of them been pursued from the beginning? A. Yes, sir, from very shortly after the beginning.

Q. And during your incumbency there? A. Yes, sir.

Q. And have both of them been continued down to the present time? A. I think not.

Q. Which one of them has been banished? A. The more expensive one.

Q. Now, when was that abandoned? A. The more expensive——

Q. Not why, but when was it abandoned? A. I cannot answer your yestion if I am to answer it by a date merely, because the more expensive method has been used, I think, occasionally, I think very nearly up to date, and yet from the beginning, only occasionally.

Q. How often would you say? A. Probably something like twenty or thirty heats, annealing furnace heats.

Q. During what period of time? A. During the whole period of manufacture there.

Q. And how many of those twenty or thirty

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heats occurred within the last year, that is occurred in 1906, as you estimate them? A. Oh, I should say only five or six times, and possible as little as two or three times, in the last year.

Q. How does that compare with the number of heats under the other process or method, when that was used? A. I don't catch the gist of that question.

Q. You say you used that method twenty-five times probably during the whole time, from the beginning, now how many times did you use the other method, approximately? A. Well, at times every day for months.

Q. So that the other has probably been used four or five or six hundred times? A. Something of that sort.

Q. Now, have you varied in this expensive treatment, so far as you have employed it, that is, in so far as it has been used, is it exactly as it was used at the beginning? A. No, sir, the weight of the casting, the thickness of the sections, would make variations in the use of either method.

Q. Yes, that I suppose is so, at the beginning, but except the variations due to variations in the character of the castings, have there been any changes in it, as used there since the beginning? A. Sometimes the castings were not heated as hot as they should have been to properly alter the structure of the metal and get it in the best state, and in some instances where that had happened it was discovered and the whole heat of castings was reannealed. It is a question of inaccuracy of workmanship, the only variation there was, no intentional variation.

Q. Of course, I was not asking about variations due to inaccuracies or carelessness? A. That is the only kind I know of.

Q. As to the other or cheaper process, has that

undergone any variation since you employed it first? A. I was speaking of the cheaper method and thought you were speaking of that also.

Q. No, I was speaking of the more expensive one? A. I never made any more very considerable variations in that, I don't think anyone ever used it but myself there.

Q. Did you instruct anyone else in that process? A. Yes.

Q. Who? A. The foundry foreman, "Fred Sands."

Q. When did you instruct him in it? A. Why I told him about that I think about three or four months after we first commenced annealing Manganese heat, treating it.

Q. Did you instruct him in it so that he could do it? A. Yes, sir.

Q. But so far as you know, it never was done by anyone except yourself? A. I don't know that it was done by Fred Sands or anyone else when I was not there.

Q. We will now go to the other method—you are quite sure that the ordinary process employed there is still the same as it was at the beginning, are you? A. So far as I know, and I am supposed to be informed on the subject.

Q. Is that process as you use it there described in any book, in its details I mean, not in its generalities? A. Not in its details.

Q. Is it described in any written or printed publication? A. I cannot say as to that, it may be for all I know.

Q. I am asking you for your knowledge, have you seen it published anywhere, or have you seen it described anywhere? A. I have seen it substantially described.

Q. Where—I am speaking of its details now? A. Why in the—I don't know just what you mean

by its details—if you mean steps by details, it is described.

Q. I mean details that would enable anyone of intelligence to follow it? A. Not without some experimenting and testing of steel treated by different details or methods, the examination of steel after you had operated upon it in certain manners, that examination of steel would determine whether you had done the thing correctly or not.

Q. That is, you mean, that it might be found out by searching after it? A. After reading, yes, sir.

Q. Can you tell me where there is a publication, if read, would enable a man, if he experimented enough, to find out how to do it? A. I think that the published patent specifications are sufficient.

Q. Whose? A. Why the Hadfield patents.

Q. Hadfield's? A. Yes, sir.

Q. Which ones? A. I could not give you the numbers, the first original patent and the—let me see—I am not sure of what that long article of Hadfield's that was published was in, it was an English scientific publication, and I think it was "The Iron and Steel Institute" publication.

Q. Now, what is the publication? A. I cannot give it to you, I cannot give you the dates or the pages, numbers, or anything of that sort.

Q. Did you do nothing at Chicago Heights in this heat treatment, different from the formulas contained in the Hadfield patent, and Hadfield's publications? A. No, sir; there is nothing radically different, there is more detail added, that is all.

Q. Are these essential details? A. Why, they are simply——

Q. Tell me whether these details are essential or not? A. Yes, sir, all details are essential.

Q. I ought not to have interrupted you, perhaps;

if you want to add anything you may do it? A. I was merely going to say that all these details are details of an annealing furnace operation which are very difficult to describe, and which a man naturally learns, as he does anything in the handling of any other tool or instrument.

Q. With respect to which he is to be instructed, I suppose; either has to be instructed, or learns from a good deal of work with it? A. Yes, sir.

Q. Now, what temperature do you begin the heat with? A. If the castings are cold, and you begin the heat from the ordinary temperature.

Q. If the castings were cold? A. Yes, sir; they are not always cold, though.

Q. Do you begin the heat with cold castings? A. More often than when warm.

Q. You sometimes do it with hot castings, don't you? A. Yes.

Q. At what degree of heat? A. Sometimes a very dull red heat or blackness, I should say about nine hundred or one thousand degrees Fahr.

Q. Does that mean that you take them at that heat from a mould, and put them into a furnace? A. Yes, into a furnace of about the same temperature.

Q. Have you no rule about that—is it a mere matter of convenience whether you begin at that temperature, or what is your rule about it? A. The rule is to endeavor to get the castings which are likely to crack out of the mould, at a temperature as high as possible; that is to say, not at a white heat, not while they are weak and tender, and difficult to handle, and not when other operations would be interfered with by trying to get them off the floor and at the same time continually opening the furnace, to put them in, but to get those that are liable to crack, when they cool, or to be strained by being cooled rapidly, to get

those castings into the furnace, when they are about at a red heat, that is about eleven hundred or twelve hundred degrees Fahr., that would be quite a good and red heat——

Q. That is your rule? A. That is our rule.

Q. With respect to that? A. Yes.

Q. What degree of temperature do you raise the furnace to, if you have a rule—have you a rule on the subject? A. Yes, they are raised to 1900 degrees Fahr., from 1900 degrees to 1897 degrees Fahr., that is to a temperature between that range.

Q. Where did you get the idea that it would be a good thing to remove these castings from the mould to the furnace at a red heat? A. Why, I found that gyratory crusher heads broke when they were allowed to cool. The first one that we ever made cracked in three places, cracked twelve inches long clear through the two and a half inch section, and I think about forty-eight hours after the casting was cold Mr. E. J. Snow and myself and others had examined that casting after it was cold, and admired it, and we came around and looked at it again, and the cracks were open wide enough in some cases to stick a pen-knife blade in, and we came to the conclusion that it was dangerous to let those castings get cold before annealing. And we had castings break when reheated with great care, and we came to the conclusion that we had better not let those castings become cold. And we had heard a great deal about the annealing of car wheels, and high steels, and white irons, which were apt to break in a similar manner, and we knew the method of avoiding that, which was common practice in cases of car wheels

Q. And you found nothing on this subject in Hadfield's publications? A. No, sir.

Q. And when was it you made these observations, or did this experimenting? A. Well, with

regard to Manganese steel, the first experiments which I had of castings breaking, was the first gyratory crusher head that I made.

Q. When was that—I don't recall that you told us about that? A. I am not sure of the month, but it was one of the very first castings we had made. We had not made more than one or two hundred castings, when we had that experience.

Q. This would be in the autumn of 1904, would it? A. Yes, sir, early in the autumn of 1904, I think.

Q. Yes, and then after having learned that, you concluded to try the experiment of putting the casting in the furnace before cooling, did you? A. Yes, sir, we did either that, or we saw to it that the casting was not taken out of the sand at a high heat, and allowed to cool rapidly in the air, so that it would be put in strain by the manner of its cooling, we cooled it in the mould, more slowly in the large pit of sand, and avoiding stress or strains in that way.

Q. Did you let it cool entirely to an atmospheric temperature in the sand? A. Yes, sir, we have done that in a great many instances.

Q. How did that work? A. Very well, the losses were very much less in that way.

Q. Did those experiments lead you to adopt a rule of practice in regard to that? A. The rule of practice was that either one of these things should be done always, with certain shapes that we found were likely to crack.

Q. So that you experimented on two lines? A. Yes, sir.

Q. One was to let the castings cool slowly in the sand in the mould? A. Yes, sir, let the castings cool slowly, either in the sand or in some other way.

Q. And the other was taking it out of the mould

at a red heat, and putting it in the furnace at the same temperature? A. Yes, sir.

Q. Did you experiment on both lines at the same time? A. Yes, sir.

Q. How long did these experiments continue before you reached the conclusion as to what would be good practice? A. I answered "yes" to your last question when you asked me if I had experimented along that line—well, we adopted that at once.

Q. At once, after you had had the experiments? A. Yes.

Q. What length of time did you take to raise the castings from a temperature of 1100 degrees Fahr. to the maximum? A. The castings going into the furnace at that temperature we usually took from six to eight hours, to as long as forty-eight hours, to get them to a maximum temperature, according to the shape and thickness of section, and also the question whether it was night or day, and whether the proper man could be there to inspect the heat and see it drawn, when a suitable length of time had elapsed to heat them slowly enough.

Q. I supposed you had some rule about it, you did not leave them in a few hours, or forty-eight hours at random? A. No, sir; if the castings were made we tried to finish them in the same day.

Q. If heavy? A. If they were heavy, and they had gone into the furnace cold, we would take more time, usually twenty-four hours, from the time they were put in the furnace, until the heat was put in and quenched.

Q. How did you find that out, or that it was advisable to consume twenty-four hours? A. Well, I think that my first ideas on that subject came from the experiments which were made, or the efforts that we had made, to make Manganese steel at Wharton, Jr., & Co.'s place. My ideas were still

very hazy when I left there, and while I was at Newport News I was working with a young Englishman by the name of Mayers, who had been in the employ of Edgar Allen & Co., at Sheffield, England, and he told me then and later, all the details, I think, of Edgar Allen method, and he did speak particularly of the slowness with which they annealed all classes of heavy steel castings, that is heavy steel castings in all kinds of steels. He said that they used sometimes as much as seven or eight days for castings in the furnace, and I got an idea that it was a very good thing to do, what they called "soaking castings" for a good many hours.

Q. "Soaking"—do you mean by heating in the furnace a long time? A. Keeping the casting for a certain time at a suitable heat to accomplish the annealing whereby the distribution of the chemical elements enter into the steel.

Q. So as to produce an even heat through the casting? A. An even quality of casting, determined by an even heat, yes, sir.

Q. Did you ever subject them to an eight-day treatment? A. No, sir, I never had castings out as long as that.

Q. You modified that practice, did you? A. Yes, sir.

Q. By cutting it down to forty-eight hours? A. I think that was about as long—sometimes when the men were worn out, and the furnaces did not work well, and we could not get the maximum heat for any reason, they frequently left them in the furnace longer than that.

Q. So really, you did not have much rule about that—what rule did you have about it? A. Well, we had a rule which was dependent on the thickness of sections.

Q. Well, what was the rule, was the thing left

to the individual judgment of anyone? A. No, sir, I wrote out a rule which I required the foundry foreman to follow.

Q. What was it? A. I think with hard carbon steels it was to be after reaching a red heat—no. From the start, it was to be an hour and a half for each inch of thickness of the heaviest section, and, if I recollect it aright, it was to be three hours for each inch of thickness of section, in Manganese steel castings, in reaching a red heat, or in reach- a heat of twelve hundred or thirteen hundred degrees Fahr.

Q. Well, you did not find that rule or formula in any book, did you? A. No, sir, I did not, still I think—I am not sure whether Mr. Hadfield has anything definite on that specification or not.

Q. Whether he has or not, I ask you whether you got it from Mr. Hadfield's works or where did you get it? A. I don't know that I did.

Q. It was the result of your experience, was it not? A. It is information picked here and there, and I don't know where I got it really.

Q. Information picked up here and there and availed of in experiments and in working out your own methods? A. Yes, sir, practically.

RECESS.

(*Mr. Lindabury.*)

Q. Just what time was it that you left Chicago Heights in 1905? A. I have already stated to you, I think, that it was the 26th day of June—either the 26th or 27th day of June—but I think it was the 26th, 1905.

Q. Are you married? A. No.

Q. So you did not keep house out there? A. No, sir, I did not keep house.

Q. That is the day you left the works and went

on a telephone communication from my mother. to New York? A. Yes, sir, I went to New York

Q. And when was it you definitely decided to go, and informed the company that you were going? A. When I had this telephone message.

Q. I thought there was some prior understanding between you and the defendant company that you were to leave, was there not? A. Mr. Snow and I had a discussion, I think in either March or February over the class of work that was being taken by the sales department, and I told him that I could not make a record on that work at the prices it was being taken at, and I was going to New York then to see my father on a summons from him to come and consult with him about something he wished to see me about, and I told Mr. Snow at that time that unless something should be done in the way of getting good plain heavy work at market prices I did not want to remain there, and I should like to know what the management was going to do about it, because I would like to look after something near New York during that trip, and it was left uncertain whether I should come back or not. That was either March or February, I don't know which. And later on I saw Mr. Cutler in Chicago, and he asked me to remain, and we decided between us that I would remain for six months from that time, and my six months was not up when I got this telephone message to come to New York because there was trouble in the family in Brooklyn and I never had a chance to go back, it was no choice with me, I had to go.

Q. When was the six months' agreement made? A. I cannot state, I really think, though, it was about half way between these other two dates I have given you, somewhere around April or May.

Q. Did they then change the policy of the com-

pany to meet your views, as expressed to Mr. Snow, preceding February and March? A. No, sir, there was nothing definite, there was a gradual tendency to give me more heavy work, and lots of it, and there was a gradual change in the policy, but very slowly.

Q. And they did not come quite up to your ideas? A. No.

Q. And that was the real reason of your deciding to go away from them? A. Well, it was the occasion of my telling Mr. Snow that I feared I could not make a financial success of it. I told him in the latter part of the winter or the early spring, but that was not the occasion of my leaving Chicago Heights, it was an entirely personal matter that caused me to leave there.

Q. Do you mind telling me what your salary was when you left Chicago Heights? A. It was $3,000.

Q. And when you returned it was how much? A. $3,500.

Q. Did you have many castings returned when you were there, I mean Manganese steel castings? A. I cannot recall any instances.

Q. When did you begin making safe bodies? A. Safe bodies were made—we began those not a very long time before I left Chicago Heights. Mr. Arnold, I think his name was, the company for whom we made the safes, came up there with Mr. McKee, and had patterns expressed to the shop for examination with me, when he should arrive. And when he arrived we discussed the method of manufacture, and I decided on the method of manufacture, and that method was pursued and is still pursued.

Q. I am asking you only for a date—can you fix the date when you began to make these safe bodies? A. No, sir; I remember we received the

patterns perhaps two months before I left. The first day that I made the first casting, was the day before I left—we made a number of castings before I left, perhaps during April and May.

Q. Were they made experimentally? A. No, sir.

Q. Did you ship them before you left? A. Oh, yes.

Q. How early did you make any shipments, as you recall? A. I cannot tell you that—I should say it was somewhere from one to two months before I left that we made any considerable shipments. We commenced manufacturing them rapidly and shipping them rapidly.

Q. Do you know whether any of those came back? A. Not during my time.

Q. Did they come back afterwards, if you know? A. A good many of them came back later.

Q. A good many? A. Yes, sir.

Q. And being returned because they were defective? A. They were returned because they were found defective, yes.

Q. Was it some of those castings that you objected to making at the price? A. No, that was not Manganese steel.

Q. Other kind of work? A. Yes, sir, very light common steel work.

Q. Do you know Dr. Leonard Waldo? A. Yes, sir.

Q. Did you have an interview with him at his office in New York a few months ago? A. I have had, I think, three meetings with Dr. Leonard Waldo; yes, sir.

Q. Of what country is he a native? A. I don't know, but I should judge him to be from England or Scotland, but I really do not know.

Q. A steel man, is he not? A. He seemed to have a knowledge of steel technically.

Q. Did you tell him at an interview in his New York office, some two or three months ago, that you had had serious difficulties in the manufacture of Manganese steel at Chicago Heights—Manganese steel castings at Chicago Heights? A. I don't remember that I told him anything that would sound like that at all.

Q. You would not say that you did not? A. No, but I would be inclined to say that I did not.

Q. Such a statement if made would have been correct, would it not? A. No, I would not say that it would be correct.

Q. Did you tell him also that you had had a large quantity of castings returned by customers, on account of defects? A. No, sir; I told him nothing of the kind, because it would be foolish.

Q. You said that that was true? A. I said there were castings returned from time to time after my leaving Chicago Heights, a considerable number of safe bodies, one type of Manganese steel castings, there was a considerable discount, not very large however, on that particular type of work.

Q. Did you tell Dr. Leonard Waldo, that the defendant company had secured a man from the Taylor Iron and Steel works, but they had not been able to use him on account of an injunction? A. I think I mentioned the suit to him, in fact, I am quite sure I did.

Q. Did you tell him that—that the defendant company had secured a man from the Taylor Iron Works, but that they had not been able to use him at all, on account of that injunction? A. I am not sure of just what I told him, although I think I mentioned something of that sort to him.

Q. Now, you said something about the sawing of Manganese steel—did you, in fact, ever see a Manganese steel casting sawed, when hot? A. In Billet.

Q. I am speaking of castings? A. I never attempted to saw castings.

Q. Did you never see anyone else do it? A. Never hot, or cold either.

Q. The difficulty would almost be insurmountable, would it not? A. I do not see that it would be very difficult if at the right temperature.

Q. Did you ever hear of anyone doing it? A. No, sir; but I have myself sawed and seen sawed quite a number of different shapes and sizes of Manganese steel, either after they had been rough rolled, or rolled to a finished shape, and there was no difficulty at all, and it was very easy, in fact, and I cannot imagine that there would be any difficulty in the case of a casting; I don't see that there would be any difficulty in sawing it.

Q. Were they not perfectly straight? A. The shapes?

Q. Yes? A. Yes, sir, but they were not firmly supported.

Q. I asked you if they were straight? A. Yes, sir; they were straight.

Q. Did you ever know castings of any shape to be sawed hot? A. No, sir; I don't see why it should be done really.

Q. Now, you say you got very good toughness by quenching, 1,700 degrees Fahr.? A. Yes.

Q. Or at a lower range of 1,010 degrees to 1,060 degrees? A. Centigrade?

Q. That is higher, is it? A. Yes, sir.

Q. Well, did you get it—do you mean to say that you got good toughness at a lower range than 1,010 to 1,600 Centigrade? A. The quenching temperature, you are speaking of?

Q. Yes? A. I have seen a good bending test from a specimen which was air cooled on a metal plate, as good as any I have ever seen from anything that was quenched from any temperature, and in any manner.

Q. Have you, experimentally or otherwise, quenched at a lower temperature than 1,010 or 1,060 Centigrade? A. Yes.

Q. With what result? A. I have tried with steam quenching and water quenching, and quenching in brine and air cooling, and I have noticed that rapid cooling adds to the toughness from a temperature we will say above 1,500 Fahr.; rapid cooling, from a very moderate temperature, adds to the toughness. The greatest toughness and greatest uniformity it takes comes from quenching from quite a high heat, that is in castings——

Q. Did you reach a rule at which you had your men quench? A. Yes, sir, decidedly.

Q. What was that rule? A. 1,900 degrees Fahr. or over.

Q. That was the rule you deduced from all these experiments? A. Not too much above 1,900, but quite close to that limit.

Q. How high did you get? A. 1900 to 1925 degrees Fahr.

Q. And how did you quench? A. In various ways. Sometimes we took a furnace full of castings out of the furnace, lifting them with a rake, which had been buried in sand, at the bottom of the furnace, lifting the rake in the castings, with the crane, and immersing the mass of hot metal in a pit full of water.

Q. That was one way? A. That was one way, and in some cases we pulled the castings out of the furnace, one at a time, maintaining the temperature of the furnace at the contained castings, at the one temperature, as nearly as possible.

Q. Until you got them into the water? A. One at a time being pulled into the water.

Q. Did you ever know anyone to quench in the first way you mentioned, anyone else I mean? A. No, sir—wait a moment. I should have to say that

Mr. Mayers described to me a method which would be somewhat between the two. A car was drawn quickly from a furnace and various appliances in the nature of cranes were used to very quickly take the castings from this car and put them in the pit of water, or tank of water, as many as could be lifted at a time——

Q. Your method then was a compromise then between that and the other method? A. Yes, sir; it was the two extremes of what was described by Mr. Mayers.

Q. And did you have another method still, of quenching? A. Yes, sir.

Q. What was that? A. Why at one time, I was so anxious to get the castings quenched at exactly a particular temperature, as determined by heat measuring appliances, that having made a few preliminary experiments to see that I was not going to blow the roof off, I filled a pit full of castings, as quickly as I could fill it with water, I filled the annealing pit as full of castings as I could, and as quickly as I could, and there were no disasters, and the castings were particularly good.

Q. Did you ever know anyone else to do that? A. No, sir.

Q. Did you leave that as a rule of practice behind you when you left? A. No, sir; they would not go on with that, they were afraid of it; I wanted to find out what the toughness would be——

Q. You have been quite a scientific investigator? A. I don't know whether I have been a scientific investigator or not.

Q. Well, what would you call that? A. I will let you give it a name.

(*Mr. Corbin.*)

Q. You developed a great deal of steam? A. Yes, sir; I experimented on that, that was only

experimental. I tried it on a pit full of castings; it was entirely too slow, although it would succeed very well with small specimens, but you could not get steam through an annealing furnace quickly enough to cool fast enough.

(*Mr. Lindabury.*)

Q. Did you work out the rule with regard to the annealing of Manganese steel by reason of your knowledge of the method of annealing carbon steel? A. I took into consideration what I knew of the annealing of carbon steel, and modified it according to the result—well, various results which I saw in attempts to anneal Manganese steel, but more particularly I modified it by making experiments which showed at once that the heat-conducting capacity of Manganese steel was very low, as compared with low carbon steel, containing little Manganese.

Q. You would not cool carbon steel in the way you have described? A. You spoke of annealing, not the quenching; that is two distinct operations really.

Q. That is because I am not a steel man—I will ask you with regard to quenching—did you work out your practice in the quenching of Manganese steel along the lines recorded or information recorded in the quenching of carbon steel? A. No, sir; I don't see that the two have anything to do with one another.

Q. You would quench carbon steel the same way you quench Manganese steel? A. No, sir; it would not be feasible; it would not work out well at all.

Q. You would ruin the Manganese steel, would you not? A. You would ruin carbon steel.

Q. You would ruin carbon steel if you quenched it in that way? A. Very high carbon steel would usually crack, a low carbon steel would be in very

small and some simple shapes, it would be merely hardened unduly, for most work.

Q. How did you find out the different ways of quenching Manganese steel? A. Well, I think I have told you that a Mr. Morat told me I should have quenched these castings which I sent to the Anaconda Mining Co. from St. Paul, Minn., that I should not have shipped them without annealing or quenching them, as I did.

Q. You quenched them as if they had been carbon steel? A. I did not quench them at all, I annealed them.

Q. That is the way you got the first idea? A. Yes.

Q. And you did not quench carbon steel at all? A. No, sir, not unless you are tempering a tool.

Q. When you made the next lot of Manganese steel, you concluded to quench it, did you? A. Yes, sir; I understood from Mr. Morat after I had made a grievous mistake, that I should have also quenched them.

Q. Then you tried the different ways of quenching, did you? A. The first opportunity, I tried to make Manganese steel as it should have been made—I tried to make some good specimens of Manganese steel.

Q. How did you try to quench it the first time? A. I tried to quench it the first time as I took it out of the mould, what appeared to be just half the heat, as I took it out of the mould.

Q. And how did you get it that time? A. Why that was at the Wharton & Co.'s works, and I could see Mr. Taylor the foreman there, he and another short workman tried to carry a switch tongue in a shovel, which broke into five or six different pieces, as they carried, as they were going towards the tank with it.

Q. How long was it before you reached to what

you settled down to, as your rule of practice for quenching? A. I talked that thing over with Mr. Morat, and Mr. Mayers, before I had had an opportunity to make anything more than a little piece of Manganese steel, after that experience at Wharton & Co.'s works, and I had heard so much about it, that I simply went ahead and did it, and I produced a good Manganese steel casting, from the start, with that information.

Q. Did you quench the first time with cold water? A. Yes, sir; always with cold water.

Q. How soon did you quench in these other ways that you have mentioned, right along during these different ways, as you went along from the start—, that is at Chicago Heights? A. I tried steam quenching before I left Chicago Heights as superintendent, and it was when I went back there to prepare a set of test specimens for this case, that I first tried methods to determine the temperature at which the castings were quenched and to determine that very exactly, by putting water in the pit, filling the furnace full of water.

Q. That is when you tried that? A. Yes, sir; I wanted to be satisfied.

Q. Did you keep on experimenting to satisfy yourself, up to the time you left there? A. I did very little experimenting from the start until I went back there to prepare these test specimens.

Q. Did you leave behind you, when you left there, definite rules of practice, with regard to quenching? A. Yes.

Q. In writing? A. Yes, sir, in writing, and it was placed in the hands of Mr. Snow.

Q. Do you happen to know whether any steel was produced, Manganese steel, between the time you left in May and the following August? A. I left in June.

Q. Well, in June then? A. And went back in October.

Q. I asked you, between the time you left in June to the middle of August, were the books kept of the company which would show that? A. Why, I am sure it is not necessary to produce the books; I think everyone connected with the company will admit that the production of Manganese steel continued.

Q. But perhaps we will not admit it? A. Well, it can be demonstrated.

Q. Do you know of your own knowledge whether any Manganese steel was produced between the middle of June and the middle of August? A. I did not see it produced.

Q. We will have to have the books, I guess—I think you said this Manganese steel is better than any steels that were previously used for crushing rolls and dipper teeth and things of that kind? A. No, sir; I don't think I have testified on the subject of the quality of Manganese steel castings in use.

Q. What is your experience in that regard? A. I don't know anything about the wear values of Manganese steel in service.

Q. Well, Manganese steel is much more expensive than the steels which were formerly used for crushing and dredging machinery, is it not? A. No.

Q. Not more expensive? A. No.

Q. Why, because it will wear longer—the initial cost is more, is it not? A. No.

Q. Per pound? A. The price charged is higher than perhaps might be charged for some other steels that cost more money than the Manganese steel.

Q. Well, it costs more to the user, does it not? A. Yes, sir, than most of the other steels used.

Q. Is it any harder than some others? A. What do you mean by "hard"? I do not think the qualities of this steel have been defined in this case yet, properly.

Q. The properties of Manganese steel have not been defined? A. I do not think so.

Q. Does it wear any longer in crushing machines? A. I stated that I have not had any experience in testing the service of Manganese steel practically, I never conducted a service test.

Q. Can you tell from the fracture of a casting, the temperature to which the casting has been raised, in the heat treatment? A. I think you can tell a great deal about it.

Q. Oh, I suppose so—but can you fix the temperature to which a Manganese steel casting has been raised in the heat treatment, from an inspection of the fracture, after it is broken? A. Well, I think I will have to make that answer quite long.

Q. I think you can answer that yes or no? A. Oh, no, sir.

Q. Can you determine the temperature to which Manganeze steel casting has been raised, in the heat treatment from an inspection of the fracture, after it has been broken? A. Only in certain cases.

Q. Well, if we should produce some ordinary specimens, could you determine the temperature to which the casting had been raised, do you think? A. I think on an inspection of the Taylor Iron and Steel Co.'s Manganese steel castings, that I could easily decide, certainly within 100 degrees, the highest temperature that any portion of that casting entered the water when it was quenched, because your practice is to quench—at least, my belief is that your practice is to quench in the neighborhood of that very critical point, and I know——

Q. Is that what Mr. Nichols says? A. Oh, no, sir; I never heard Mr. Nichols make a remark like that.

Q. Well, you infer it? A. I never heard Mr. Nichols make any remark as to the temperature at which you quench it, at which you quench your castings at Highbridge. Neither did I get any informa-

tion from him in an indirect manner, as to the temperature at which you quench your castings. But as I was saying, I found that if I quenched castings in the neighborhood of a critical point, which I believe to exist between 1,010 and 1,060 Centi., the fracture of the steel is different, entirely different, according as it is quenched, above or below that temperature. For example, if you quench well above that temperature, you get a fracture which has the appearance of bundles of fibres radiating from the centre towards the surface of cooling, or, we will say, building from the surface of cooling, towards the centre of the section. If, on the other hand, you quench slightly below this critical point, you get a very fine crystalline structure.

Q. Can you tell anything by inspection, that is anything more than whether it had been quenched below or above your critical point? A. Not if it was a quenched steel, you can examine and see whether it was annealed at all or not, or whether it is in the condition after it is cooled, in the sand.

Q. Could you determine the degree of temperature above or below the critical point; could you tell how much above or how much below it had been quenched? A. Only in a rough way, by the degree to which one or the other structure existed in the section that you broke.

Redirect by Mr. Corbin.

Q. When did you first meet Mr. Nichols? A. In this room.

Q. Since this trial commenced? A. The first day of this trial.

Q. Did you have any aid or information from him in the manufacture of steel? A. None whatever up to the present moment.

Q. What precautions were taken by you in preparing samples for the tests? A. In what way, what kind of precautions?

Q. With a view to making the test a fair one? A. Why, I always poured the specimens or samples from which the specimens were cut, from full heats of steel, Manganese steel heats, which were being poured into commercial work, and although we used a little care in the selection of that stock, such care as I do always use, and did when I was at the Chicago Heights works, and perhaps a little more care than the practice had been, until I returned there, a little more care in the selection of materials, than may have existed during the time I was not there——

Q. That is in the preparation of the mould? A. In the metal entering the cupola, before being moulded.

Q. You did some work on the samples of other manufacturers, what precautions did you take there? A. Just a moment, please—I did not complete my answer to the first question.

Q. Complete your answer? A. In preparing these samples of our own metals, we always annealed them with commercial steel castings, and in the same manner exactly as we were annealing and quenching castings, which were being shipped, except that, where I prepared some of the rolled and forged specimens in considerable haste, to add to the number of tests we were submitting, or specimens we were submitting for tests, I should say, I heated for quenching those rolled and forged specimens in the heating furnace of the Columbia Tool Steel Co., and I got more trouble than benefit from that, the furnace was too hot.

Q. I am now asking you about the care in preparing samples of any materials, by other manufacturers, for your tests? A. We secured, as best we could in the market, Mr. McKee and myself, any castings that were large enough to have a test piece cut from it; anything that we could get hold of that was big enough, and when we got that casting

delivered to Chicago Heights, we had it cut cold into strips with an emery wheel, cooling the casting constantly with water, so that it very rarely showed even under the tread of the emery wheel, any color due to heating, which might indicate 300 or 400 degrees Fahr. or possibly 600 or 700 degrees Fahr. at some points, at the immediate section of the metal last cut by the emery wheel, but that metal would be removed, and it was finished in the lathe entirely cold, with so slow a speed, that all metal which had been in the least heated had been removed before the specimen was taken to the test machine, it was ground in the lathe, at so low a temperature that you could always hold your hand on the bar while it was being ground.

Q. Was there any cases, or any samples which in the treatment had been cooled in the air? A. I don't understand your question.

Q. Was there an air-cooled car wheel? A. Yes, sir; there was not an air-cooled, but a sand-cooled car wheel, submitted for test, one; that casting was reheated after quenching to a very low red heat as shown in the night time, the very lowest temperature that would show red in the dark; it was done at about eleven o'clock at night in a very dark shop, and I would say that temperature must have been about 950 or 1,000 degrees Fahr. That car wheel after quenching, after being once quenched, that commercial Manganese steel casting, in the ordinary manner, was reheated, to a temperature in the neighborhood of 1,000 degrees Fahr., and being buried in dry sand and cooled for about two hours in that sand, and then it was taken out of the sand and cooled in the air for five or six hours more; when it was entirely cold, it was then taken by me personally to Chicago and tested and it showed a lower value in ultimate strength and bending, also in the tread, in the wheel than those wheels which

had not been reheated after quenching, wheels of the same pattern—(interrupted)——

Q. Was that one of the car wheels tested? A. Yes, sir, that was one of the car wheels tested and reported in that test by Mr. Bowen.

Q. Can you identify it? A. I cannot be entirely sure, I could by conecting my own affidavit with this test.

(*Court.*)

Q. Whose wheel was it? A. It was one of my own wheels of the same size of casting and the same pattern, and it was of the least value that we got, that is the only way that I could identify it.

(*Mr. Corbin.*)

Q. It showed there was a loss of toughness by reason of that heating, did it? A. Well, I attributed the low value to that cause. I had specially undertaken to get a comparison and seemed to have found one.

Q. Are the methods of handling castings so as to avoid fracture in cooling, peculiar to Manganese steel castings? A. No, sir.

Q. What, in your judgment, is the value of Manganese steel as used in the arts? A. Why, I think that value is determined by its peculiar physical properties, which I would endeavor to describe as being an unusual degree of strength and toughness, rather than an unusual degree of hardness and toughness; it is not an exceptionally hard metal, other than its resistance to abrasion, and that seems to me to be determined by its capacity to flow at ordinary temperatures. It flows at ordinary temperatures as carbon steels flow in the neighborhood of 600 or 800 degrees Fahr.; it is also very strong at ordinary temperatures, although it is capable of a great de-

gree of flow, thus it can bend or be indented with a hammer, as copper can be indented, while resisting this outside force that may be applied to it with a much greater strength than similarly tough metals, as copper or wrought iron. It does not allow a particle to be turned away from it as readily as copper and wrought iron, it is very strong, and still flows; you would seem to have, according to Leon Guillet, the lower critical point which exists in most carbon steels, in the neighborhood of 600 degrees Fahr., we will say from 500 to 800 degrees Fahr., as exists in Manganese steel, from a little above ordinary temperatures down to 100 degrees below zero, according to the analysis of the metal. That is, it will continue to be extremely tough and flow very readily, at very low heat, and at the same time that is the reason why it resists abrasion.

Q. It will stand frost then, will it? A. It will be tough when cold.

Q. What have you to say of the importance of a high elastic limit, in Manganese steel? A. Well, high elastic limit is certainly a measure of strength and value of steel, which for most purposes, is considered of paramount importance; it does not seem to me that the elastic limit is the important feature with Manganese steel; it would seem to me quite the contrary. Its capacity to flow which is entirely the contrary to a high elastic limit metal, and which is the quality which determines its great value.

Q. What do you say of the tensile strength as to its value? A. The tensile strength would be a measure of its strength and capacity to resist rupture, and would be very important.

Q. If you ascertained the chemical elements of a given lot of Manganese steel, can you by examination, determine the heat treatment? A. I don't know that of my own knowledge, Mr. Corbin. I would state that all steels are known according to

all authorities, to differ in their critical points, with variations in their analysis, and the most favorable heat treatment. All steel is determined by its analysis, knowing by experiment and test, the highest value that you could get out of any given steel, as Manganese steel by some particular heat treatment, you would be very safe in assuming that the same heat treatment would be best for another lot of Manganese steel of identical analysis.

Q. I think you mentioned that there was a defective car wheel; was that used in the experiment? A. It was purchased by the American Brake Shoe and Foundry Co. from C. E. Billin, for the purposes of the test.

Q. Yes; was that tested? A. It was not tested; it is still unbroken in the office of the American Brake Shoe and Foundry Co. in Chicago.

Cross-examination by Mr. Lindabury.

Q. Ability to resist rupture is not the only quality that Manganese steel needs that is to be used for crushing, is it? A. No, sir.

Q. The fact is that the abrasion test is the one determining test, as to the quality for the use of this stuff, is it not? A. Yes, sir.

WESLEY G. NICHOLS, recalled in behalf of the defendant, on further direct-examination saith:

Examined by Mr. Corbin.

Q. It appears in the testimony, either in my question or in Mr. Lindabury's, I forget which, that you stated you were employed when you went to the Taylor Iron and Steel Co.'s works for six years, that your employment was for a term of six years, or that the——

A. I signed a pledge of secrecy so far as the Hadfield patents were concerned for six years.

Q. Was your employment for any term? A. Not as I understood.

Q. You could have been discharged at any time? A. Yes, sir, and I presume I could have left at any time.

Cross-examination by Mr. Lindabury.

Q. I suppose the latter is your view of the law, that you could have been discharged at any time, and that you could have left at any time? A. I supposed so, under that pledge of secrecy.

Q. You say now, you were not employed for six years, but you testified in answer to one of Mr. Corbin's questions, that you were employed under an agreement, for six years, did you not? A. I may have done it—I cannot recall just the form of that pledge—it was a pledge of secrecy, rather than a pledge of employment.

Q. Have you read over your direct-examination? A. I have not.

Q. Suppose you do read it over and see how many of my questions you have answered incorrectly—do you say you have not read your direct-examination over? A. Oh, yes, sir, I have; I answered incorrectly before.

WILLIAM LEONARD, a witness produced in behalf of the defendant, being duly sworn according to law, on his oath saith:

Examined by Mr. Corbin.

Q. Where do you reside? A. Newark, here.

Q. What is your occupation? A. Moulder.

Q. In whose factory? A. In James Clark & Co.'s factory on Adams street, here.

Q. How long have you been working there? A. About two months or two and a half months.

Q. Before that, where were you employed? A. The Newark Steel Works, the Atha Company.

Q. How long were you there? A. About eight or ten weeks.

Q. Before that, where were you employed? A. In the Standard Steel Works, Burnham, Pa.

Q. And how long were you there? A. Very near three months.

Q. And before that where were you employed? A. In the American Brake Shoe and Foundry Co. at Chicago Heights.

Q. And how long were you there? A. About four months.

Q. And before that where were you? A. I was in Clark's employ as I am now.

Q. And how long were you there then? A. About two months, maybe six weeks to two months, or about that.

Q. And before that, where were you? A. At Highbridge.

Q. How long had you been there then? A. About a year or a little over—a little bit over a year.

Q. Do you remember when you left there, that last time? A. When I left Highbridge?

Q. Yes? A. I cannot give you the date.

Q. Was it after Mr. Nichols left? A. Yes, sir, it was after Mr. Nichols left.

Q. How long after? A. About two months.

Q. That would make it about September, 1905?

MR. LINDABURY—He left on the 4th of October, 1905.

A. September or October, 1905.

(*Mr. Corbin.*)

Q. Where were you born? A. In Scotland.

Q. What was your occupation in Scotland? A. Moulder.

Q. Where? A. James Abernethy & Co., Fairhill, Aberdeen.

Q. When did you come to this country? A. In 1893.

Q. Where did you work first? A. Maher and Flockhart Iron Foundry.

Q. Where? A. In Newark, here.

Q. Where did you go from there? A. To the Newark Steel Works.

Q. And how long were you there? A. Well, I was only a few weeks there that time.

Q. Where did you go then? A. Back to Maher & Flockhart's foundry.

Q. From there where did you go? A. To Cohn, of New York, that is during the panic.

Q. And where next did you go? A. To Highbridge.

Q. When did you go to Highbridge? A. In 1894.

Q. How long did you stay there? A. Four years.

Q. And you left about 1898? A. Yes, sir.

Q. Where did you go then? A. I went then to Brooklyn.

Q. Do you remember where next you went? A. To the Standard Steel Works, Burnham, Pa.

Q. Burnham, Pa.? A. Yes, sir.

Q. Where did you go then—to the Taylor Iron and Steel Co.? A. Yes, sir, I believe I went back there for a short while.

Q. About what time was that? A. That was nine months I was in Burnham, Pa.

Q. And where did you go from there? A. To Newark again.

Q. And then did you go back to Highbridge again? A. Yes, sir, I then went back to Highbridge.

Q. That is the third time? A. Yes?

Q. Did you go back a fourth time? A. Yes.

Q. Four times in all? A. Yes.

Q. Now, then, at the time you were in these various employments, in what capacity were you employed? A. Sometimes I was working on the floor as a moulder, and sometimes I had charge as assistant foreman.

Q. When you were at Highbridge, what did you do? A. I had charge there for about a year or something like that.

Q. When you were last there? A. No, sir, the time before.

Q. These various times when you were employed there, were you ever under any pledge of secrecy? A. No.

Q. Were you ever asked to make a pledge of secrecy? A. No.

Q. What opportunities did you have to see the work that was done there? A. Every opportunity you wanted; you could go all around the place if you wanted to go.

Q. Did you see the work about the cupola? A. You can see the cuopla, and the converter and the crucible furnace, and everything.

Q. Did you, actually, the operations carried on there? A. Yes, sir, I have seen them many a time, all of them.

Q. Did you see the introduction of the physic into the ladle? A. Surely you could see everything that is going on, right in the moulding shop.

Q. Was there a wall round the converter? A. Partly, there was.

Q. Did you ever go inside that wall? A. Often.

Q. Did others do the same? A. Yes, sir, anybody in the plant could go around and see it all.

Q. Did you ever know of any orders to keep the secrets there being given? A. I never heard of them, no, sir.

Q. Your business was with the moulds? A. Yes.

Q. That was your special business? A. Yes, sir.

Q. In what manner was the steel delivered from the ladle to the mould? A. From the lip, poured from the lip.

Q. Is that the common method? A. Yes, sir, that is the common method of doing that.

Q. Is that the common method in all foundries? A. Yes, sir, it is the comon method in nearly all the foundries, excepting in steel foundries; it is sometimes poured from the bottom stopper, from the bottom of the ladle, that is.

Q. Have you dealt with Manganese steel at any other places than at Highbridge? A. At Atha's and at Chicago Heights.

Q. What Manganese steel do they make at Atha's? A. Flint Stone steel, they call it there.

Q. It is Manganese steel, is it not? A. As far as I know, it is Manganese steel; it goes through the same process.

Q. Now, what was there peculiar about the method of preparing the mould for this steel, as compared with other steel at Highbridge? A. There was no difference.

Q. Was there any special methods employed, ever any exception to the rule? A. Only the one steel mostly cast, there was one steel which was mostly poured in green sand, as it was called, and the other was poured in dry sand moulds——

Q. Which was poured into the dry sand moulds? A. All the steel, sometimes Manganese steel, according to what class of work it was for.

Q. What was done after pouring into the moulds, what next was done? A. Well, the moulder was supposed to know whether to free his casting, to allow it to contract; he was supposed to know that much himself when he put a mould up; if he was capable of putting a mould up, he was capable of knowing

where it would contract most, and was liable to contract, and to treat it accordingly.

Q. Would you make an allowance in Manganese steel from that of other steels, or more than for other steels? A. Yes, sir, there is more contraction in that.

Q. Is that the moulder's business? A. Yes, sir.

Q. What was done with the steel then in the mould, how long was it left there? A. Until it was set; sometimes it was left there until it was cold, and in other cases, when a casting was liable to crack, sometimes we had to shake it out, dig the core out, and free it, and put it right in the furnace again.

Q. While it was still hot? A. Yes, sir, while it was still hot.

Q. Suppose the furnace was not ready to receive it? A. Well, you covered it up with the sand and kept it as hot as possible.

Q. You kept it hot longer? A. Yes, sir; of course you had to relieve it from the mould, so as to allow for the shrinking.

Q. When it was taken from the mould, what was done with it? A. It was placed in the furnace; if the furnace was ready, it went right in the furnace.

(*Mr. Lindabury.*)

Q. What have you had to do with that? A. I had to do that sometimes.

Q. I thought you were a moulder? A. So I was, but I had charge of that sometimes.

(*Mr. Corbin.*)

Q. What was the condition of the furnace when you put it in? A. It was hot.

Q. Would it be as hot as the metal when you put it in?

MR. LINDABURY—I object to the question as leading.

Objection sustained.

(*Mr. Corbin.*)

Q. What took place next—you say you put it in the furnace? A. To keep it from getting too cold, it was placed in the furnace.

Q. Well, what was the next step? A. Then it was plunged into water.

Q. How hot would you heat it first? A. This time that I am talking about we had to judge by a peep-hole in the door of the furnace, a hole made so that you could see how the castings were, and we had to see that through a peep-hole in the door of the furnace.

Q. By watching it? A. Yes, sir, by watching it with the naked eye.

Q. How would it look? A. About cherry red or a little hotter.

Q. When it was cherry red, or the right color, what did you do with it? A. We took it out and plunged it in cold water.

Q. What was done then? A. It was left there until it was cold, and then it was taken out and then shaped in the lathe.

Q. What was done with it there? A. It was ground and made ready for shipment.

Q. And in the case of Manganese steel can you chip it? A. No, sir; well, you can chip it a little bit, that is, you can hit it with a hammer and a chisel and break little pieces off, but that is all.

Q. Can you chip it like ordinary steel? A. No, sir.

Q. What cleaning is necessary? A. It don't take much cleaning after it leaves the water, only the grinding.

Q. The water cleans it, does it? A. Yes.

Q. How many workmen in the Taylor Iron and Steel Co.'s works could see the operation going on? A. Everyone in the works, everyone in the whole plant could see everything that was going on.

Q. You said you were there part of the time as foundryman? A. Yes.

Q. What was your office there the other part of the time? A. Assistant foreman.

Q. When you were at Chicago Heights, what was your work? A. At Chicago Heights I mostly inspected castings, I had very little of anything to do, and a little of everything to do.

Q. You went from there to New York? A. Yes.

Q. And from there to Chicago Heights? A. Yes.

Q. What was your work there—did you have to do with the moulding? A. Very little.

Q. What methods were employed there in the making of Manganese steel? A. Just the same as at Highbridge.

Q. What were they?

COURT—Describe the methods.

A. The moulding part was just the same as I saw in any other shop, in my experience, and as far as the making of the steel was concerned, I don't know anything about the making of steel, but the treatment was much about the same, every way, as I could see.

Q. Did you see the process of using the cupola? A. Yes, sir, you could see the cupola there.

Q. And the converter? A. Yes, sir.

Q. Was there any difference in the converter? A. Yes, sir, there is a difference in the converter, it is a top-blower, instead of a bottom-blow, I guess.

Q. Or side-blow? A. Yes, sir, a side-blow.

Q. How is the physic prepared? A. In crucibles.

Q. Is that the same way at Highbridge?

MR. LINDABURY—I object to that—he has said that he knows nothing about steel working.

A. Only what I see them do.

(*Mr. Corbin.*)

Q. How did they prepare the physic at Highbridge? A. They prepared the physic at Highbrdge in crucibles.

Q. Do they do the same thing at Chicago Heights? A. The same thing.

Q. How did they pour it from the ladle? A. Where?

Q. At Chicago Heights? A. The same way, from the lip.

Q. Where did they put the physic when the physic was prepared, where did they put it? A. In the ladle.

Q. Not in the converter? A. No, sir, the ladle.

Q. After they put it in the ladle, what did they do next? A. They took the ladle over to the converter.

Q. Did they take the ladle over before or after they put the steel in? A. Before.

Q. In both places? A. Yes, sir.

Q. When you were at these other places, at Atha's, what was the process there? A. The same way, only they poured from the bottom of the ladle; they used to pour from the lip, but they found they could not handle it so easy, and then poured from the bottom of the ladle.

Q. They did not do that at Chicago Heights? A. No.

Q. And they did not do it at Highbridge? A. No, sir.

Q. Did they pour it from the lip at Highbridge? A. That is the first place I ever saw it poured in that way, and they turned out good castings with it.

Q. You did iron moulding? A. Yes, sir, that is what I served my time at.

Q. What is the difference in the methods of moulding? A. There is no difference at all, only in steel you have to allow for shrinkage more than you have for iron; otherwise there is very little difference.

Q. In this allowance for shrinkage, did you ever use chills? A. Yes.

Q. Where did you first make use of chills? A. I have seen chills used many a time at many places; different places I have been in chills were used.

Q. Did you ever see it used in Scotland? A. Yes, sir, chills were used there, chilled mould and chills for the stoppage of shrinkage.

Q. Did you ever see anything special about the use of chills at Highbridge? A. Nothing that I ever saw.

Q. Did you use them there? A. Yes, sir, I used chills many times.

Q. Did you learn any new methods at Highbridge? A. No, sir, not as regards mouldings.

Q. Was there any more secret sand mixtures there? A. No, sir.

Q. At any time? A. There was at one time what was thought to be a secret in the sand.

Q. A sand mixture? A. A sand mixture for green sand steel.

Q. Did they continue to use that? A. Yes, sir.

Q. How long did they use that? A. Well, it was there when I went there first.

Q. Was it there when you went there again? A.

Yes, sir, it was the same when I went there the last time.

Q. Did you know what that mixture was? A. Yes, sir, I knew what the mixture was; there was no mixture much about it, all there was to that was that the foreman when I went there first, he was supposed to be the foreman, he had made that mixture himself, that is, he mixed that sand, but there was no secret to it at all; some parties said there was, but there was no secret to it that I ever saw.

Cross-examination by Mr. Lindabury.

Q. You seem to have had quite a varied experience in moulding? A. I have, that is what I have always looked for.

Q. For fifteen or twenty years you have been a moulder, have you? A. Twenty-four years, pretty near.

Q. Now, at Highbridge, they did not try to keep from you, or secret, any of their processes, you think? A. Nothing that I ever seen.

Q. Well, did you see all the processes of manufacture of steel in such a way that you could understand and reproduce them? A. I could not make steel.

Q. For instance now, as to the mixture, on the start in the cupola, you could hardly do that, could you? A. Well, I would not say as I could, I would not say that; I would not say that I could mix it in the cupola so as to make steel.

Q. Did you know how they treated it in the cupola? A. No, I never took particular notice.

Q. An ordinary man working around the place there, that is, an ordinary workman I mean, would be able to gather that information, would he? A. If he wanted to, he could.

Q. Do you think he could? A. Yes, sir.

Q. Could he tell what percentage of the different things to use? A. No, sir.

Q. Were strangers allowed in there? A. Well, I have seen strangers in there, but very seldom.

Q. You know that they were kept out, don't you, unless they had a special permission to enter there? A. Yes, outsiders not employed there.

Q. I mean outsiders? A. Yes, sir, they were kept out.

Q. What outsiders have you ever seen there—did you ever see a man named Snow there? A. No, sir, I cannot say that I ever saw him there.

Q. Well, anyone else? A. I saw people that was employed in the forge in there.

Q. I am speaking of outsiders, someone not employed by the Taylor Iron and Steel Co., whom have you seen of people not employed at the works there, inside the plant? A. I cannot say.

Q. You knew that the rule was that strangers were not to be admitted, didn't you? A. Yes, sir, and it has been more so lately than before.

Q. What do you mean by lately—how many years do you refer to now? A. Well, if anyone had their dinner carried in to them there, the party that brought their dinner could walk on down through there and into the foundry, with the meals at any time.

Q. I am not talking about men there, the other employes of the place, I am not talking about them? A. No, sir, these are the people that were carrying the dinners to the men, that didn't belong to the factory at all, carrying one another's suppers or dinners in there,—outside people carrying meals in to the men.

Q. You mean people bringing dinners and suppers and such like, to the men employed in the plant? A. Yes, sir.

Q. Children mostly, were they not? A. Yes, sir, and grown-up people, too.

Q. Men? A. Yes, men.

Q. Men employed to bring dinners and meals in there to the men? A. Well, they were not employed to do it.

Q. Well, engaged to do it? A. Yes.

Q. There was not much of that done, was there? A. At one time, there was, yes, sir.

Q. Well, now, after they get through with the cupola, do you know what they did with the molten metal, then? A. Yes, sir, it is poured from the spout to the ladle and then from the ladle into the converter.

Q. Do you know what they do with it in the ladle? A. Pour it from the cupola to the ladle.

Q. Do you know what they did with it, after it was poured into the ladle? A. It was poured then in the converter.

Q. Did they do anything to it in the ladle? A. I didn't see anything done to it.

Q. What did they do with it in the converter? A. They blow it.

Q. Could you blow it? A. I believe I could, if I had a chance.

Q. Did you ever have a chance? A. No, sir, I did not.

Q. To what degree of heat did they blow it? A. You judge by the flame.

Q. How do you know? A. I noticed it.

Q. How do you know they went by the flame? A. I judged it by the flame.

Q. How do you know what they did—how do you know that they judged it by the flame—I understood you to say that you were no steel maker? A. No, sir, I cannot make steel, I said that.

Q. And you don't know how they controlled the temperature, do you? A. No, sir.

Q. You could not do that, could you? A. No, sir, I cannot say that.

Q. You were the assistant foreman, not of the whole plant, but of the moulders, is not that so? A. Yes.

Q. That is one time you were there? A. Yes.

Q. And you do know something about moulding, you think? A. Yes.

Q. But you had nothing to do with the heat treatment or the annealing, had you? A. Sometimes—well, no, sir, I had no management over that at all; I was supposed to have charge of every man inside the foundry at that time.

Q. That did not include the heating—did you have charge of the heat treatment, that is, of the annealing process? A. No, sir, but if I saw anything going on that I didn't like, I had the right to check them.

Q. Did you have charge over the work in the furnaces? A. No.

Q. And I don't suppose, from standing around there, either you or any of the other men could tell how that work was done, could you? A. Yes, sir, easy.

Q. Easy? A. Yes, sir.

Q. Well, I suppose, to just build a fire and let her go? A. Oh, no, sir.

Q. Well, at what temperature did you put the castings in? A. There was nothing to show you the temperature, only from your eyesight.

Q. Anything you pleased, hey? A. From your own eyesight.

Q. How long did you leave it in there? A. Until they got to a certain heat.

Q. How fast did you heat them up? A. In a gradual heat.

Q. That is about all of your knowledge of that process, is it not? A. Yes.

Q. When they took them out, they put them in water didn't they? A. Yes.

Q. Well, how hot was the water? A. It was cold water.

Q. What else did they put in the water—did they put salt in? A. No, sir.

Q. Only water? A. Only water.

Q. Who hired you to go to Chicago Heights? A. Mr. Gallagher.

Q. The vice-president? A. Yes, sir.

Q. Where did you strike him? A. Where did I see him?

Q. Yes? A. In his New York office.

Q. Did you go there, or did he send for you? A. I was there at the time.

Q. Did you go of your own accord, or did someone send for you? A. It was in his office to make an affidavit, it was, that I had to go there.

Q. Who sent for you to go and make an affidavit? A. Mr. Goode.

Q. And they told you that if you made the affidavit they would give you employment in the Chicago Heights plant, did they? A. No, sir.

Q. They did give you employment at the Chicago Heights plant, didn't they? A. Well, yes.

Q. And they had no connection with each other? A. No.

Q. Did you go right out to Chicago? A. No, sir, not right away.

Q. You did not? A. No, sir, not right away.

Q. How soon did you go? A. About three weeks after.

Q. Who supported you in the meantime? A. I was on a salary from the American Brake Shoe and Foundry Co., from the time I was engaged.

Q. Now, what did you go to Chicago to do? A. Well, I was supposed to inspect castings, as assistant foreman.

Q. To inspect castings, as assistant foreman, eh? A. Yes,

Q. But you didn't have much to do, you say? A. Well, no, there wasn't much to do; there was plenty to do if you wanted to do it.

Q. Well, didn't you want to do it? A. Certainly, I done enough.

Q. But you said you didn't have much to do, on your direct examination, didn't you? A. There wasn't much to do any time.

Q. Were they not doing much out there? A. Yes, sir, there was lots of work out there.

Q. Why wasn't there much to do, then? A. There wasn't much to do for me; there was a foreman there when I went out there.

Q. So they had the services of a foreman already, had they? A. One foreman could take charge of the shop.

Q. There didn't seem to be much need of you there, did there? A. Yes, sir, they had lots to do inspecting castings, and that is what I done there.

Q. Did you make any castings while you were there? A. No.

Q. Did you make any mouldings while you were there? A. No.

Q. You just looked at the castings? A. I just looked at the castings.

Q. Did you make any written reports as to them? A. No.

Q. Did you see anything of Mr. Nichols while you were out there? A. I never saw Mr. Nichols out there.

Q. At Chicago Heights—didn't you see him out there? A. I saw him two or three times only.

Q. Well, how often did you see him? A. Once a month, or once in five weeks, or once in a couple of weeks, or something like that.

Q. What was the average time that you saw him there? A. Well, about once in two or three weeks.

Q. Once every two or three weeks? A. Yes, sir.

Q. What did you see him for? A. Well, he was calling on me.

Q. Just socially? A. Socially, that is all.

Q. You had no business with him? A. No, sir, I had no business with him at all.

Q. You were not the go-between between him and the factory, were you? A. No, sir.

Q. You didn't carry messages or instructions back and forth, did you? A. No, sir.

Q. There was nothing of that kind? A. No, sir.

Q. You didn't go out there to do that? A. No.

Q. And you didn't undertake to do that when you were there? A. No, sir.

Q. When you left there, who took your place? A. I cannot say; I never found that out.

Q. You don't know who took your place? A. No, sir.

Q. You don't know who your successor was in that business of looking at castings? A. I was inspecting castings, I said.

Q. What kind of castings did you inspect? A. Every kind.

Q. Did you make the acquaintance of a gentleman named "France" while you were out there? A. No, sir, I cannot say that I did; I cannot swear to that.

Q. Well, you will have to swear to it, if you tell us anything about it—just tax your memory a little, and see if you didn't make the acquaintance of a man by the name of "France," whom you saw a great deal of during the time you were there? A. "France?"

Q. Yes. A. I made quite a few acquaintances there; I met quite a good many people there, but I cannot remember their names.

Q. Did you meet a gentleman there engaged in the business of selling cement blocks? A. No, sir, I cannot say that I did.

Q. You did not make the acquaintance of a man doing that, or selling machines for cement blocks? A. I met quite a few gentlemen when I was out there, and I don't remember what their business was.

Q. And you don't remember meeting a gentleman by the name of "France," who was selling cement blocks or anything of that kind? A. No, sir, I cannot say that I do.

Q. And the man's name was "France;" don't you remember that? A. No, sir.

Q. Didn't you meet a man of that name, and were you not with him about every day for months? A. Every day?

Q. About every day? A. No, sir.

Q. For months? A. Not as I know of.

Q. You never heard of him, eh? A. No.

Q. You never heard of a man selling machines for making cement blocks? A. I cannot say that I did; I cannot recollect that I did.

Q. I should like to know whether or not, on the 20th day of February, you did not have a conversation with this gentleman in the Victoria Hotel barroom, at Chicago Heights; in the course of this conversation, you invited him to inspect the foundry of the defendant company, do you remember that? A. No, sir, I do not.

Q. Do you remember of extending such an invitation to your friend, and of his saying that he thought it would not be best for him to be seen at the foundry, for fear the superintendent would not like it, and do you remember replying "that it makes no difference, as the superintendent is in Chicago, and he is prevented from visiting the plant by an injunction which has been served on him, and that you, Mr. Leonard, were working in his, the superintendent's place, and you received your orders from him"? A. It is correct.

Q. You did not tell Mr. France any such thing as that? A. No, sir.

Q. Do you remember the gentleman now with whom you had aconversation that day in that Victoria Hotel bar-room? A. No, sir; there was so many that I got acquainted with, when I was out there, I cannot say what their names were; I never asked them their names.

Q. Do you remember the man asking you the name of the superintendent, and that you replied his name was "Nichols;" do you remember that? A. I could not have said the Mr. Nichols was the superintendent.

Q. That depends on who was the superintendent, does it not? A. Mr. Jones, I guess, was the superintendent.

Q. Do you remember seeing Mr. France again on the 24th of February, 1906—do you remember going from Chicago Heights to Chicago with Mr. France on the 24th of February, 1906, and going to a saloon, to the Olympia on Wabash Avenue and Hubbert Court, do you remember that? A. I cannot say.

Q. You remember that saloon, don't you? A. No, sir, I do not; I wasn't much acquainted in Chicago, you know.

Q. And you don't remember that? A. No, sir, I do not.

Q. Was Mr. Nichols there with you on that day? A. I don't remember that day at all, I cannot say as I do.

Q. See if you cannot remember that towards midnight on the day you met Mr. Nichols and Mr. France together in this saloon, and you spent an hour or two there, having several drinks between you; do you remember anything of that kind? A. No, sir, I don't.

Q. Do you remember that sometimes you got off

at Englewood—where is Englewood? A. Englewood, Chicago?

Q. Outside of Chicago, is it? A. Yes, sir.

Q. Do you remember that you got off the train at Englewood and met Mr. Nichols, do you remember that? A. Once, I did.

Q. Do you remember leaving Mr. France and getting off the train at Englewood, and do you remember telling Mr. France that detectives were following Mr. Nichols, and that you didn't dare go to Chicago, and that you therefore got off at Englewood, so as to throw the detectives off the track? A. I never knew anything of that? A. You never knew anything of that? A. No, sir; I didn't know whether detectives were following him, or whether they were following me; the fact is I never saw them, and I didn't know anything about it.

(*Court.*)

Q. How did you get word to go to New York to make that affidavit you spoke of? A. Mr. Goode came after me.

Q. To Chicago? A. Oh, no, sir, he came here to Newark; I was employed in Newark at the time.

(*Mr. Lindabury.*)

Q. Do you remember that on the 4th day of March you met Mr. France at a hotel in Chicago Heights, and that you told Mr. France then, or that you made the following statement to him—"to-day is the 4th day of March; ten days from now Mr. Nichols will know what to do. If he wins, I will take two weeks off, and if he does not win I will go anywhere; it makes no difference to me which way it goes, but I hope he will come out all right"—do you remember making that statement to Mr. France on that occasion? A. I cannot say.

Q. Don't you remember making that statement at all? A. No, sir, I do not.

(*Court.*)

Q. Well, now, did you make any such statement as that, when you say you don't remember, do you mean to say that you did not make any such statement—if you did not, you want to say so. A. No, sir.

Q. I understand you to say that you did not know this man—that you never saw him—that is, this man "France." A. I do not know him by his name.

(*Mr. Lindabury.*)

Q. And you don't remember making any such statement as that to anybody? A. No, sir.

Q. Now, do you remember having a conversation with this man "France" on the 6th day of March, 1906, in which he told you "that he would like to see a safe made at the Chicago Heights foundry of the defendant company from start to finish," to which you replied, "come over some day at one o'clock, and I will show you how to pour one of them," to which he replied, "all right, but it is pretty hard to gain admittance to the place," to which you replied, "you ask for me, the same way you did before, and I know they will let you in; but when the new superintendent comes he will not let you in, as he will do it the same way as they do it in the East," and to which I replied, "Oh, you mean Mr. Nichols"—do you remember that conversation? A. No, sir, I do not.

Q. Do you say that it occurred, or not? A. I do not believe it did.

Q. Do you say it did not occur? A. It did not occur.

Q. You say you did not tell him that—you did

not have that conversation with him? A. I don't know the man at all.

Q. And you don't recall any such conversation? A. No, sir, I do not.

Q. Do you remember saying to him on the 8th day of March, 1906, in a walk that you had with him in Chicago, on the east side of Chicago Heights, "that Mr. Nichols was offered $7,000 a year, and $10,000 of shares in the American Brake Shoe and Foundry Co. by the defendant company, that he was previously getting $85 to $95 per week from the company that he left, and, further, that there was six or seven companies now watching to see how this case is decided, and that you had commenced to go around to all these steel companies and see if they would not pay you $1,000 to tell them how to make steel, and how to handle it—do you remember any such conversation as that? A. No, sir, I do not.

Q. Do you say that no such conversation took place? A. I don't remember that it ever did.

Q. Is that the most you will say as to that? A. That is the most I can say; I never knew what his salary was, or what the salary was that he was going to get; the only time that I ever saw what his salary was was once in the papers, and that is all I knew about it.

Q. Didn't Mr. Nichols ever tell you that he had been offered $7,000 a year, and that he was to have $10,000 in the stock of the defendant company—didn't he ever tell you that?

Q. Well, do you remember meeting Mr. France on the 10th day of March, on the train going from Chicago Heights to Chicago, and of your telling Mr. France that you intended to get off at Englewood—that is 63rd Street, Chicago, is it not? A. Yes, sir, I guess it is.

Q. As Mr. Nichols agreed to meet you there; and

also to say to this Mr. France—that Mr. Nichols is on the lookout that no detectives should catch us together—don't you remember saying that? A. No, sir.

Q. And don't you remember saying that that would settle the whole thing? A. No, sir.

Q. If the detectives caught you together? A. No, sir.

Q. And do you say that you and Mr. Nichols never avoided detectives? A. I never knew the detectives was after me, or after Mr. Nichols, for that matter.

Q. Did you ever know, or did you ever have any talk with Mr. Nichols about detectives being after you? A. Well, he said sometimes that detectives might be after me.

Q. But didn't Mr. Nichols think detectives were watching him? A. No, sir, I don't know whether they were watching him or not.

Q. He never said it to you? A. No, sir.

Q. He did not? A. No, sir.

Q. Now, on January 23rd—do you remember where you were on the 23rd of January, in the evening? A. No, sir, I cannot say that I do.

Q. Were you in the habit of visiting Mr. Nichols' house in Chicago? A. I was there a few times.

Q. You did visit him there? A. Yes, sir.

Q. Now, where did Mr. Nichols live? A. He lived in No. 4160 Lake Avenue, I think it was.

Q. No. 4160 Lake Avenue, Chicago? A. Yes, sir.

Q. And you were in the habit of visiting Mr. Nichols there pretty regularly, were you not? A. No, sir, very seldom.

Q. Well, were you there on the 23rd of January? A. I cannot say.

Q. You don't know? A. No, sir.

Q. Well, were you there on the 4th of February?

A. I cannot say; I didn't take any dates for anything.

Q. Were you there on the 4th of February? A. I cannot say.

Q. Were you there on the 10th of February? A. The 4th of February and the 10th of February?

Q. Yes, were you at Mr. Nichols' house? A. I don't know about the dates.

Q. Were you there on the 10th of February? A. I cannot say whether I was there on the 12th of February, or not; I didn't keep any dates for anything.

Q. You don't know whether you were there or not? A. No, sir.

Q. Were you there on the 13th of February? A. No, sir, I never was there as close as that.

Q. Well, the 16th of February, what have you to say as to that—were you there? A. No, sir.

Q. Were you there on the 19th of February? A. No, sir, I cannot swear to any date at all that I even went there; I never put anything down, and I went there very seldom; I went to Chicago lots of times, but I didn't go to see him.

Q. I am speaking of your visits to his house. A. No, sir.

Adjourned to December 27th, 1906, at 10 A. M., at Newark.

DECEMBER 27, 1906

JOSEPH D. GALLAGHER, a witness produced in behalf of the defendants, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. Glen Ridge, N. J.

Q. What connection have you, if any, with the defendant company? A. First Vice-President.

Q. How long have you been connected with the company in that position? A. As First Vice-President, I have been connected with the company for a little over two years, but I have been an officer of the company, and director, since it was formed.

Q. Other than that, what is your occupation or profession? A. I am a counsellor-at-law of this State.

Q. Are you acquainted with Mr. Howard E. White? A. I believe I have that pleasure.

Q. Were you present at the company's office in Chicago at any time at which Mr. White was present, Mr. Cutler, and other gentlemen connected with the Taylor Iron and Steel Co. and the American Brake Shoe and Foundry Co., at which there was a discussion as to the employment of Mr. Wesley G. Nichols by the American Brake Shoe and Foundry Co? A. I was there in August, 1905, when Mr. Cutler was not there and I think I was there also on an occasion when Mr. Cutler was there, which was at some date later. The first time our Mr. Terbell, our second vice-president, was present, and Mr. Snow, I think, our general superintendent.

Q. Do you remember the dates of these two conferences? A. Why, the first one was early in August, I think it was August 10th, that is my recollection at the present time, that it was August 10th. The second conference was shortly thereafter, but I cannot give you the date.

Q. About the 15th, was it? A. Well, it was shortly afterwards, it was long enough at all events for Mr. White to go to New York, and return again to Chicago.

Q. You may relate what conversation was had with Mr. White at the first interview that you had in regard to the employment of Mr. Nichols? A.

I will do the best I can. Mr. White called and introduced himself as the counsel and one of the directors of the Taylor Iron and Steel Co. I happened to be in Chicago at that time, and I met him there, and he said he had called about this Nichols matter, and he protested somewhat against our hiring Mr. Nichols. He said Mr. Nichols was under a contract with the Taylor Iron and Steel Co. for a period of years, I think he said five years, and that we ought not to hire him. I said that I did not think the contract was a valid contract, as far as that went, and I could not see any moral reason why we should not hire the employees of any steel company, if we wanted to, and he said that if we were getting Mr. Nichols with the idea that he knew any of the Taylor Iron and Steel Co.'s secret processes, that we would be disappointed, for he did not. And I told him—well now, this is as far as I recollect, I cannot remember the exact words—but I told him that I didn't care whether he did or not. And Mr. White said that what they wanted of Mr. Nichols was that they had some contracts with which he was particularly with them, and they wanted to get those contracts out, or to get the goods out, and that if Mr. Nichols could go back to them for a few weeks, he thought there would not then be any difficulty in releasing him. And he said something about bringing this suit—he was talking about bringing some suit, and that he was going to bring it to restrain Mr. Nichols, and I think he said, that they were going to bring the suit as much from a desire to prevent other employees breaking away from the company as from a desire to get Mr. Nichols back again—that was the general run of the conversation.

Q. Was any remark made by you, at that time, as to your interest and with regard to the discipline of the Taylor Iron and Steel Co.? A. Why, I

think I did say something to Mr. White about not being particularly interested in the discipline of the Taylor Iron and Steel Co., not caring particularly to help it along at all.

Q. Was anything said by Mr. White in regard to the taking of Mr. Nichols back to the Taylor Iron and Steel Co.'s works? A. My recollection is that Mr. Nichols could not permanently be employed there at Highbridge, that his usefulness as an employee was practically at an end; that they wanted him for this special contract work.

Q. What did he say as to his capacity or otherwise? A. I think he said that Mr. Nichols was not a good superintendent himself, but that he was a good man when he was working under someone else's instructions, and in carrying out the details of those instructions.

Q. At the time of this conversation between you and Mr. White, had you seen any affidavits which had been prepared in the suit in Chicago? A. No, sir; my recollection, Mr. Goode, is that those affidavits were shown to me that night or the next morning, and I commented then with Mr. Whitman——

MR. HARDIN—I object to any conversations with another person not in the presence of Mr. White.

Objection sustained.

(*Mr. Goode.*)

Q. When was the next interview that you had with Mr. White? A. It was a few days later. Mr. White, my recollection is, went to New York and then came almost immediately back to Chicago, and Mr. Cutler met him there and I think we had a second interview with Mr. Cutler present, and I

think also, Mr. Christie was present at that second interview, if not mistaken——

Q. At that time, the injunction proceedings had been started, had they? A. At that time, an injunction had been obtained in Illinois.

Q. But not here? A. No, sir; I do not think it had been begun here.

Cross-examination by Mr. Hardin.

Q. Where did you first meet Mr. White? A. I think in Chicago at that first interview, I don't recollect meeting him before that.

Q. You had not been present at any conversation or conference in New York, in reference to this matter, had you? A. Not with Mr. White, no sir; I was in Chicago during that time.

Q. You had prior to the interview you mention seen Mr. Nichols' contract with the Taylor Iron and Steel Co., hadn't you? A. Yes, sir.

Q. And you told Mr. White at this first interview, on this first occasion, that you regarded that contract as without any validity, did you not? A. Yes.

Q. Did you have a copy of the contract before you during this interview with Mr. White? A. I think not.

Q. Did you have a copy of the contract out there at Chicago with you, or not? A. No, sir; I think the only time that I ever saw that contract, prior to the beginning of this suit, was—or possibly prior to the beginning of the Illinois suit—was in the New York office when Mr. Nichols showed it to me.

Q. And when was that? A. Oh, that was—it must have been along in July, I think.

Q. And at that time you told Mr. Nichols that you thought the contract was without validity, did you not? A. Yes, sir.

Q. Do you remember having, while Mr. White

was at your office in Chicago, a long distance conversation with New York? A. I may possibly have had one, I have them almost every day I am there. I talk with the New York office almost every day that I am there, and I cannot say that I recall one particularly when Mr. White was present in Chicago.

Q. Perhaps it will help your memory if I ask you whether you did not have a long distance conversation with your New York office on that occasion, when Mr. White was present, with reference to this Nichols contract? A. No, sir; I do not remember it—it is very possible I had such a conversation, but I do not remember it.

Q. Do you recollect having said to Mr. White, when he was there, and on your coming from the telephone, that you had just been advised from the New York office that the contract was in the opinion of the general counsel of the company void? A. Yes, I remember that now. I called up New York on the telephone, and I was told by Mr. Cutler—I think it was Mr. Cutler, although possibly it might be Mr. Fallows, but I think it was Mr. Cutler—that he had received an opinion from Mr. Fallows that the contract was invalid. And I think now that I had that taken down by my stenographer right there and then and I showed it to Mr. White and read it to him, I am not quite certain about that though, but I seem to have some such recollection of it——

Q. Do you remember that you then said to Mr. White, that, the contract being void, that you proposed to keep Mr. Nichols unless the courts prevented you? A. That we proposed to hire him, unless we were prevented by the courts from doing so—yes, I remember that.

Q. Can you give us the date of this interview in Chicago? A. Which interview?

Q. The first interview. A. My recollection is that it was the 10th of August. I made a memorandum of the conversation immediately on Mr. White's going, that is, I called in my stenographer and I dictated it to him, and I dated it that time, and my recollection is that it was on the 10th of August, 1905.

Q. Have you given the exact words used by Mr. White or only your impression of what Mr. White said? A. Well, in some cases his exact words and in some cases the impression conveyed to my mind by what he said.

Q. He told you, did he not, that Mr. Nichols was probably not the man or the valuable man that you thought he was? A. Something to that effect, yes.

Q. He did not tell you at any time that the Taylor Iron and Steel Co. did not dispute your right to take him away from them, that is the Taylor Iron and Steel Co.? A. No, sir; he was telling me all the time that they were going to begin suits to actually prevent us from taking Mr. Nichols away from the employment of the Taylor Iron and Steel Co.

Q. Did he say that he was going to bring a suit in the east or at Chicago? A. My recollection of that is, that he did not say anything about the suit, any suit, at the first interview that I had with him, but, at the next interview, I hink it was, that the matter of the suit was introduced, he told me then that they would spend any amount of money to prevent our employing Mr. Nichols or to prevent Mr. Nichols taking employment of our company.

Q. He told you at the first interview that the Taylor Iron and Steel Co. were going to dispute your right to employ Mr. Nichols, didn't he? A. Yes, and that they would spend all the money necessary to prevent the employment of Mr. Nichols, I think that was said at the first interview, also.

Q. Do you remember when the papers were served in that Chicago suit? A. No, sir.

Q. You do not know whether the suits had been begun or not at the time of the first interview? A. Well, it had either been begun or was about to be begun just at that time, but you see it is over two years ago and it is very hard to tell just as to how things happened, they happen so quickly and you cannot remember just in what order they occur.

Q. Was Mr. Snow present at any part of this interview, the first interview? A. My recollection is that he was present at all of them.

Q. The first interview, I mean? A. Yes, sir.

Q. And your best recollection is that this interview took place on the 10th of August? A. Yes, sir.

Q. And Mr. Snow was present at that interview? A. Mr. Snow was present at that interview—now, if you want to see the memorandum I made, Mr. Goode has the memorandum—that is the memorandum I made at the time, and that has the date in it, and you can tell exactly then when it was.

MR. LINDABURY—It is for you to tell us when it was, but you can refresh your recollection as to that by reference to the memorandum.

WITNESS—I am sure, practically, that it was the 10th of August.

(*Mr. Goode.*)

Q. I hand you the memorandum (handing witness paper)? A. August 10th, 1905, was the date.

(*Mr. Hardin.*)

Q. Don't you recollect at that first interview, that the injunction order issued by the Chicago

Court was referred to? A. Possibly it might have been but I have not seen the affidavits on which it was based at all.

Q. I misunderstood you then before—you knew that the injunction had been granted, did you? A. No, sir; I did not say so, but I said if it had been granted, prior to that time, I undoubtedly knew it, but I had not seen the moving papers in the case at all.

Q. You do not now tell us that at this first interview in Chicago the injunction order already issued by the Chicago Court was not the subject of discussion? A. No, sir; I don't know whether it was or not, I don't recollect about that.

Q. You have no recollection of having talked about it? A. It might have been talked about, but I do not recollect it.

Q. Do you remember expressing your indifference to that injunction on that occasion? A. No, sir; not particularly, I am not apt to be indifferent to injunctions.

Q. Do you remember saying that you would put a seidlitz powder on that injunction and dissolve it? A. No, sir; I did not propose to dissolve any injunction in that manner that I recollect at all, I have no recollection of ever having said anything of that kind, I don't dissolve injunctions in that way.

Q. You did not talk about dissolving that injunction by putting a seidlitz powder on it? A. No, sir; I did not.

Q. Do you say you do not remember using that figure of speech? A. No, sir; that is a new one to me. I will use it the next time I get a chance, but it is legal slang of New Jersey that I am not familiar with at all.

Q. You have been quoted by both sides as hav-

ing used that figure of speech? A. Well, no, I think I am not guilty—I think I am misquoted.

Q. It is quite possible, is it not, that at this interview—that is the first interview with Mr. White in Chicago, at which yourself and Mr. Snow and Mr. White were present—that the papers in that Chicago injunction suit were in the room at the time? A. I cannot say what Mr. White had in his pocket, but I will say that they were not shown to me.

Q. Mr. Snow might have had them, might he not? A. No, sir; I should think not, I should have seen them if Mr. Snow had had them.

Q. When did you see them first? A. I think either that night or the next day, as soon as Mr. Whitman, our Chicago counsel, got them.

Q. You know, as a matter of fact, do you not, that they were served on Mr. Nichols on the night of the 9th of August? A. I do not, I will take your word for it, if the papers show that they were served on Mr. Nichols on the night of the 9th of August then I am satisfied that that is correct.

Q. Then did he not show you the injunction—do you mean to say that you did not see the injunction? A. I did not say that I did not see the injunction, I have already said that I did see the injunction, but the papers on which the injunction was based, I have said already two or three times that I have not seen them.

Q. Then it is quite possible that the injunction itself may have been there at the time of this first interview? A. Yes, sir; it is quite posssible the injunction may have been there, but the papers on which the injunction was based I did not see.

Q. How long was it before the next interview with Mr. White? A. I cannot tell you exactly how long it was, I should say it was four or five days. After the first interview Mr. White went

back to New York and he had some conversation with Mr. Cutler and Mr. Fallows in New York, and then he came back again to Chicago, and we all met in Chicago in our office there again, and it was about long enough for Mr. White to go to New York and come back again—I should say the second interview was four or five days after the first one.

Q. Did not you and Mr. White part at the first interview with a kind of an understanding that there should be a further conference? A. Yes.

Q. And you suggested that, did you not? A. I don't know who it was suggested it, but that was the understanding, that there should be a further conference in the matter.

Q. At this subsequent interview in Chicago, the subject of the injunction suit was again brought before the conference? A. Yes.

Q. On that occasion did Mr. White say anything to you indicating any willingness on his part or on the part of the Taylor Iron and Steel Co. consenting or that your company should employ Mr. Nichols? A. No, sir; not that I know of.

Q. Didn't he say rather that the Taylor Iron and Steel Co. people were prepared to spend any amount of money to prevent the employment by your company of Mr. Nichols? A. Yes, he said that.

Q. And didn't you say that you would fight the matter out? A. Yes, sir; I think so.

Q. And didn't he indicate that the suits should be begun at once and fought out to the end? A. Yes, he said that the suits would be commenced.

Q. And that at that time you had already seen the affidavits and the papers in the Chicago suit, had you not? A. Yes.

WILLIAM LEONARD, recalled for further cross-examination, saith:

Cross-examined by Mr. Lindabury.

Q. How much time did you spend in the foundry at Chicago Heights while you were there; did you spend parts of every day or now and then a whole day? A. I spent parts of every day, sometimes I was out in the shipping platform and sometimes I was in the grinding room, the finishing room.

Q. How many hours a day on the average? A. I cannot say.

Q. Two hours a day, do you think? A. Oh, more than that.

Q. Would you spend three hours—I mean actually at work in and about the foundry? A. Well, I was every day there.

Q. You were in Chicago sometimes, were you not? A. Very seldom, not in the day time; I was only once in Chicago in the day time.

Q. My question is, how many hours did you average there at work, in and about the foundry? A. I cannot say for sure.

Q. For sure I don't want—give it us approximately? A. I cannot tell you.

Q. Well, how many hours—would you spend four, five, six or eight hours there, during the day—tell me something about it, give me your best judgment? A. Well, maybe four or five hours a day.

Q. What work did you do besides inspecting the castings, if anything? A. Sometimes I would see them pour the heats, and sometimes I would help them pour the heats.

Q. Did you help them do that? A. Yes, sir.

Q. You did sometimes help them pour the heats, did you? A. Yes, sir.

Q. Do you remember telling Mr. France, on the 2d of March at the Eagle Restaurant in Chicago

Heights, that you "dared not write to any of the boys at the old place (meaning Highbridge), for fear the firm would get possession of the letter, and that would be good evidence for them against Mr. Nichols, and that the only one I can write to is my wife, that the trial comes off next week at Chicago—— A. No, sir; I don't remember ever saying such a thing.

Q. Are you able to say that you did not make that statement to Mr. France? A. I cannot say that I did, I won't swear to it.

Q. Did you or not, at the same place and during the same conversation, hand Mr. France the card which I now show you (handing witness a card), bearing on one side of it the words Stratton & Cox, Concrete Blocks and Construction Yard, &c.," and on the other side written in pencil the words and figures "4160 Lake avenue, W. G. Nichols, Chicago, Ill."? A. That ain't my writing.

Q. Do you know whose writing it is? A. Yes, Mr. Nichols' handwriting, I think it is, although I ain't sure of that.

Q. Don't you know Mr. Nichols' writing? A. Well, I cannot swear if it was or not.

Q. Whose card is it? A. That must be that Mr. France's card you spoke of?

Q. Mr. France's card, is it not? A. I cannot say for sure.

Q. Well, now, don't you remember that it was his card? A. No, sir, I cannot say that it is.

Q. Then what makes you say in the first place that it must be France's card? A. Because I remember nothing about that gentleman until now after speaking with Mr. Nichols about it, I did not remember him before until Mr. Nichols told me about him.

Q. You have been talking with Mr. Nichols about it, have you—and you now remember this Mr.

France, after having spoken with Mr. Nichols about him—did Mr. Nichols meet this Mr. France? A. That night in the Olympia was the only time——

Q. The night in the Olympia, you all got pretty full, didn't you? A. I was not so full.

Q. You all got pretty full, though, didn't you? A. No, sir; this other gentleman was full that was with us.

Q. The other fellows did get full, but you did not, is that it? A. I cannot swear to it but that I was feeling pretty good myself.

Q. And France was feeling pretty good, too, was he not? A. I cannot say how he felt, but I guess so.

Q. And Nichols was feeling pretty good, was he not—was he full, too? A. No, sir; he was not.

Q. But you were all feeling good, were you not? A. Well, I had a few drinks.

Q. Something made a greater impression on you on that occasion, I should judge from your testimony, than you received on the other nights? A. No, sir; I cannot say that.

Q. You recollect Mr. France that night? A. I remember him being there that night, I never was in that man's company alone once.

Q. Is that the only time you ever met Mr. France? A. Oh, no, sir; I met him lots of times, I remember now, but that was after that night.

Q. Was that the first time you met him? A. No, sir; it was not; that is the only time that it put me in remembrance of the man, was that night, that was the only time that put me in the remembrance of Mr. France, who he was.

Q. The only time you recall him by the name of France—and what you remember most about him was, the night that you had with him at the Olympia? A. Yes.

Q. Now, having recalled that, you now recall

him as having been with him on several other occasions, do you not? A. I met him in the hotel, he was there when I went in; he was at the bar when I went into the hotel.

Q. You recall meeting him several other times, do you not? A. Oh, yes, sir, I have met him lots of times.

Q. You got quite intimate with him, didn't you? A. Not particularly.

Q. Do you remember when you left there for Highbridge in March? A. Yes.

Q. What day was that? A. I cannot tell by the date.

Q. About when was it? A. I cannot tell you that.

Q. Well, was it March or April? A. I never kept any record of any dates.

Q. Was it March or April, you surely remember that? A. March, I believe.

Q. What road did you go on? A. Well, I left on the——

Q. If you don't remember you may say so? A. Well, I don't remember.

Q. What hour of the day did you go? A. Ten o'clock at night, I guess it was.

Q. Well, was it? A. About ten o'clock at night, I think it was.

Q. Did anyone go with you to the station? A. Yes.

Q. Who? A. He did.

Q. Mr. France? A. Yes.

Q. You remember that then? A. Yes, I remember that.

Q. You had quite an affecting parting with him, hadn't you? A. Why, no; I cannot say that I did.

Q. Do you remember that you cried when you parted? A. I cried?

Q. Yes, don't you remember that you cried when

you parted with him that night? A. No, sir, I did not.

Q. You don't remember? A. No, sir, and I ain't subject to that sort of thing.

Q. Did you leave him any memorandum or paper and did he make you any present when you left on that occasion? A. I cannot say for that.

Q. What do you say? A. I cannot remember if he did or not.

Q. You cannot remember if he gave you a present or not? A. No, sir.

Q. On the night you left—do you remember how it was that Mr. France happened to meet you or happened to go with you to the station when you left for Highbridge that night? A. No.

Q. You don't remember that? A. No.

Q. Do you remember whether you asked him to go or not? A. No, I cannot say.

Q. You don't remember about that? A. No.

Q. Do you remember that on the 13th of March —do you remember that the 13th of March was the day you left for Highbridge? A. I cannot say for the date.

Q. Do you remember saying to Mr. France on that day, while you were with him and before you left, "I wish the case against Mr. Nichols was settled, it is worrying him a great deal, and causing him a lot of trouble and expense, and now they have postponed the hearing to the first of the month, and that was done to cause him all the trouble they could—do you remember saying that to Mr. France? A. No.

Q. And do you remember Mr. France saying to you—"What will they do at the foundry while you were gone," and of your replying, "Most of it will be taken care of by 'phone, Mr. J. J. Worn will have to take care of my work"—do you remember that? A. No, sir; I never said any such thing.

Q. And do you remember that Mr. J. J. Worn succeeded you, after you left there? A. No, sir; he has nothing to do with my business at all, nor me with his.

Q. Well, do you remember that he came there before you left? A. Yes.

Q. Was he not to take your place, as the go-between, between Mr. Nichols and the foundry? A. No, sir.

Q. What did Mr. Worn do in the foundry? A. He was the steel blower, I guess.

Q. Well, do you know? A. The steel blower.

Q. Do you know how long he had been there? A. He was there before I went there; I cannot say how long he was there.

Q. Do you remember telling him when you would come back, that is, telling Mr. France when you expected to return, and saying, "I do not expect to return until I hear what the decision in the case is, but if it is put off again I will have to come back in two weeks"? A. No, sir.

Q. And did you tell Mr. France to tell J. J. Worn to write to Mr. Nichols as soon as possible, as Mr. Nichols had something very important to tell him? A. No, sir, I don't remember anything of that kind.

Q. And do you remember that after making that statement, Mr. France asked you, "if you would return in two weeks," and you replied, "Well, if the case is sure to come off the 1st of the month, I will stay until I hear what the decision is, but if it is put off again, I will have to come back in two weeks. If Mr. Nichols loses, he and I will go at once to Montreal, Canada, and begin to work there"—do you remember making that statement to Mr. France? A. No, sir.

Q. Now, do you remember after telling Mr. France to see Mr. Worn—Jack Worn or J. J. Worn

—and telling him to write to Mr. Nichols as soon as possible, as Mr. Nichols had something important to tell him, that Mr. France then gave you a memorandum to write the address of Mr. Nichols on, to give him, and that you did that? A. I cannot remember.

Q. Did you give Mr. France a memorandum containing or having upon it Mr. Nichols' address, to which address Mr. Worn was to be told to write to Mr. Nichols as soon as possible? A. I cannot remember if I did or not.

Q. Look at the paper which I show you, being a leaf from diary and bearing the name, "Nichols, 4160 Lake Ave, Chicago," and tell me whose handwriting that is in? A. Yes, sir; that is my handwriting.

Q. Why did you take so long before answering? A. I could not know it for sure.

Q. Was it to make up your mind whether it is your handwriting or not? A. I cannot think so quick.

Q. Didn't you write that on a leaf that Mr. France took out of his own memorandum book when you were parting, and gave it to him, as the address of Mr. Nichols, which he was to give to Mr. Worn, when he told Mr. Worn to be sure to write to Mr. Nichols as soon as possible? A. I cannot say for sure.

(*Court.*)

Q. I would like to ask you a question or two—I now understand you to say that you recollect this Mr. France, that you used to meet him at the hotel every night, that you met him in the barroom, and that you were with him one evening in the Olympia, and that he went with you to the train when you started to come East in March—do you remember all that now? A. Yes, sir.

Q. And do you want me to understand, when you were testifying before, that you did not know such a man, that you had forgotten all that you had testified to? A. Not by that name.

MR. GOODE—If your Honor please, that is not my understanding of the evidence.

COURT—That is my understanding of it, and if I am not right, you had better straighten that out now.

(*Mr. Lindabury.*)

Q. Didn't you get a letter from Mr. France, after you got to Highbridge? A. No, sir; not as I know of.

Q. Where did you go to after you left Chicago? A. I went to the Standard Steel Works.

Q. Didn't you get a letter from Mr. France there? A. No, sir.

Q. Well, didn't you get a letter from him somewhere? A. No, sir.

Q. Do you say you never got a letter from Mr. France? A. No, sir.

Q. What was Mr. France's business in Chicago? A. I never saw him doing anything but drinking and playing pool, and playing cards.

Q. Was that what he was doing every day? A. I cannot say for the day time, it was only night time when I was there.

Q. Pretty much every night, was it not? A. I never talked much nights to him.

Redirect by Mr. Corbin.

Q. When you were called the other day, did you remember the name of France at all? A. No, sir.

Q. How did you get hold of that name afterwards? A. I talked to Mr. Nichols when we went out and he told me that that was the one that was

with us that night in the hotel, and the name of the hotel I cannot tell, I cannot think of the place just now that we were at——

Q. Do you recollect the man now? A. Yes, sir.

Q. Do you remember how he looked now? A. Yes.

Q. Describe to me how he looked? A. He was a tall fellow, clean shaved, that is about all I remember.

Q. What is the color of his hair? A. A sort of dark, dark complexion.

Further cross-examination by Mr. Lindabury.

Q. Were you not asked all that by myself, when I tried to have you tell the name of the man? A. Well, there was so many people that I met there, in such a short time, that I could not place him by his name.

Q. Didn't you take Mr. France through the foundry at Chicago Heights? A. No, sir.

Q. And didn't you give him sand or show him some sand? A. No, sir; I did not.

Q. Well, what about that? A. I told you Mr. Worn was the one that he asked for when he came there, and there was four others with him from the hotel——

Q. Were you there when Mr. France came to the works that time? A. Yes, sir; I was in the foundry at the time when he came in.

Q. What did he come for? A. I cannot tell you, unless it was to see the place; he never asked to come as far as I know.

Q. Was he shown around the works? A. Someone took him around the works.

Q. Were you not in the company with them at the time? A. Some part of the time I was, yes, sir.

Q. Do you remember now a conversation later, about his coming again? A. No, sir; I do not.

Q. Don't you remember that in such a conversation as that he said that there might be trouble in his getting into the works? A. No, sir, there could not be any trouble, there is no fence around the place.

Q. I mean in getting through the foundry? A. No.

Q. And in which you said that it woud not make any difference if he asked for you? A. I never mentioned such a thing.

Q. And that when the new superintendent got there he would keep them out, the same as he did at Highbridge, don't you remember that conversation? A. No, sir; that is someone else that has been telling him something. Mr. Worn must have been telling him something, or some other of the steel workers.

DAVID SIMPSON, a witness produced in behalf of the defendants, being duly sworn according to law, on his oath saith:

Examined by Mr. Goode.

Q. Where do you reside? A. 37 Jackson street, city.

Q. Newark? A. Yes, sir.

Q. Where are you employed? A. Maher & Flockhart Iron Foundry.

Q. What business are they engaged in? A. Iron foundry.

Q. Where? A. Polk street.

Q. Here in Newark? A. Yes, sir.

Q. How long have you been employed by Maher & Flockhart? A. About eight and a half years.

Q. Continuously? A. Yes.

Q. What is you work with them? A. I am a moulder.

Q. They have an iron foundry, I think you said? A. Yes.

Q. Were you ever employed by the Taylor Iron & Steel Co.? A. I was.

Q. How long ago—when did you go to the Taylor Iron & Steel Co.? A. In 1894.

Q. How long did you remain there? A. About four years.

Q. And you left in 1898? A. Yes, sir; I left in 1898.

Q. And did you go from the Taylor Iron & Steel Co. to the present employment? A. Yes.

Q. In what capacity were you employed by the Taylor Iron & Steel Co.? A. Moulding.

Q. Steel moulding? A. Yes, sir, Manganese steel moulding.

Q. While employed in the steel foundry of the Taylor Iron & Steel Co., tell whether or not you were under any pledge of secrecy as to any process of moulding? A. No, sir; I was not.

Q. State whether or not you had access to all parts of the foundry? A. I had.

Q. And had you opportunity to observe all that was going on? A. Yes, sir; I was never stopped from going any place.

Q. Have you, in your occupation of moulder, become acquainted with the use of chills in moulding? A. Oh, yes, sir; we use chills in moulding where I am employed right along.

Q. Did you use them at Highbridge, at the Taylor Iron & Steel Co. works? A. Yes, sir.

Q. And do you use them now where you are working? A. Yes, sir; we use them now.

Q. Is there anything different from the way you use them now, to the way you used them in the Taylor Iron & Steel Co.'s works? A. No, sir; they are used just for the same purposes.

Q. Were you taught any secrets by the Taylor

Iron & Steel Co. in the use of chills there? A. No, sir.

Q. Or in moulding Manganese steel? A. No, sir.

Q. Is the moulding at the place you are now employed at any different from what it was at the Taylor Iron & Steel Co.'s works? A. None whatever, no, sir.

Cross-examination by Mr. Lindabury.

Q. What is your age? A. Thirty-eight.

Q. Where were you born? A. In Scotland—Aberdeen.

Q. When did you come to this country? A. In 1893.

Q. Where were you educated? A. At Aberdeen, Scotland.

Q. In the common school? A. The common school.

Q. What time did you leave school? A. When I was twelve years old.

Q. Did you receive any special education in the manufacture of steel or iron? A. No, sir.

Q. You were just taught the common branches in the common school? A. They didn't teach me anything about steel or iron in the school.

Q. You never learned anything about the process of manufacture, of iron or steel, except what you got from your practical experience? A. I don't know anything about steel at all, I only know how to make the mould and put the steel in it.

Q. How did you learn that? A. I served seven years to learn it.

Q. Where? A. In Aberdeen, Scotland.

Q. How much wages did you get at the Taylor Iron & Steel Co.'s place? A. $2.75 a day.

Q. And what do you get now? A. $3.50 a day.

Q. By a gradual increase I suppose? A. I left Highbridge to get more money.

Q. You acted as laborer about and in the foundry at Highbridge, did you not? A. No, sir; I acted as moulder.

Q. In the ordinary laborious part of the work, I mean? A. Well, it is laborious, that is all we have to do, you know.

Q. There was a superintendent over you, I suppose? A. Yes.

Q. Who was that? A. Mr. Brinton.

Q. And he directed you what to do, did he not? A. No, sir; there was a foreman under him.

Q. And who was that? A. Mr. Cherry—James Cherry.

Q. How is his name spelled? A. "Cherry."

Q. He was foreman over the moulders? A. Yes, sir.

Q. And he directed what the moulders should do? A. He gave us our jobs.

Q. Did he tell you how to perform the job? A. He told us how to do it if we didn't ourselves.

Q. He told you where to place the chills? A. Sometimes he did; but there was men there then and there are men there now just knew as much as he did where to place them.

Q. I asked you whether they were placed under his direction, or not. A. Well, yes, sir.

Q. Did you pay any attention to any of the business going on there, except the moulding? A. No, sir, not much.

Q. You did not see how they mixed the steel, did you? A. No.

Q. And what they did to it in the ladle? A. No.

Q. I mean, you did not observe what they did to it in the ladle? A. I saw it come out of the cupola, and I saw it enter the converter.

Q. But what they did to it in the converter you did not know, I suppose? A. No, sir; they blowed it, that is all I could tell about it.

Q. You didn't blow it? A. No, sir.

Q. And you didn't watch it close enough so that you understood it, did you? A. No, sir.

Q. And no one ever taught you that, did they? A. No.

Q. When they got it out of the converter, they did something to it, didn't they? A. It went into the ladle.

Q. Do you know what they did to it in the ladle? No, sir, but I believe they put the manganese into the ladle first.

Q. You don't know how much manganese they did put in? A. No.

Q. And you don't know what the mixture was that they put into the ladle? A. No, sir.

Q. So that you could not do that yourself, from any observation you made of it? A. No, sir.

Q. Now, after it was put into the moulds, they took it out? A. Yes.

Q. At some temperature or other? A. Yes.

Q. And then they put it in the annealing furnace—did they have an annealing furnace there? A. Yes, sir, but I didn't know anything about the annealing furnace; I didn't pay any attention to the annealing; I was only there to make the mould and do the moulding.

Q. You saw the annealing furnace there? A. Yes.

Q. And you saw them put it in? A. Yes.

Q. And heat it up? A. Yes.

Q. And you saw them take it out? A. Yes.

Q. And put it in the water? A. Yes.

Q. And your associates did that, did they? A. Yes.

Q. And neither you or they knew anything about it? A. No, sir—well, the foreman and the assistant foreman knew all about it, and they didn't hide anything from us.

Q. You mean that they were there, and allowed you to see it done, that is, they did not interfere with your seeing this work done? A. No, sir.

Q. Well, could you do it? A. No, sir.

Q. Could any of the others do it, do you think? A. Yes, sir, any one smart enough could tell all about it.

Q. Then you were not smart enough? A. No, sir.

Q. Was there anyone there smarter than you, do you think? A. Oh, yes, a good many.

Q. Occupying the same position that you did? A. Oh, yes, sir, there are both good and bad men in all shops, you know.

Q. And you might be a good man and not understand all that you saw? A. Oh, yes, sir, that is true.

[DEFENDANT RESTS.]

FRANZ W. FRANCE, a witness produced in behalf of the complainant, in rebuttal, being duly sworn according to law, on his oath saith:

Examined by Mr. Lindabury.

Q. What is your age? A. Thirty-eight.

Q. Where do you live? A. Chicago.

Q. What is your occupation? A. Detective.

Q. In whose employ? A. The Pinkerton National Detective Agency.

Q. Were you assigned by that company to work in Chicago, in the spring of 1906? A. Yes, sir.

Q. When did you begin—in 1906 or 1905? A. On this case, in 1906.

Q. Do you remember the month? A. Yes, sir—January.

Q. Now, do you remember making the acquaintance of, or having Wesley G. Nichols identified to you? A. Yes, sir.

Q. When was that—give about the month? A. In February.

Q. And do you remember having William Leonard identified to you? A. Yes.

Q. Where? A. At Chicago Heights.

Q. Did you follow Mr. Leonard at any time from Chicago to Chicago Heights? A. Yes.

Q. Can you recall, now, the first time? A. May I look at my notes?

Q. Can you tell approximately, without doing that—if not, you may refer to your notes. A. (Referring to notes) January 23rd.

Q. How long had you known him then, that is, known who he was—this Mr. Leonard—approximately will do now? A. Three days.

Q. Where did you trace him to, at Chicago? A. To 4160 Lake Avenue.

Q. Did you know then who lived there? A. I found out, yes, sir.

Q. Then, or afterwards? A. Afterwards.

Q. Who was it? A. It was Mr. Nichols' house.

Q. Now, do you know how long he stayed there? A. No, sir; I remained there about an hour.

Q. You remained outside? A. Yes, sir.

Q. And he had not left yet when you did? A. No, sir.

Q. Did you follow him again from Chicago Heights? A. Yes.

Q. Where to? A. The same place.

Q. When next did you do that? A. February 4th.

Q. Was that day or night? A. If I remember aright, it was in the afternoon, the latter part of the afternoon.

Q. Did you remain then on the outside of the house? A. For about an hour, yes, sir.

Q. And then you left? A. Yes.

Q. Was he still there? A. Yes.

Q. How many times in all did you trace him or follow him to that place? A. Three times.

Q. When was the next time? A. February 10th.

Q. Did you make the acquaintance of Mr. Leonard at any time? A. Not during this time.

Q. When did you make his acquaintance? A. February 20th.

Q. I mean Mr. Leonard, not Mr. Nichols—Leonard. A. Mr. Leonard.

Q. Well, what was the date when you made the acquaintance of Mr. Leonard? A. That was February 20th.

Q. Did you make the acquaintance of Mr. Nichols at any time? A. Yes, sir.

Q. When was that? A. On February 24th, the evening of February 24th.

Q. Where did you meet Mr. Leonard, and how came you to get acquainted with him; state the circumstances? A. The first time I got acquainted with him was at the Victoria Hotel bar.

Q. Where is the Victoria Hotel? A. Let me see —it is on West End Avenue.

Q. In what town? A. Chicago Heights.

Q. Do you remember how you came to meet him, whether you introduced yourself to him, or whether you were introduced by somebody else? A. Why, I passed as a salesman of concrete blocks, and that is the way I came to meet him.

Q. Salesman!—who for? A. Of Stratton and Cox, of Evanston, Ill.

Q. Were you engaged in offering these blocks about Chicago Heights? A. Yes, sir.

Q. From what time—when did you begin to offer these blocks approximately? A. The first part of February.

Q. And where did you put up—where did you board? A. At the Victoria Hotel.

Q. Did you meet Mr. Leonard day or night, when you made his acquaintance? A. In the evening.

Q. Do you remember what you were doing, or how you met him? A. I was up at the bar in the Victoria Hotel, and made a display there of concrete samples I had with me, and Mr. Leonard stepped up and commenced asking questions, and finally I was introduced to him by one of the saloon men.

Q. And then, what—did you spend any time with him that evening? A. Yes, sir, I spent I should judge an hour or so that evening with him.

Q. Did you have anything to drink with him that evening? A. Yes.

Q. Who treated? A. Well, if I remember aright, "we chucked dice" and I got "stuck" and I was the one that treated.

Q. Something in your business that often happens—that you get stuck? A. Yes.

Q. So you paid for the drinks? A. Yes.

Q. And do you remember when that was—that was the 20th of February, was it not? A. Yes, sir, that was the 20th of February.

Q. Do you remember having any conversation on that evening with Mr. Leonard about a man named Nichols? A. I will have to look up my report as to that.

Q. Did you make notes of conversations you had during this period? A. Yes, sir.

Q. Have you got the notes with you for that day? A. Yes.

Q. You might refer to them—telling us first when you made them? A. I made them on the evening of each day.

Q. Now then, you may refresh your recollection, if necessary, by looking at your notes for the 20th of February, and I will ask you whether or not you

had a conversation with Mr. Leonard, in which you told him that the American Brake Shoe and Foundry Co.——

MR. CORBIN—I object to counsel leading the witness.

COURT—Let the question be completed first.

(*Mr. Lindabury.*)

Q. I will ask you whether or not you had a conversation with Mr. Leonard that evening—that is the 20th of February—in which you told him that you would like to have foundry sand to demonstrate your concrete blocks with, whereupon he said, "I will furnish you with all the sand you want," at the same time handing you a bill-head of the American Brake Shoe and Foundry Co., and telling you to come and see him some afternoon, when he would take you through the works? A. Yes, sir.

Q. Did you have that conversation with him? A. Yes, sir.

Q. Did he then tell you that they were making safes at the foundry for the Victor Lock Safe Co., of Cincinnati, Ohio? A. Yes, sir.

Q. Did you then tell him that you had had six years' experience in the safe business yourself? A. Yes, sir.

Q. Which was true? A. Yes, sir, which was true.

Q. Did you have more than one drink with him? A. I think I had.

Q. And did you have a cigar with him? A. Yes, sir.

MR. CORBIN—I object to all this evidence as immaterial, except with a view to question the witness on any particular statements for contradiction.

(*Mr. Lindabury.*)

Q. Did you tell him that you thought it would be best for you not to see him at the foundry for fear the superintendent would like it? A. Yes, sir.

Q. And did he reply "it makes no difference, as the superintendent is in Chicago, and is prevented from visiting the plant by an injunction, which has been served on him"—did he tell you that? A. Yes, sir.

Q. Did he also say, "that he (Leonard) works in his, the superintendent's, place and receives his orders from him"? A. Yes, sir.

Q. And did you ask who the superintendent was? A. Yes, sir.

Q. And did he reply "Mr. Nichols"? A. Yes, sir.

Q. Now, February 24th—did you meet Mr. Nichols on the 24th of February? A. Yes, sir.

Q. Where? A. At the corner—well, in the saloon at the corner of La Salle and Van Buren Streets, Chicago.

Q. How came you to meet Mr. Nichols? A. I went in to the city with Mr. Leonard; he told me he was going to meet Mr. Nichols, and I told him I was going on down to see my sister.

Q. Had you seen Mr. Leonard between February 20th—the date on which you gave us the conversation—and this 24th of February, when you met Mr. Nichols? A. Yes, sir.

Q. Every day, or not? A. Every day.

Q. Where had you seen him? A. On the 20th, at the Victoria Hotel bar.

Q. That you have told us about; when next did you see him, between the 20th and the 24th, that is, the 21st, 22d and 23rd of February? A. On the 21st, at the Victoria bar; on the 22d at the Victoria

bar, and on the 23rd of February I went through the foundry with him.

Q. What time of day did you go through the foundry, on the 23rd? A. In the afternoon.

Q. You two alone, or was someone else with you? A. Oh, no, sir, there was a number of us went through together.

Q. How much time did you spend there? A. About two hours.

Q. Who did you arrange with to go through the foundry? A. Mr. Leonard.

Q. Did he invite you? A. Yes, sir.

Q. When was it you made the arrangements to go to Chicago with him on the 24th of February, when you said you were going to see your sister—was it on the 24th or before that? A. It was on the 24th of February.

Q. What time of day or evening did you go, on the 24th of February? A. Well, it was somewheres around seven o'clock.

Q. In the evening? A. Yes, sir.

Q. Now, where did you meet Mr. Nichols? A. In the saloon at the corner of La Salle and Van Buren Streets?

Q. How came you to go to that place? A. Mr. Leonard told me or made arrangements that I should meet him at the La Salle Street Depot, at 9.30 that evening, and I met him there, and then Mr. Leonard took me to this saloon at the corner of La Salle and Van Buren Streets.

Q. What did he take you there for? A. To introduce me to Mr. Nichols.

Q. When had it been arranged that he would do that? A. That was unbeknown to me.

Q. You did not know when you were going to meet him? A. No, sir; in fact, I did not think I was going to meet him that evening.

Q. But you did meet him? A. Yes, sir.

Q. And were introduced to him? A. Yes, sir, by Mr. Leonard.

Q. How long did you stay at that saloon that night? A. Oh, about half-an-hour, or somewhere about that.

Q. Did you have anything to drink there? A. Yes, sir.

Q. Did you go to any other saloon that night? A. Yes.

Q. With Mr. Nichols? A. Yes.

Q. And with Mr. Leonard? A. Yes.

Q. Where did you go? A. Mr. Nichols suggested that we should go up to a place on Wabash Avenue, and he took us in to the Olympia.

Q. Who went? A. Mr. Nichols, Mr. Leonard and myself.

Q. How long did you stay at the Olympia? A. Until a little after twelve o'clock.

Q. What time did you get there? A. I should judge about ten o'clock; I cannot say exactly.

Q. Did you have anything to drink that night? A. Yes, sir.

Q. Who had anything to drink? A. Mr. Leonard, Mr. Nichols and myself.

Q. Did you have any conversation with Mr. Nichols that night with regard to his employment —I mean with regard to how he was employing his time? A. Yes, sir.

Q. Mr. Nichols I am speaking about. A. Yes, sir, I understand.

Q. You may give that conversation.

MR. CORBIN—I object to the question on the ground that Mr. Nichols was not asked anything in regard to it.

COURT—Mr. Nichols is a defendant, and any of his admissions are competent. I will allow the question.

A. Mr. Nichols said to me, "I am suspicious of detectives watching us, and that is the reason I met Mr. Leonard at Englewood to-night, so that they would not catch us together; there is a firm in the East that has served an injunction on me"—do you want any further?

Q. Go on. A. "Which prevents me from going to the Heights now, and I have Mr. Leonard there, taking care of the work until this is settled in the courts, which I think will be done some time next month, and then I shall move out to the Heights." After he was through talking, I said, "You had better let me furnish you with concrete blocks"——

Q. That is enough. Do you remember the name of anyone except Mr. Leonard who went through the works with you that day? A. Yes, sir.

Q. Who? A. Mr. J. J. Worn.

Q. Any one else? A. Of the foundry—no, sir, those were the only two.

Q. Now, was there anybody else not connected with the foundry who was in the party? A. Yes, sir.

Q. Who? A. I shall have to look that up.

Q. Never mind then, if you do not recall them; now, how soon did you see Mr. Leonard again, after this 24th of February? A. I don't exactly remember, but I think it was the next afternoon.

Q. Where, if you recollect? A. At the Victoria bar.

Q. How often did you see him between then and the 4th of March, which is the date I want to ask you about presently? A. How many times?

Q. Yes, with about what frequency? A. About once a day, once every day.

Q. Were you with him much or little? A. A great deal.

Q. Day time, or night? A. Generally in the evening.

Q. Sometimes in the day time? A. On Sundays.

Q. Where did you go then, on Sundays? A. Why, most of the time, hanging around the hotel and the bar-room.

Q. Did you go off walking or anything of that kind with him? A. Yes, sir.

Q. What days? A. I think this was on the 4th of March.

Q. Who was with you? A. Mr. Leonard and myself and William Bordell.

Q. Where did you go? A. We went to Stiger—we walked there.

Q. How far is that? A. Two and a half or three miles.

Q. Did you walk back? A. Yes, sir.

Q. Did you find a saloon there? A. Yes, sir.

Q. Did you have something to drink? A. Yes, sir—well, Mr. Leonard refused to take a drink there and took a cigar.

Q. How long were you gone? A. It must have taken us about three-quarters of an hour.

Q. You mean out and back? A. Oh, no, sir, going out, and three-quarters of an hour coming back.

Q. How long were you there, about? A. Fifteen or twenty minutes to half an hour.

Q. By what name were you introduced to Mr. Leonard? A. "France."

Q. And to Mr. Nichols? A. "France."

Q. Were you known by any other name out there than "France"? A. No, sir.

Q. "France" is your real name? A. "France" is my real name.

Q. Did you have a conversation on the 4th of March with Mr. Leonard in which he said, "To-day is the 4th of March; well, ten days from now Mr. Nichols will know what to do. If he wins I will take two weeks off, and if he does not win I will

go anywhere; it makes no difference to me which way it goes, but I hope he will come out all right." Do you remember his telling you that? A. Yes, sir.

Q. I will next ask you about a conversation on the 6th of March—do you remember meeting Mr. Leonard at the Victoria bar-room on the evening of that day and having a conversation about moulding safes at the foundry of the American Brake Shoe and Foundry Co.? A. Yes, sir.

Q. And of Mr. Leonard saying to you, "Come over some day at one o'clock, and I will show you how to pour one of them"—meaning safes? A. Yes, sir.

Q. And you said, "All right, but it is pretty hard to gain admittance to the place," to which he replied, "You ask for me, the same way you did before, and I know they will let you in; but when the new superintendent comes he will not let you in, as he will do it the same way as they do it in the East"—do you remember his stating that? A. Yes, sir.

Q. And then of your replying, "Oh, you mean Mr. Nichols"? A. Yes, sir.

Q. And did he then say "yes"? A. Yes, sir.

Q. You recollect that, do you? A. Yes, sir, I do.

Q. Do you remember seeing Mr. Nichols on Thursday, the eighth of March, 1906, at the Victoria Hotel, and that Mr. Leonard suggested that you should take a walk on the east side of Chicago Heights? A. Yes, sir, that is right.

Q. Now, you remember that, do you? A. Yes, sir.

Q. Did you take a walk with him? A. Yes, sir.

Q. With Mr. Leonard? A. Yes, sir.

Q. How long were you together in this walk; how long were you walking? A. I should judge about an hour.

Q. In the course of that walk, did he say to you "that Mr. Nichols was offered $7,000 a year and $10,000 of shares in the American Brake Shoe and Foundry Co. by that company"—do you remember that? A. Yes, sir.

Q. And did he say that he (Mr. Nichols) had been previous getting $85 to $95 per week from the company that he left? A. Yes, sir.

Q. He told you that, did he? A. Yes, sir.

Q. About how often were you seeing Mr. Leonard during this time, that is, the early part of March—did a day pass without your seeing him? A. I do not think there was a day passed but what I saw him.

Q. How much were you with him on an average in each of these days? A. I was always with him while in the hotel.

Q. In the evening, was that? A. Yes, sir.

Q. How long a time? A. It would vary from two to four hours—no, from one to four hours.

Q. Look at your notes for the 10th of March. A. Yes, sir.

Q. Do you remember Mr. Leonard asking you to go with him anywhere that night? A. Yes, sir.

Q. What did he tell you? A. "That he received a letter from his friends in the city, and was going in on the 6.38 P. M. train and wanted us to go with him."

Q. Who was "us"? A. That was William Bardell, Mr. Leonard and myself.

Q. This William Bardell; was he a man whose acquaintance you had made there? A. Yes, sir.

Q. Did you decide to go with him? A. I finally decided to go with him, yes, sir.

Q. Did you have any conversation with him on the train, as to where he proposed to get off? A. Yes, sir.

MR. CORBIN—I object to this examination—how can this conversation be material?

COURT—Mr. Leonard was asked about it, whether he did not get off at Englewood, or not—I think it is competent.

(*Mr. Lindabury.*)

Q. Did he tell you that he intended to get off at Englewood? A. Yes.

Q. Did he tell you that Mr. Nichols had agreed to meet him there? A. Yes, sir.

Q. Did he tell you that Mr. Nichols was on the lookout to see that no detectives would catch us together—is that what he said? A. Yes, sir.

Q. And did he tell you on that occasion that if Mr. Collins loses, that he and I (that is Mr. Leonard) will go at once to Montreal, Canada, and begin to work there, and the people in the East could not prevent him from working there? A. Yes, sir.

Q. Did you see Mr. Leonard again the next day, that is, the 11th of March? A. I cannot just recall it.

Q. Do you remember seeing him on the 13th of March? A. Yes, sir, I did.

Q. Where did you see him then, at what town—Chicago Heights? A. Chicago Heights.

Q. What time of day did you meet him? A. In the forenoon.

Q. What hour in the morning? A. At 11.30 A. M.

Q. Did he tell you he was going to leave Chicago Heights for Highbridge on the next train? A. Yes, Sir.

Q. Is that 11.30 A. M. at Chicago Heights? A. I met Mr. Leonard at 9 A. M.

Q. 9 A. M. Chicago Heights? A. Yes, sir.

Q. And he told you there he was going to leave Chicago Heights for Highbridge on the next train? A. Yes, sir.

Q. Did he ask you or extend any invitation to you? A. Yes, sir, he did.

Q. What? A. He insisted on my going with him to the city.

Q. What city? A. Chicago.

Q. Did you go with him? A. Yes, sir.

Q. Did you accompany him to the station? A. Yes, sir, I did.

Q. At what hour did he leave? A. Why, about 10.30 P. M.

Q. What hour did you leave Chicago? A. About 10.30 P. M.

Q. Did anyone go with you there? A. No, sir.

Q. Did you make him any present when he left? A. Yes.

Q. What was it? A. A quart bottle of whiskey.

Q. Was he aware of it, that you gave it to him; did he see it, or how did you give it to him? A. I put it in his grip, or the bartender put it in his grip.

Q. Do you remember his finding it there before you left him, and speaking about it? A. Yes, sir, I think so.

Q. I don't care about that; I will ask you whether, or not—what did you do with him that morning; did he say, referring to Mr. Nichols' lawsuit, "I wish the case is settled, for it is worrying Mr. Nichols a great deal, and causing him a lot of trouble and expense, and now they have postponed hearing it—on the first of the month—which was done to cause him all the trouble they could"—do you remember that? A. Yes, sir.

Q. And then do you remember asking him, "What would they do at the foundry, while he was gone?" and of his replying, "Most of it would have to be taken care of by others"? A. Yes, sir.

Q. That "J. J. Worn would have to take care of my work"? A. Yes, sir.

Q. And do you remember that Mr. Leonard asked you to tell Mr. Worn to write to Mr. Nichols as soon as possible, as Mr. Nichols had something very important to tell him? A. Yes, sir.

Q. And do you then remember asking Mr. Leonard if he would return in two weeks, and his replying, "Well, if the case is sure to come off on the first of the month I will stay and hear what the decision is, but if it is put off again, I will have to come back in two weeks, and if Mr. Nichols loses the suit, then he and I will go at once to Montreal, Canada, and begin to work there"—do you remember that? A. Yes, sir.

Q. Do you remember when Mr. Leonard told you to tell J. J. Worn to write to Mr. Nichols as soon as possible, as Mr. Nichols had something very important to tell him," that you asked him to give the address of Mr. Nichols? A. Yes, sir.

Q. Did he do it? A. He wrote it on a slip of paper.

Q. Did he do it? A. Yes, sir.

Q. Look at the paper I show you, and say whether or not that is it? A. Yes, sir, it is.

Q. Where did the paper come from? A. From a little memorandum book of mine.

Q. You tore it out? A. Yes, sir.

Q. And who did the writing? A. Mr. Leonard.

MR. CORBIN—I object to this evidence. What is the necesity of all this? It does not contradict anything.

MR. LINDABURY—I will ask that this paper be marked for identification.

Marked C 31, for identification.

(*Mr. Lindabury.*)

Q. How did you and he part that day? A. I left him in the train.

Q. What was his manner towards you when you parted?

MR. CORBIN—I object to the question—if this is to discredit a witness, how could it matter?—and I object to it as immaterial.

Question allowed.

A. Oh, when we parted?

(*Mr. Lindabury.*)

Q. Yes? A. Oh, tears came to his eyes and we shook hands.

Q. Occasioned by what—what was his manner?

MR. CORBIN—I object to that as immaterial.

Objection sustained.

(*Mr. Lindabury.*)

Q. I want his whole manner; describe when you parted with him.

MR. CORBIN—I object to the question as immaterial.

Question allowed.

A. Well, he appeared to be a very close friend, that is about the way I can express myself, he was very sorry to see us part.

(*Mr. Lindabury.*)

Q. What did he do or say?

MR. CORBIN—I object to that question as immaterial.

Question allowed.

A. He had tears in his eyes after seeing him off——

Q. Is that the whole answer—I asked you to describe the whole parting scene?

MR. CORBIN—I make the same objection.

Question allowed.

A. Well, he promised me that he would write me a letter.

(*Mr. Lindabury.*)

Q. What kind of a hand-shake did you have?

MR. CORBIN—I object to that as immaterial.

Objection sustained.

(*Mr. Lindabury.*)

Q. How long did he shake hands with you?

Same objection.

Question allowed.

A. I don't recollect.

(*Mr. Lindabury.*)

Q. You have your notes in your hand?

MR. CORBIN—I object to this as immaterial.

COURT—I think he ought to be able to recollect it without his notes.

Question withdrawn.

(*Mr. Lindabury.*)

Q. Do you remember any day that you were not with him during the period between the 1st and 13th of March?

MR. CORBIN—I object to that as immaterial.

Question allowed.

A. No, sir; I do not.

(*Mr. Lindabury.*)

Q. You were with him every day? A. I think I was.

Q. And how friendly did you become? A. Very friendly.

Q. Do you remember seeing him on the second of March and at the Victoria Hotel barroom, and of his saying to you then, "I dare not write to any of the boys at the old place, for fear the firm would get possession of the letter, and that would be good evidence against Mr. Nichols; the only one I can write to is my wife"?

MR. CORBIN—I object to the question—is this a conversation with Mr. Leonard?

MR. LINDABURY—Yes.

MR. CORBIN—It was not asked Mr. Leonard.

COURT—He was asked that question.

Question allowed.

A. Yes, sir.

(*Mr. Lindabury.*)

Q. And do you particularly remember that conversation, that during that conversation Mr. Leonard handed you one of your cards on which Mr. Nichols had written his name and address? A. Yes, sir.

Q. Look at the card which I now show you, bearing the name of Mr. Nichols on one side and Stratton & Cox Co. on the other side? A. Yes, sir.

Q. How came he to do that?

MR. CORBIN—I object to that question as immaterial.

Question allowed.

A. Well, I cannot recall that just now.

(*Mr. Lindabury.*)

Q. You do recall his giving it to you? A. Yes, sir, I do.

Q. And do you remember anything being said to you about whose handwriting it was? A. Mr. Nichols.

Q. Who said that—do you remember his saying anything about whose handwriting it was? A. Yes, sir.

Q. What did he say? A. It was Mr. Nichols'.

Q. Do you remember anything about the handwriting yourself? A. No, sir, I do not.

Q. Whose card is that? A. This is my personal card of the firm.

Q. Do you know where Mr. Nichols got it? A. I handed it to him, the evening I was out with him.

Q. Which evening, the one at the Olympia that you have told us about on the 24th of February? A. Yes, sir; the evening at the Olympia on the 24th of February, that I have already told you about.

MR. LINDABURY—I ask that this card be marked for identification.

Marked C 32, for identification.

Cross-examination by Mr. Corbin.

Q. This card you have used to refresh your memory with, when were these entries made on it? A. About a month ago.

Q. And is that supposed to show the dates when you met Mr. Leonard? A. Yes, sir, the dates and my reports.

Q. The dates when you met Mr. Leonard? A. No, sir; it is the dates of my reports.

Q. The dates of your reports? A. Yes, sir.

Q. In making these reports, you say you wrote them each night, that is you made them up each night? A. Yes, sir.

Q. And you had these meetings for hours with Mr. Leonard, did you? A. Yes.

Q. And was carrying on a conversation with him during all that time? A. Yes.

Q. Were there others present? A. On what occasions?

Q. On any of these occasions? A. Yes, sir, there was.

Q. A good many people at one time or another, were there not? A. Not right with us, but in the room, in the barroom there was.

Q. Were there any others taking part in your conversations? A. No, sir.

Q. You never talked with anyone else at these meetings? A. Did I?

Q. Did he? A. Yes.

Q. Mr. Leonard talked frequently with other people, did he? A. Yes, sir.

Q. A good many other people? A. Yes, sir, he was very well acquainted there in Chicago Heights.

Q. At all of these meetings, he met a good many other people besides you, didn't he? A. Yes, sir.

Q. Sometimes he would talk with you and sometimes he would talk with others? A. Yes, sir.

Q. Who were the others that he talked with, workmen? A. Workmen as well as business people and the saloon people.

Q. Workmen from what establishments? A. From different factories in Chicago Heights.

Q. He had a good many acquaintances there, didn't he? A. Yes, sir.

Q. And he talked with a good many people besides yourself, didn't he? A. Yes, sir.

Q. In your conversations, you had a good deal of talk with him that you did not take down? A. Oh, yes, sir.

Q. And you talked for hours on the occasions that you have mentioned, didn't you? A. Oh, yes, sir; there was no end of it.

Q. Well, how did you determine what to put down? A. I kept it in my mind.

Q. What was it that made you think was proper to be put down? A. I thought out what was proper.

Q. How did you make that selection? A. The selection that concerned the Taylor Iron & Steel Co.

Q. You thought this matter concerned the Taylor Iron & Steel Co.? A. Yes, sir.

Q. What were your instructions about that? A. About what?

Q. About what you should put down? A. I used my own judgment on that.

Q. How did you find out that you should put down anything about the Taylor Iron & Steel Co.—did someone give you instructions about it, or not? A. Give me instructions?

Q. Yes; did someone give you instructions what to take down? A. No.

Q. Well, how did you know anything about the Taylor Iron & Steel Co.? A. They were the clients of the Pinkerton Detective Co.

Q. Well, what were your instructions about that? A. I was sent out there to get what I could out of Mr. Leonard.

Q. About what? A. In regard to the Taylor Iron & Steel Co.

Q. There was a good deal you took down that had nothing to do with the Taylor Iron & Steel Co., was there not? A. Certainly.

Q. What did you take that down for? A. To bring it along, to show what had happened.

Q. How did you determine that this particular matter was what you wanted, and that the other was not; how did you determine that? A. I used my own judgment in that.

Q. You used your own judgment, founded on instructions that you got, referring to matters concerning the Taylor Iron & Steel Co.? A. Yes.

Q. From whom did you get the instructions? A. I got it from my assistant superintendent of Chicago.

Q. When you made these reports, what did you do with them? A. I mailed them right in to the Pinkerton people.

Q. Are these reports all in your own handwriting? A. Yes, sir.

Q. Please look at the paper I now show you here, which is one of those sheets, which I have shown you, and which you say was in your handwriting? A. Well, such as this, that I didn't write (indicating).

Q. There is a good deal there not in your own handwriting, is there not? A. No, sir.

Q. Nothing at all? A. Yes, sir; there is some there not in my handwriting.

Q. Two or three of these reports have interlineations which are not in your own handwriting, are they not? A. Very few.

Q. Whose handwriting is that (indicating)? A. My assistant superintendent's, that I am working under.

Q. That is not in your handwriting, but in the handwriting of your assistant superintedent under whom you worked? A. Yes, sir.

Q. Do you know when he made these changes in these memoranda? A. I suppose the next day or the day he got my report.

Q. You didn't see it done? A. No, sir.

Q. These reports you sent in to him, and he made these pencil changes in them, did he? A. Yes, sir.

Q. Did you make any other reports than these? A. No, sir.

Q. These were your reports? A. Yes.

Q. And he made the reports to the Taylor Iron & Steel Co. people, did he? A. Yes, sir.

Q. Was anyone else employed as a detective in this work to your knowledge?

MR. HARDIN—I object to that question as incompetent and irrelevant.

COURT—It must be confined to this case, I will allow the question.

A. Yes, sir.

(Mr. Corbin.)

Q. Who else? A. I cannot remember his name—oh, Mr. Jenkins.

Q. Was he with you at any of these places? A. No, sir.

Q. What was he employed to do? A. To shadow Mr. Leonard while I was roping him.

Q. Did you communicate with Mr. Jenkins? A. No, sir; not after the first day that he was there.

Q. Was anyone else employed? A. Not that I know of.

Q. You have referred to meeting Mr. Nichols with Mr. Leonard at one place? A. Yes.

Q. And you had several rounds of drinks there? A. Yes, sir.

Q. And then when you left there, you say you went to the Olympia? A. Yes.

Q. Who went with you besides Mr. Nichols and Mr. Leonard, anyone? A. No, sir.

Q. When you went to the Olympia, did you have more drinks there? A. Yes, sir.

Q. Were you intoxicated? A. No, sir, but I pretended to be.

Q. What? A. I pretended I was intoxicated.

Q. Did you get into any difficulty with a policeman? A. Yes.

Q. And this policeman struck you? A. Yes.

Q. All pretense was it, your being drunk? A. Yes.

Q. Now, as this paper was first written, was it not written by you as follows: "I notice the aim was to get me drunk, but instead of drinking, I would throw them on the floor"? A. Which I did, and a good many of them, too.

Q. "Between eleven and twelve P. M., Mr. Nichols said to me, that he was a little skeptic on account of detectives which are watching us, and that was the reason I met Mr. Leonard at Englewood to-night, so they would not catch us two together," is that the way you had it? A. Yes, sir.

Q. Now, as it is changed, it reads, "I was aware of his object which was to get me drunk, thinking I might admit my indentity, but instead of drinking, I threw most of the drink served to me in the cuspidor. About twelve midnight, Mr. Nichols said to me, "I am suspicious of detectives watching me, and that is the reason I met Mr. Leonard at Englewood to-night"—is that the way it is corrected to read? A. That is the way the assistant superintendent corrected it.

Q. There was similar corrections all through your notes, are there not? A. Yes, sir.

Redirect by Mr. Lindabury.

Q. Were any changes made, except in mere words? A. Just words, that is all it was.

MR. LINDABURY—I offer in evidence the memorandum heretofore marked C. 31, for identification as well as the card which was marked for identification C. 32.

MR. CORBIN—I object to the offer as incompetent.

COURT—Your witness certainly denied that card, he said it looked like Mr. Nichols' handwriting, but that he did not know anything about it. I will allow them to be marked in evidence.

The memorandum marked C. 31, for identification. Marked Exhibit C. 31.
The card marked C. 32, for identification. Marked Exhibit C. 32.

LEONARD WALDO, a witness produced in behalf of the complainant, in rebuttal, being duly sworn according to law on his oath, saith:

Examined by Mr. Hardin.

Q. Where do you reside, doctor? A. Plainfield, N. J.

Q. Do you mind telling us how old you are? A. I am fifty-three.

Q. What has been your occupation during your life, in a general way? A. I was connected with the Staff of the School of Mines, with Yale University and with Harvard University. I received academic degrees from Yale and Harvard. My chief occupation has been that of a student of sciences, and, in later years, as consulting engineer in electricity and metallurgy.

Q. And you are at the present time engaged as consulting engineer and consultant in metallurgy? A. Yes, sir. I wish to add here that I qualify merely on a question of fact, not on a metallurgical question raised in this cause.

Q. Do you know Mr. Winfield S. Potter? A. I know the gentleman.

Q. Who is now, as I understand, the chemist of the American Brake Shoe & Foundry Co.? A. Of that I have no knowledge.

Q. Do you know whether he is connected with that company or not? A. I do not.

Q. Have you had any talk with him as to the manufacture of Manganese steel at the Chicago Heights plant of the American Brake Shoe & Foundry Co.? A. In certain conversations, which occurred in February and April of this year, Mr. Potter in my office spoke casually of the difficulties he had encountered in the manufacture of Manganese steel, without specifying the particular difficulties.

Q. Difficulties in the manufacture of Manganese steel, where? A. At, as I understand, the Chicago Heights, American Brake Shoe and Foundry Co.'s plant.

Q. The Chicago Heights plant of the American Brake Shoe Co.? A. Yes, sir.

Q. Did he tell you at that time that he or that they had had serious difficulties in the manufacture of Manganese steel castings at the Chicago Heights plant?

MR. CORBIN—I object to the question on the ground that it is leading; I think he should ask him what he had said, or to give the conversation?

MR. HARDIN—I am willing that the doctor should give the conversation, if Mr. Corbin prefers it.

COURT—Give the conversation that occurred.

A. The part of the conversation which is pertinent to this subject?

Q. Yes? A. Mr. Potter said to me, that the difficulty in making Manganese steel he fully appreciated, and cited as an instance that I think it was a carload of castings had been returned to the works, which he was advising, and that in spite of

such advice, and help, as a man from the Taylor Iron & Steel Co. at Highbridge could afford them, their difficulties—well, I think still remained, would be as—well, their difficulties continued.

(*Mr. Hardin.*)

Q. Did Mr. Potter tell you at that time that the American Brake Shoe & Foundry Co. had secured a man from the Taylor Iron & Steel Co.? A. I cannot recall that any such definite statement as that was made. The statement was that the man was from the Taylor Iron and Steel Co.——

(*Mr. Hardin.*)

Q. What man? A. The man on whom they depended to give them such information as an intelligent workman is reasonably expected to have in regard to the processes from works with which he has been associated.

Cross-examination by Mr. Corbin.

Q. Are you quoting what Mr. Potter said or is it your explanation? A. I am trying to identify the man.

Q. You are not telling what Mr. Potter said, you are not trying to give Mr. Potter's words, are you? A. Oh, no, sir.

Howard E. White, a witness recalled in behalf of the complainant, in rebuttal, saith:

Examined by Mr. Hardin.

Q. Turning your attention to the first interview in Chicago with the American Brake Shoe and Foundry Co.'s first Vice-President, Mr. Gallagher, do you recall whether the papers in the Chicago in-

junction suit had been served, before that interview or not? A. They had.

Q. How long before? A. They were served about five o'clock on the afternoon of the previous day.

Q. On whom? A. On Mr. Nichols.

Q. And in whose presence? A. In mine, the deputy sheriff served them upon Mr. Nichols in the doorway, and I was standing right behind the deputy sheriff and saw the deputy sheriff hand them to Mr. Nichols; as Mr. Nichols opened the door, they were served upon him.

Q. Did you see Mr. Nichols give these papers to anyone else? A. No, sir; Mr. Nichols took the papers and looked them over; I was with Mr. Nichols almost that whole evening in his room, and it lay on Mr. Nichols' bureau, as I recall it. After Mr. Nichols had read it over, and we were discussing it, it lay, I think on Mr. Nichols' bureau, and after Mr. Nichols read it we discussed it until about half past ten, I think, and then Mr. Nichols said that before he could come to any decision in the matter he must send for Mr. Snow, who was down stairs. Mr. Nichols did telephone down, and Mr. Snow came up, and then Mr. Nichols told him that he had been served with an injunction, and pointed to it, and then Mr. Snow took the paper up, and whether he read it through, or not, I do not know, but I am inclined to think that he just glanced at it, because he immediately turned to Mr. Nichols and told Mr. Nichols that he would be foolish to go back to Highbridge.

Q. You then heard Mr. Nichols bring the injunction papers to the attention of Mr. Snow that night, did you? A. I heard him do it, yes, sir.

Q. When the papers were served on Mr. Nichols in your presence, what did the papers consist of—the injunction order only, or the affidavits filed in the cause? A. The injunction order, and attached

to the injunction order was the bill of complaint, which I was informed served as an affidavit out there, that is, the thing I had verified, the bill of complaint.

Q. Do you have any recollection of having again seen the papers that were served on Mr. Nichols, after the evening on which you say Mr. Nichols called Mr. Snow's attention to them? A. I have a very clear recollection that the papers were lying on Mr. Gallagher's desk.

Q. When? A. The next day when Mr. Snow, Mr. Tarbell and myself met in Mr. Gallagher's office. At all events I know we discussed the injunction which had been issued against Mr. Nichols by the Chicago courts.

No cross-examination.

WESLEY G. NICHOLS, recalled in behalf of the defendants, in sur-rebuttal, saith:

Examined by Mr. Corbin.

Q. Do you remember meeting Mr. France in Chicago Heights? A. Not in Chicago Heights.

Q. Where did you meet him? A. Chicago.

Q. How often did you see him? A. On one occasion.

Q. Where was that? A. That was on LaSalle street, at the corner of LaSalle and Van Buren streets in a saloon.

Q. Was Mr. Leonard there? A. Mr. Leonard was there, yes, sir.

Q. How long did that interview last? A. I think I was with him until about twelve o'clock or a little after.

Q. What was Mr. France's condition? A. When I left him he was very much under the influence of liquor.

Q. Was he simply pretending, or not? A. No, sir; he was not pretending, he was under the influence of liquor.

Q. Did he get disorderly? A. I did not see that, that occurred after I left them.

Q. You went away—he was there after you left them? A. Yes, sir; I understand that occurred after I left, they were there some time after I left, so I understand.

Q. He was there when you left, of course that is all you know? A. Yes, sir.

Q. Did you tell him that you had Mr. Leonard taking care of things for you at the Chicago Heights' foundry? A. I did not.

Q. Did you tell him anything about your work? A. I did not, but I told him I suspicioned that he was a detective.

Q. When did you tell him that? A. Yes, I told him that I suspicioned he was a detective and that he had certain parties in view, but of course I would hardly tell him anything outside of that, even if such things had occurred——

(No Cross-examination.)

Recess.

Henry M. Howe, recalled in behalf of the complainant in rebuttal, saith:

Examined by Mr. Hardin.

Q. You have either read or heard the testimony in this cause, given by Mr. Potter and Prof. Langley, have you not? A. Yes, sir.

Q. From a fracture on a Manganese steel casting, is it possible to tell the degree of heat to which the casting has been brought in treatment? A. No, sir; I do not know of any such way.

Q. Is there any aid in that direction to be had from previous knowledge of carbon steel castings? A. No, sir; on the contrary, the knowledge to be had from the behavior of carbon steel castings would lead you completely away from the behavior of Manganese steel, the behavior of the fracture, or the relation between the fracture of carbon steel castings, and the temperature to which the castings have been heated is a matter of common knowledge in the trade, but it throws absolutely no light whatsoever on the fracture of Manganese steel or the relation between that fracture and the temperature to which the Manganese steel has been heated. In other words, the effect of heat on Manganese steel is not related at all to the effect of heat on the fracture of carbon steel.

Q. Is the tensile strength of Manganese steel of any aid in determining its wearing qualities, when used for purposes requiring great surface wear? A. I cannot see that it has any bearing on that question whatsoever, because we know perfectly well it is a matter of common notoriety and has been for a very long time that some of the weakest classes of iron are those which resist wear the best, and some of the strongest are those which do not resist wear well.

Q. By the weakest class, of iron and steel, do you mean low in tensile strength? A. Low in tensile strength.

Q. Give us an example? A. Chilled cast iron is one of the best things for resisting wear and yet it is the most brittle and one of the weakest forms of iron known. It has been a matter of notoriety, not only to the iron trade but to everyone else I believe, that for sawing marble that strong steel was nothing like so efficient as wrought iron. I knew that as a boy, before I ever knew anything about steel or iron.

Q. How about the elongation of Manganese steel castings, as giving any aid in determining their resistance to surface wear? A. I cannot see that it throws any light on the existence of surface wear whatever, for the same reason that some of this excessively brittle substance, like chilled cast iron, gave excellent resistance to wear.

Q. What is the elongation of chilled cast iron? A. I do not think it can be measured, it is so extremely minute; it is practically like glass.

Q. What would you say as to the propriety of using washed metal to reduce temperature in the converter? A. If used in the proper way it would reduce the temperature.

(*Mr. Lindabury.*)

Q. Is washed metal low or high in carbon? A. Very high in carbon.

Q. How is it in silicon? A. Very low.

Q. Is a metal low in silicon adapted to reduce the heat in the converter? A. If properly used.

MR. CORBIN—I renew my application to be permitted to cross-examine this witness about the processes actually in use at Highbridge.

COURT—You must ask the question, and I will then rule upon it. I do not want to rule on a general offer like that. Some of the processes in use at Highbridge, I do not suppose there would be any objection to your cross-examination as to them, but you must ask your question, and I will then rule upon it.

MR. CORBIN—I want to make it clear on the record that we have not waived anything. I do not know that I can say that the case stands just as it did; I would

rather say that it does not stand as it did; I would not like to make that concession, because I think otherwise.

MR. LINDABURY—Counsel should point out to the Court what he thinks has changed the situation, that would give him the right now to cross-examine this witness on those subjects that he did not have then.

(*Mr. Corbin.*)

Q. I will ask him this question: Did you not at Highbridge use a retort in preparing the physic?

MR. LINDABURY—We object.

MR. CORBIN—He declined to answer that as one of the secret processes.

COURT—How has the case changed in your judgment since then to justify me in changing my ruling?

MR. CORBIN—It is quite apparent that they use a retort, which the witness declined to testify about, because he said it was disclosing a secret method there employed. Now, that method is in general use everywhere and it has been fully disclosed by the case already.

COURT—What have you to say as to that, Mr. Lindabury?

MR. LINDABURY—The preceding question was as follows: "Is it not customary to have a small cupola or retort for preparing what you call physics"? To which he answered, "No, I do not think it is"—then he was asked, "Did you not do that at Highbridge"? As to that

question the witness declined to answer. He did say, however, it is not customary elsewhere, but he declined to answer as to what they did at Highbridge. Now, counsel says that he has succeeded in proving that that was done, that there was that small cupola or retort in use there. I won't discuss at this time whether they have proven that or not, but if they have, that would be no reason why this witness's position is not the correct one or why he should be allowed now to do it; that is, suppose it is, as he says, one of their secret processes up there. But notwithstanding, it is a secret, they have been able to show by some witness or other, like this man Leonard, who has worked there, that we have it, but he not being under a covenant of secrecy like Mr. Nichols, of course he could not be prevented from telling it, and if he has told it, as they claim he has, and that testimony establishes the thing, we shall have to submit to that, but it does not alter the fact at all, that it was a process that we regarded as secret, and undertook to keep as secret, and are entitled to have it protected as such against the disclosures of those whom we confidentially instructed in the processes. And Prof. Langley says that it is not a common practice to have these cupolas. Now, if they were able to prove it by some one, whose lips are not sealed by a covenant, it does not change the fact or give them the right to inquire about it.

COURT—Then I overrule that question.

MR. CORBIN—I do not want to keep pressing the question, if I have my point fairly made on the record, and the point that I want to present is this—that we are ready to ask this witness to describe the processes which were actually in use. I am not asking him to tell what the mixtures prepared by the chemist were, but the processes as they were visible in the works. Now, your Honor overruled that before, and what I desire now is to ask, if permitted, that same class of questions, some of which I asked, which were sufficient to draw the ruling of the Court on.

COURT—If you will point out to me any change in the case, on which you now justify your right to repeat the questions, I will pass on it.

MR. CORBIN—The only change in the case is this—that we have shown that these operations were carried on in the presence of a great number of witnesses, many of whom were not pledged to secrecy.

COURT—I will overrule it on that ground.

MR. CORBIN—Of course I contend that, regardless of that fact, the testimony is competent anyway, with a view to show that the processes in use there were not secret processes.

COURT—That was your original view.

MR. CORBIN—That was my contention at that time.

COURT—I stand by my ruling made then.

(*Mr. Corbin.*)

Q. Do you know any steel very high in tensile strength, and at the same time high in toughness, as measured by its elongation in a tensile test, which does not give good wearing values in an abrasive test? A. The only two such steels I know of are Manganese steel and nickel steel. Manganese steel does give a good wearing test; whether nickel steel does or not I do not know.

Q. Is there any steel as high in tensile strength and elongation as Manganese steel? A. Nickel steel resembles it equally in this combination.

Q. But Manganese steel stands very high in those particulars? A. Yes, sir, in that combination.

Q. Is there any steel which has as high tensile strength, and at the same time as high elongation value as Manganese steel? A. In nickel steel—nickel steel is the only other one as far as I know.

Q. Under what circumstances would washed metal increase the temperature of a heat and when would it make the heat of steel finish colder? A. Am I to answer that quesion?

(*Mr. Lindabury.*)

Q. You might answer it? A. I should rather be excused from answering that question, if I may, because that was one of the specific points that was covered in our information from Mr. Hadfield as received in the first place, and we put ourselves under a very solemn pledge not to reveal that, and if I can be excused, I should like to be very much.

(*Mr. Lindabury.*)

Q. Is that one of the processes employed at Highbridge and our keeping it secret there, the use of the washed metal for some one of the purposes referred to? A. Yes, sir.

MR. LINDABURY—I object to the question then.

COURT—He testified in answer to your question, that washed metal would change the temperature if properly used—I will ask the stenographer to read that portion of the witnesses' evidence.

(Evidence read as follows:)

"Q. What would you say as to the propriety of using washed metal to reduce temperature in the converter? A. If used in a proper way it would reduce the temperature.

"Q. Is washed metal low or high in carbon? A. Very high in carbon.

"Q. How is it in silicon? A. Very low.

"Q. Is a metal low in silicon adapted to reduce the heat in the converter? A. If properly used."

COURT—You may ask your question, Mr. Corbin.

(*Mr. Corbin.*)

Q. Under what circumstances would washed metal increase the temperature of a heat and when would it make the heat of steel finish colder?

MR. LINDABURY—I object to that question.

COURT—If he knows how it is generally used, commonly and publicly used, he may say so.

MR. LINDABURY—Outside of Highbridge.

COURT—It might be used at Highbridge properly and it might be used at a great many other places properly, and it may not be any secret; I think he ought to

answer that question so far as it does not disclose the secret methods employed in Highbridge.

A. I do not know about its use anywhere else than at Highbridge, and under Mr. Hadfield's practice, and if I told you how it was used at Highbridge, then I should be telling you how Mr. Hadfield told us how to do it, and I would be giving you exactly our practice, which I do not want to do—I do not know of its being used anywhere else.

MR. CORBIN—He has testified that under some circumstances it increases the heat, and under some other circumstances it decreases the heat—now, I want to ask him what those circumstances are.

COURT—He has testified that he does not know of its being used anywhere else than at Highbridge, and if he should disclose what he meant by that, then it would be exposing their secret.

MR. CORBIN—I want the ruling of the Court or an answer to my question.

COURT—I shall rule that he is not required to answer any further than he has already answered; he has practically answered that he does not know of its being done or used anywhere else.

(*Mr. Corbin.*)

Q. Would not a mixture of fifty per cent. silicon heat a bath of metal more, pound per pound, than washed metal?

MR. LINDABURY—I object to the question because it is simply another of the same

line as the last, for the purpose of ascertaining what he knows as the result of the use of these materials at Highbridge, because he says he has no knowledge of the use of washed metal elsewhere.

COURT—Then let him say it; I do not see why the question should not be answered so far as he can answer it.

A. I believe that such a mixture in the Bessemer process would raise the temperature more than washed metal. That is only my opinion; I have never known it to be done.

Redirect by Mr. Hardin.

Q. Do you know whether any experiments have been made as to the utility of manganese steel in making steam car wheels? A. Yes.

Q. Were you familiar with those experiments? A. Yes.

Q. Where were they made? A. Several railroads, one the Central Railroad of New Jersey.

Q. By what company? A. The Central Railroad of New Jersey.

Q. The steel made by what company? A. The Taylor Iron & Steel Co.

Q. What was the result of those experiments as to the desirability of this manganese steel for steam car wheels? A. Not successful. We were utterly unable to understand why a material apparently perfection for the track is not very much good for the wheel, that is running on that same track. Whereas, for wheels running in mine cars, it is a very excellent material, but for a steam railroad car wheel we have not been able to make a success of it.

Further Cross-examination by Mr. Corbin.

Q. Is not the trouble that the brakes would not take hold of a manganese steel wheel? A. No, sir; it is not the reason; the wheel wears out.

[COMPLAINANT RESTS.]

MR. CORBIN—I do not want to omit anything, your Honor; your Honor made some suggestion in the examination of some of the witnesses that I could make my motion to renew the inquiries I made before, and which were overruled, to show what the processes used at Highbridge were, and I do it with a view to bringing out or showing that they are not secret processes.

COURT—I will not open the case for that purpose.

[CASE CLOSED.]

To be argued January 14th, 1907, at Newark.

COMPLAINANT'S EXHIBITS.

Exhibit C 1.

Agreement between Wesley G. S. Nichols and Taylor Iron and Steel Co. and R. A. Hadfield, dated March 16, 1896.

(Printed on pages 35, 36.)

Exhibit C 2.

Letter from Wm. W. Snow to Taylor Iron Works.

(Printed on page 39.)

Exhibit C 3.

Agreement between Taylor Iron and Steel Company and Wesley G. Nichols, dated March 15, 1905.

(Printed in bill of complaint on page 10, etc.)

Exhibit C 4.

Letter from Percival Chrystie, Supt., to W. W. Snow, dated March 10, 1905.

(Printed on page 45.)

Exhibit C 5.

Letter from Fred. W. Snow to Percival Chrystie, dated March 17, 1905.

(Printed on page 46.)

Exhibit C 6.

Letter from Wm. W. Snow to Percival Chrystie,
(Printed on page 47.)

Exhibit C 7.

Letter of resignation from W. G. Nichols to Percival Chrystie, Supt., Taylor Iron and Steel Co., dated July 31, 1905.
(Printed on page 49.)

Exhibit C 8.

AGREEMENT made this tenth day of August in the year of our Lord one thousand eight hundred and ninety-one, between ROBERT ABBOT HADFIELD, steel maker, of Sheffield, England, by Henry M. Howe of Boston, Massachusetts, United States of America, his attorney in fact, party of the first part, hereinafter called the licensor; and Henry M. Howe, Robert E. Jennings of Jersey City, in the State of New Jersey, and United States of America, and William J. Taylor of Bound Brook, in the State of New Jersey, and United States of America, parties of the second part hereinafter called the licensees.

WHEREAS, the licensor controls and uses in his steel works in Sheffield, England, certain secret processes of manufacture of steel, known as the R. A. Hadfield System, and is likewise the patentee of certain inventions, described in Letters Patent of the United States, No. 303,150, dated August 5th, 1884, No. 303,151, dated August 5th, 1884, and 333,748, dated January 5th, 1886, relating to

Manganese steel, and whereas the said licensor has agreed with the said licensees to grant them a license to use the said R. A. Hadfield System of making steel, and the said Letters Patent to the extent and subject to the restrictions hereinafter expressed:

NOW THIS AGREEMENT WITNESSETH, that in pursuance of said agreement and in consideration of the sum of twenty-five thousand dollars, now paid by the said licensees to the said licensor, the receipt whereof is hereby acknowledged and of the rent or royalties hereinafter reserved and of the promises and agreements of the said licensees hereinafter contained, it is hereby mutually agreed between the parties hereto as follows:

1. The licensor licenses and permits the licensees to use for all purposes (except projectiles, car-couplers, and the knuckles thereof which the licensees hereby agree not to make) at works now or hereafter to be erected or acquired at High Bridge, New Jersey, and at any other place or places in the United States of America, or Canada, the methods of manufacturing and treating steel castings and other steel known as "the R. A. Hadfield System," being the system in use at the Hecla works, Sheffield, England, and to erect suitable works adapted to the said system. The licensor shall initiate the licensees into the said system by giving to the three following nominees of the licensees, namely, Mr. Wiliam J. Taylor, Mr. Oliver W. Christie and Mr. Henry D. Hibbard on behalf of the licensees information and particulars of the said system, comprising different processes and mixtures for the manufacture of steel and steel castings, which the licensor believes possesses considerable advantages and amongst others, the advantages especially of good quality combined with a low cost of production, and by showing the said

three nominees at the said Hecla works the necessary details of the said system and by giving to them such instructions as may be necessary for the production at the works in the United States by means of the said system of an equally good and cheap steel casting to that manufactured at the said Hecla works, having regard to the different prices of material and labor and other differences, at the different places of manufacture. The said three nominees shall have the right at any time before the first day of January, eighteen hundred and ninety-two, of entering the said Hecla works and of taking the drawings of all the apparatus, furnaces and other appliances used for working the said system, and the licensor will give to the said three nominees the necessary assistance for such purpose. The licensor will use his best endeavors to procure permission for the said William J. Taylor, or some other person to be nominated for that purpose by the licensees, to visit the Gruson Works in Germany in company with the licensor for the purpose of inspecting the same with a view to seeing how the said system is worked there.

2. The licensor grants hereby unto the licensees license to use in the licensees' said works the inventions described in Letters Patent of the United States #303,150, dated August 5th, 1884, #303,151, dated August 5th, 1884, and #333,748, dated January 5th, 1886, all relating to Manganese steel, together with any improvement or improvements thereon for which Letters Patent of the United States or Canada may hereafter be granted to the licensor or his legal representative, during the term of said patent, and any renewal, extension or reissue thereof of or of any patents obtained from any improvements as aforesaid, for all purposes

except the manufacture of Armor plate, projectiles and brake shoes.

3. The licensor agrees that he will not license prior to January first, eighteen hundred and ninety-four, any concern in the United States or Canada to make car-wheels by the R. A. Hadfield System east of the Sierra Nevada, except mining car-wheels as hereinafter provided; and that he will not at any time hereafter license more than three concerns, including the licensees, at one time, in the United States or Canada, east of the Sierra Nevada, to use the R. A. Hadfield System for any purpose.

4. The licensor agrees that he will not at any time hereafter license any concern to make car-wheels east of the Allegheny Mountains in the United States or Canada by the R. A. Hadfield System. The term "car-wheels," as used in this clause and wherever used in this agreement includes railroad car-wheels, mining car-wheels, tram car-wheels and all other car-wheels.

5. The licensor agrees that he will not at any time after the first day of January, eighteen hundred and ninety-four, license any concern in the United States or Canada east of the Sierra Nevada to make car-wheels by the R. A. Hadfield System, provided that the licensees

(1) Shall carry on the R. A. Hadfield System in some establishment west of said Alleghenies, making car-whels therein; or instead thereof

(2) Shall pay to the licensor on the thirty-first day of December of each year from and including the year eighteen hundred and ninety-four, up to and including the year eighten hundred and ninety-

eight, a special compensation of two thousand dollars per annum for refraining from licensing other concerns, and shall on or about said thirty-first day of December in each of said years (on the demand of the licensor) affirm and give reasonable evidence in support of such affirmation, that they fully intend and confidentially expect to erect and operate works west of said Alleghenies within three years thereafter for using the said R. A. Hadfield System. Said special compensation shall be apart from and in addition to the royalties and other payments provided for in this agreement. But should the licensees at any time either omit to pay such special compensation within thirty days of its falling due, or omit on demand of the licensor to make such affirmation or to give evidence in support thereof, and should they in either of such events further fail to equip and within one year to begin operating an establishment west of said Alleghenies and making car-wheels by the R. A. Hadfield System therein, and continue so making therein, with reasonable regularity on a reasonable scale and in good faith, then the licensor shall be at liberty to license other concerns to make car-wheels at any place or places west of said Alleghanies by the R. A. Hadfield System. No such special compensation is to be required by the licensor from the licensees after the year eighteen hundred and ninety- eight.

6. The licensor will not hereafter grant any license to any concern in the United States or Canada other than the licensees to make car-wheels partly or wholly of Manganese steel, without first obtaining the consent of the licensees, except that the licensor shall be at liberty to grant licenses for making mining car-wheels by the said system, but in the event of licensing any concern with the consent of the licensees, to make car-wheels part-

ly or wholly of Manganese steel, the licensor will pay to the licensees one-fourth of the net profits accruing to the licensor from such licenses after deducting all expenses of whatsoever nature connected with such licenses, or with the collection of the royalties therefrom, and after deducting the whole of all expenses of any litigation connected therewith, and after deducting a part of all expenses connected with maintaining or defending the said patents, or of prosecuting or restraining infringements thereof, said part to be proportional to the ratio between the value of royalties received under license and the total royalties received under all licenses under said patents; provided always, that the licensees shall, before the first of January, eighteen hundred and ninety-four, have successfully established and successfully carried on the manufacture of steam railway car-wheels made partly or wholly from Manganese steel, and shall have made and sold at least six hundred such wheels, and shall in all respects have conformed to the provisions of this contract; but should the licensees not fulfil each and all of these conditions, then the licensor shall be free to license whom he pleases, with or without the consent of the licensees, to make car-wheels partly or wholly of Manganese steel, and the licensor shall be free from all obligations to pay to the licensees any part of the royalty or other money received by the licensor on account of such licenses.

7. The licensor shall be at liberty to grant any licenses for making mining car-wheels by the said Hadfield System, but the licensor will pay to the licensees one-fourth of the net profits accruing prior to the first day of January, one thousand nine hundred and two to the licensor from such licenses after deducting all expenses (except agent's commission) of whatsoever nature connected with such

licenses or with the collection of the royalties therefrom, and after deducting all expenses connected with any litigation in relation to such licenses.

8. The licensees agree that they will pay to the licensor a royalty of three and one-half per cent. of the gross selling price at its works of all steel castings, or other steel or iron, that they shall make by the R. A. Hadfield System, and either use or sell prior to the first day of January, eighteen hundred and ninety-nine, and further, that they will pay a like royalty of three and one-half per cent. of the selling price of all Manganese steel which it may make by any other system and sell or use during the life of said patents 303,150, 303,151, 333,748, provided said royalty shall in no case be double; and provided further, if any of the said patents be declared void, or if the licensees shall learn that any person or concern is infringing any of said patents, and shall notify the licensor of such infringements, and the licensor shall fail to restrain such infringement, the licensees shall pay no royalty for work done by them after the patents shall be declared void or notice is given as aforesaid of the infringement, unless such work be done by the R. A. Hadfield System; but neither the declaring void of said patents, nor infringements of any or all said patents, nor the failure of the licensor to restrain such infringement shall in any way release the licensees from their obligations to pay for all work done under the Hadfield System, whether such work be also done under any of said patents or not; and provided further, that the royalties shall be payable if any part of the said system is used, and all material made under such system or any part of it shall be deemed iron or steel and chargeable with royalty accordingly; and provided further, and it is hereby expressly understood and agreed that the total amount of royalty payable by

the licensees to the licensor under this license shall not be less than five thousand dollars for each of the five years ending December thirty-first, eighteen hundred and ninety-four, eighteen hundred and ninety-five, eighteen hundred and ninety-six, eighteen hundred and ninety-seven and eighteen hundred and ninety-eight, notwithstanding that the steel made by the licensees during any or all of said first years may not aggregate a sufficient weight to yield said five thousand dollars.

The royalties hereinabove provided for shall be due and payable on the first days of July and January in each year.

9. The licensees agree that they will equip promptly and operate at least one establishment for the use of the R. A. Hadfield System, and use due diligence and make all reasonable efforts to use said system and sell the products thereof.

10. The licensees agree that they will pay the several license fees, royalties, and other moneys above specified within thirty days after maturity.

11. The licensees agree that they will take and record the weight of steel made by the R. A. Hadfield System and of all Manganese steel made under this license by whatever system, during the period for which royalties are payable therefor respectively, and will deliver to the licensor or his attorney, on or before the twentieth day of July and January of each year during said period, a statement of the weight of such steel and the gross collective sum of money for which said steel was sold or otherwise disposed of, such statement to be under oath if desired by the licensor; and the licensees will at all times prior to January first eighteen

hundred and ninety-nine permit the licensor or his authorized representative at all reasonable times (but not oftener than once in each calendar month without the consent of the licensees) to enter the works of the licensees for the purpose of examining at the licensor's expense the books containing said records and statements, and from which the same were made, and all vouchers relating thereto; and at said licensor's expense to weigh and test all Managanese steel made under said Letters Patent or any of them, then found in said works, and to do all other acts and things which may be necessary for examining and testing the accuracy of the accounts and statements to be kept and rendered as aforesaid; and said licensees will also permit at the same time examinations at the expense of said licensor for the purpose of ascertaining whether the said system or any part thereof, or the said patents or any of them, is or are being used either before or after the revocation of this license; and the said licensees during the continuance of this license will use their best endeavors to detect any infringement of said Letters Patents and in the event of said licensees ascertaining or having good reason to suspect any such infringement they will forthwith notify the same to the licensor and will, at the expense of the licensor render all the assistance in their power to enable the licensor to restrain further infringements and to recover damages for any past infringement of said letters patent or either of them.

12. The licensees will make no objection to the performance of this license or agreement on the ground that all or any part of such Hadfield System is not novel or that the castings produced by working such system are not satsifactory or equal to what has been represented, or what was expected; and no royalties or other moneys which

have been paid, or shall be paid to the licensor shall be refunded in any event; and if any of the said patents shall be declared invalid the licensor shall be under no liability whatever in respect thereof; patent 333,748 is now in dispute and of doubtful value.

13. The licensees will not at any time before the first day of January one thousand nine hundred and two knowingly make or sell, or deliver for export to Great Britain or the British Colonies (other than the Dominion of Canada and the Province of New Foundland), or to the continent of Europe any steel manufactured by the said system or any part thereof; but this obligation does not refer to machines and constructions, which contains parts of steel manufactured by the said system.

14. The licensees will not acquaint any other person or firm with the said system or any part thereof, or give such information to other parties as will enable them to make use of the said system or any part thereof, but will to the best of their ability keep the said system strictly secret, the obligation under this clause to remain in force until the first day of January one thousand nine hundred and two, whether this license is revoked or not.

15. The licensees should any concerns hereafter be licensed by the licensor to make Manganese steel will, on demand of such concerns and at their expense, instruct them in the manufacture of Manganese steel.

16. It is hereby expressly agreed and understood that if any of the said royalties, license fees or other moneys payable by the licensees to the licensor remain unpaid for sixty days after becoming due; or in case of any breach or non-perform-

ance of any of the covenants herein contained on the part of the licensees, it shall be lawful for the licensor (whether there shall have been any waiver of any previous breach or non-performance or not) to give notice in writing to the licensees to terminate this license and contract from a day to be named in such notice and from and after such day such license and all obligations of the licensor and licensees under this agreement shall cease, except such parts of this agreement as are by its terms continued in force whether said license is revoked or not.

17. It is hereby expressly understood and agreed that in case of the termination of this license from any cause whatsoever, nothing herein contained shall be construed as releasing the licensees from paying to the licensor the herein stipulated license fees and other moneys accrued up to the time of such termination, or to prevent the licensor from recovering the same by suit or otherwise, or to release the licensees from liability as an infringer should they continue thereafter to make steel in accordance with any of the above-named patents; and the licensees shall not after the termination of the license by notice as aforesaid use the said system or any part thereof, but if they shall after such termination by notice use the said system or any part thereof, they shall be liable to pay as damages the same royalties and moneys in respect of all steel or iron which they shall make by the said system, or any part thereof, which they would have been liable to pay in case the license had not been terminated.

18. It is hereby expressly agreed and understood that the licensor shall be at liberty at all times hereafter, without the consent of the licensees and without prejudice to the reservations, covenants

and conditions contained therein, or any of them, to make and file a disclaimer of any matter not essential contained or claimed in said letters patent, or either of them, or to apply for and procure a re-issue of said letters patent or either of them.

19. It is further agreed and understood and the licensor hereby declares, and his declaration forms a part of the basis of this agreement, that he has licensed no other concern in the United States or Canada to use the R. A. Hadfield System, and that the only licenses now outstanding for the use of the said patents are as follows:

A. To the Solid Steel Company, Alliance, Ohio, an exclusive license to make manganese steel brake-shoes; also a shop-right license to make manganese steel for all purposes except armor plate, car-wheels, tires, or steel for the manufacture thereof; shot, shell and brake-shoes.

B. To the Chicago Tire and Spring Company, a license to make manganese steel for rolled tires and rolled wheels, stamp heads, shoes and dies, crushing rings, knuckles and coupler-heads.

C. To Pratt & Letchworth, an unrestricted license to make manganese steel.

D. To Miller, Metcalfe & Parkin.

This declaration is made in good faith according to the best of the knowledge of the licensor, and should any license be inadvertently omitted such omission shall not invalidate or affect this agreement.

20. The licensees shall not knowingly employ any person who is now or shall hereafter be in service at the said Hecla Works of the licensor without the written consent of the licensor.

21. The licensees shall pay the licensor for all samples or goods supplied or to be supplied by the licensor to the licensees and proper compensation and expenses of any person whom the licensor may send to America for the purpose of instructing the licensees in the working of the said system.

22. It is hereby expressly agreed and understood that this license and contract shall not be assignable or transferable by the licensees without the consent of the licensor in writing, which consent he is at liberty to grant or refuse as he may see fit; except to the Taylor Iron and Steel Company, a corporation of the State of New Jersey, to which corporation the licensees are at liberty to transfer this license and contract, and the performance of the conditions hereof and the payment of the royalties herein provided for by said company shall be accepted by said Hadfield as performance and payment by the licensees, provided that the failure to pay said royalties by the company, if such failure is made good by the licensees within the time named herein shall in no event work a forfeiture of this license.

23. It is hereby further expressly agreed by and between the parties hereto that all disputes and differences, if any, which shall arise between the said parties hereto shall be referred to and decided by three competent persons in or well acquainted with the trade, one to be chosen by the licensor (who, if the licensor shall so desire may be a British Subject), one by the licensees, and one by the other two, and the dicision of said arbitrators so chosen, or of a majority of them, shall in all respects be final and conclusive on both parties hereto; and it is expressly agreed and declared that no action or legal proceeding shall be commenced or prosecuted by either of the parties here-

to against the other touching any of said disputes and differences unless the party to be made defendant to such action or proceedings shall have refused or neglected to refer such matters to arbitration, as above provided.

In witness whereof the parties hereto have hereunto set their hands and seals in duplicate, the day and year first above written.

ROBERT A. HADFIELD,
By his Attorney in fact,
HENRY M. LOWE [L. S.]
HENRY M. HOWE [L. S.]
ROBT. E. JENNINGS [L. S.]
WM. J. TAYLOR [L. S.]

Signed, sealed and delivered in the presence of
JOHN R. HARDIN.

The foregoing agreement and license is in all things ratified, approved and confirmed, and the act of any attorney in fact in executing the same adopted, ratified and approved.

Witness my hand and seal this day of January, A. D. eighteen hundred and ninety-two.

[L. S.]

Exhibit C 9.

AGREEMENT made this twenty-fourth day of December in the year of our Lord one thousand eight hundred and ninety-one, Between Henry M. Howe, of Boston, in the State of Massachusetts, Robert E. Jennings of Jersey City, in the State of New Jersey, and William J. Taylor of Bound Brook in the State of New Jersey, parties of the first part, and The Taylor Iron and Steel Company, a corporation of the State of New Jersey, party of the second part:

WHEREAS the parties of the first part having secured from Mr. Robert A. Hadfield of Sheffield, England, a license to use in this country the system of making steel known as the R. A. Hadfield system and also certain patents of the United States known and designated as #303,150, #303,151, and #333,748, issued to said Hadfield relating to Manganese steel, on the tenth day of August last offered such license and patents to the said Taylor Iron and Steel Company on the assumption by said company of the obligations and covenants assumed by the parties of the first part in procuring said license in consideration of five hundred thousand dollars of the common stock of the said Taylor Iron and Steel Company to be issued to said parties of the first part for property purchased, and whereas at that time the terms and conditions of the said license were laid before the stockholders of said company, in the form of an agreement spread upon the minutes of the stockholders meeting of that date, proposed to be made, for reasons of convenience, between said Robert A. Hadfield, the vendor of said license and patents to the parties of the first part and said Taylor Iron and Steel Company directly instead of with the said parties of the first part who were then the

actual owners of the said license and patents under contract with said Hadfield:

And Whereas, at that meeting of the stockholders of the said Taylor Iron and Steel Company, it was resolved to purchase property and rights represented by the said license and patents, and issue to said Robert A. Hadfield five hundred thousand dollars of the common stock of said company for property purchased in payment therefor, it being well known to the said stockholders and to all concerned or interested in the said Taylor Iron and Steel Company, then and now, that the said parties of the first part were the actual owners of the property and rights to be acquired for such stock issued for property purchased:

And Whereas, in pursuance of the resolution of the stockholders meeting above referred to, the Directors of said company did afterwards purchase the property and rights aforesaid, execute the contract with said Hadfield hereinabove referred to and issue to him the said five hundred thousand dollars common stock of the Taylor Iron and Steel Company for property purchased in payment therefor, which contract was executed and the stock accepted by said Robert A. Hadfield, by Henry M. Howe, his attorney in fact, said stock being by said Howe immediately transferred to the said Howe, Jennings and Taylor:

And Whereas subsequently the said Robert A. Hadfield declined to ratify and confirm the contract so as aforesaid executed by his attorney in fact, and to accept the stock so as aforesaid issued to him for property purchased on the ground that he had contracted with the parties of the first part and not with the said company:

And Whereas by such refusal the means selected to convey the property and rights above referred

to from said party of the first part to the said Taylor Iron and Steel Company were ineffectual, and it has become necessary to secure the same to the said company by a new conveyance thereof directly by the parties of the first part, the said former contract with Hadfield and the stock issued to him for property purchased, having been rescinded and recalled, canceled and made void, for the purpose of effectually carrying out the resolution of the stockholders above referred to and perfecting the title of the said company to the property and rights aforesaid:

And Whereas, the said company and the said parties of the first part have been advised that the only proper and safe way to convey to said company the property and rights referred to in the resolution of the stockholders aforesaid and intended to be purchased by said company for the five hundred thousand dollars common stock aforesaid is a conveyance thereof to said company by the said parties of the first part in consideration of the issue to them of the said five hundred hundred thousand dollars common stock of said company:

NOW, THEREFORE, THIS AGREEMENT WITNESSETH, that in consideration of five thousand shares of the common stock of the Taylor Iron and Steel Company, issued to the said parties of the first part for property purchased, the receipt of which is hereby acknowledged, the said parties of the first part do hereby bargain, sell, assign, transfer and set over unto the said The Taylor Iron and Steel Company, party of the second part, all their right, title and interest in a certain license given by one Robert A. Hadfield of Sheffield, England, to said parties of the first part, the terms of which are hereinafter more particularly stated and also

in certain Letters Patent of the United States known as #303,150, dated August 5th, 1884, #303,-151, dated August 5th, 1884, and #333,748, dated January 5th, 1886, all relating to Manganese steel; this transfer being expressly recognized by said license from said Hadfield to the parties of the first part, the said party of the second part hereby agreeing to assume the performance of the covenants and obligations assumed by the said licensees in said license from Hadfield, and the payment of the royalties in said license provided; and to hold the said parties of the first part safe against any loss or damage by reason of the said license or the obligations and covenants they have therein assumed.

For the purpose of definitely ascertaining the covenants and obligations of the said license and the liabilities thereunder assumed, and the rights secured by the said Taylor Iron and Steel Company those parts of the said license from Hadfield are hereinafter recited; said recital containing every part of said license essential to this agreement, and being practically a counter-part of an agreement spread upon the minutes of the stockholders' meeting of the said Taylor Iron and Steel Company held on the 10th of August last at High Bridge, N. J.; the said Robert A. Hadfield being referred to in said recital as the licensor and the said parties of the first part hereto as the licensees:

(*Here follows a copy in full of paragraphs numbered from* 1 *to* 23 *from the above agreement, Exhibit C* 8.)

In witness whereof, the said parties of the first part have hereunto set their hands and seals the day and year first above written, and the said Taylor Iron and Steel Company hath caused this agreement to be signed by its President, attested by its

Secretary and its corporate seal to be hereto affixed in duplicate.

HENRY M. HOWE. [L. S.]
ROBT. E. JENNINGS. [L. S.]
WM. J. TAYLOR. [L. S.]
THE TAYLOR IRON & STEEL CO.,
By LEWIS H. TAYLOR,
Prest.

In presence of
JOHN R. HARDIN.
Attest:
[SEAL.] T. F. BUDLONG,
Secty.

Exhibit C 10.

THIS INDENTURE, made the ninth day of June, One thousand eight hundred and ninety-two Between THE TAYLOR IRON AND STEEL COMPANY, a Corporation of the State of New Jersey, in the United States of America, of the first part, HENRY MARION HOWE, of Boston, Massachusetts, in the United States of America, ROBERT EMMETT JENNINGS, of Jersey City, in the State of New Jersey, in the United States of America and WILLIAM JOHNSTON TAYLOR, of Bound Brook in the State of New Jersey, in the United States of America, of the second part, and ROBERT ABBOTT HADFIELD, of Sheffield, in the County of York, in England, of the third part.

WHEREAS, by an Agreement dated the tenth day of August, One thousand eight hundred and ninety-one and made between the said Robert Abbott Hadfield (by the said Henry Marion Howe, his Attorney in fact) of the first part, and the said Henry Marion Howe, Robert Emmett Jennings and

William Johnston Taylor, of the second part (which agreement is hereinafter referred to as "the said License"). The said Henry Marion Howe, as Attorney of the said Robert Abbott Hadfield, purported to license the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor to use the "R. A. Hadfield system" for making steel and certain inventions relating to manganese steel to the extent and subject to the restrictions and on the terms and conditions specified in the said License.

AND WHEREAS, by an Agreement dated the twenty-fourth day of December, One thousand eight hundred and ninety-one, and made between the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor of the first part and the said Company of the second part (which last-mentioned Agreement is hereinafter referred to as "the said Transfer"), the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor purported to transfer unto the said Company all their right, title and interest in the said License, AND WHEREAS the said Robert Abbott Hadfield having been requested to ratify the said License has declined to do so or to recognize the validity of the said Transfer, unless this document is executed for the purpose of placing the said Company and the said Robert Abbott Hadfield respectively (as far as practicable) in the same position as they would respectively have been in if the said Company had been the original Licensees and accordingly it has been agreed that this document shall be executed.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the said Robert Abbott Hadfield ratifying the said License and recognizing the validity of the

said Transfer, IT IS HEREBY AGREED AND DECLARED by all the parties hereto as follows:

1. The said Company shall henceforth be under such and the same obligations and restrictions to or in favour of the said Robert Abbott Hadfield as the said Company would have been under if the said Company had been the Licensees under the said License instead of the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, and had executed the said License instead of the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor.

2. The said License shall henceforth be read construed and take effect in all respects as if the said Company were the Licensees under the said License.

3. All rights of the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor under the said License shall henceforth be vested in the said Company.

4. Provided that nothing herein contained shall release the said Henry Marion Howe, Robert Emmet Jennings and William Johnston Taylor from any obligations or restrictions under the said License, but all such obligations and restrictions shall remain in full force and effect in the same manner as if the said Transfer and this document had not been executed.

IN WITNESS WHEREOF the said Company has caused this document to be signed by its President and attested by its Secretary and its Corporate

Seal to be hereto attached, and the other parties hereto have hereunto set their hands and seals.

TAYLOR IRON & STEEL CO.,

[SEAL] LEWIS H. TAYLOR,
Prest.

Attest:

T. F. BUDLONG, Secty.

HENRY M. HOWE [L. S.]
ROBERT EMMET JENNINGS [L. S.]
WILLIAM JOHNSTON TAYLOR [L. S.]
R. A. HADFIELD [L. S.]

Exhibit C 11.

THIS INDENTURE made the ninth day of June, one thousand eight hundred and ninety-two, Between ROBERT ABBOTT HADFIELD, of Sheffield in the County of York in England, of the one part, and THE TAYLOR IRON AND STEEL COMPANY, a corporation of the State of New Jersey in the United States of America of the other part, WHEREAS the said Company are entitled to use the "R. A. Hadfield system" for making steel and certain inventions relating to Manganese steel to the extent and subject to the restrictions and on the terms and conditions specified in a license dated the tenth day of August one thousand eight hundred and ninety-one and made between the said Robert Abbott Hadfield (by Henry Marion Howe his attorney in fact) of the first part and the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor of the second part the rights of the licensees under the said license having been transferred to the said Company. AND WHEREAS the said Company are not entitled to use the said system or the said inventions for the purpose of making any projec-

tiles and they being desirous of making such projectiles as are hereinafter specified they have applied to the said Robert Abbott Hadfield to grant such further license as hereinafter appearing which he has agreed to do. Now this indenture witnesseth that in pursuance of the said agreement and for the considerations herein appearing it is hereby agreed and declared as follows:

1. The said Robert Abbott Hadfield (hereinafter called "the Licensor") licenses the said Company (hereinafter called the "Licensees") to use the said system and inventions in the United States of America East of the Sierra Nevada but not elsewhere for the purpose of making the following projectiles, viz.: (*a*) Cast steel common shells (*b*) Cast steel shrapnel shells (*c*) Cast steel deck piercing shells and (*d*) forged steel deck piercing shells but not any other kind of projectiles. The term "deck piercing shells" means shells fired from mortars for deck piercing purposes. Armour piercing shells other than the foregoing are not included in this License.

2. The foregoing License shall continue in force as well after as before the thirty-first day of December one thousand nine hundred and three unless revoked by the Licensor prior to that date pursuant to clause 15 hereinafter contained.

3. The Licensor shall not before the thirty-first day of December one thousand nine hundred and three if the foregoing license shall so long continue grant any license to use the said system or the said inventions in the United States of America East of the Sierra Nevada for the purposes of making cast steel common shells cast steel shrapnel shells and steel deck piercing shells or forged steel deck piercing shells.

4. The Licensees shall pay to the Licensor a royalty of ten per cent. upon the contract price of all steel shells made by the Licensees on or before the thirty-first day of December one thousand nine hundred and three and sold either before or after that day whether the said system and inventions or any part thereof shall be used in the manufacture of such sheels or not Provided always that if the contract price of any steel shells shall be under twelve cents per pound the royalty payable in respect of such steel shells shall be one cent per pound.

5. The royalties shall be due half yearly on each thirtieth day of June and thirty-first day of December and shall be paid within thirty days of the same becoming due and each half years royalty shall be payable in respect of the shells sold during that half year and not previously paid for by the minimum royalties mentioned in the next clause.

6. Provided always that under no circumstances shall the amount payable on account of royalties in each of the eleven years following the thirty-first day of December one thousand eight hundred and ninety-two be less than the following amounts whether the shells sold in such years respectively shall be sufficient to produce royalties of those amounts or not, viz.:

For the year ending	31st December, 1893	a minimum royalty of	$5,000
"	31st December, 1894	"	$5,000
"	31st December, 1895	"	$10,000
"	31st December, 1896	"	$1,000
"	31st December, 1897	"	$1,000
"	31st December, 1898	"	$1,000
"	31st December, 1899	"	$1,000
"	31st December, 1900	"	$1,000
"	31st December, 1901	"	$1,000
"	31st December, 1902	"	$1,000
"	31st December, 1903	"	$1,000

7. The royalties hereby made payable shall be paid whether this license shall be revoked before the thirty-first day of December one thousand nine hundred and three or not.

8. The Licensees will forthwith erect and properly equip a first-class suitable and sufficient plant for production on a large scale of the very best quality of cast steel shells similar to those produced at Hecla Works Sheffield and shall from time to time during the continuance of this license use their best endeavors to obtain orders for cast steel shells from the Army Bureau as well as the Navy Bureau of the United States of America.

9. The Licensees will keep a clear record of the number and weight and price of all steel shells made by the Licensees before the first day of January one thousand nine hundred and four. Within to his Attorney a statement of the number and ing on any thirtieth day of June or thirty-first day of December (whether before or after the first day of January one thousand nine hundred and four) the Licensees will deliver to the Licensor or to his Attorney a statement of the number and weight and price of the steel shells (made before the first day of January one thousand nine hundred and four) sold by the Licensees during such half year and such statement shall be made under oath if so desired by the Licensor.

10. The Licensees will at all times permit the Licensor and every person authorized by him at all reasonable times (but not oftener than once in each calendar month without the consent of the Licensees) to enter the works of the Licensees for the purpose of examining at his own expense the books containing the said records and statements and those from which the same were made and all

vouchers relating thereto and at his own expense to do all acts and things which may be necessary or convenient for examining and testing the accuracy of the said records and statements and ascertaining the number and weight and price of all steel shells made by the Licensees prior to the first day of January one thousand nine hundred and four and the number and weight and price of all steel shells (made prior to that day) sold before or afterwards.

11. The Licensor gives no guarantee respecting any shells produced by the said system and inventions and the licensee will make no objection to paying the said royalties or to observing and performing any of the provisions of this License on the ground that all or any part of the said system is not novel or that all or any of the patents for the said inventions are invalid or that the shells produced by the said system and inventions are not satisfactory or equal to what has been represented or what was expected. No royalties which shall be paid to the Licensor shall be refunded in any event whatever.

12. The Licensees will not at any time before the thirty-first day of December one thousand nine hundred and three knowingly make or sell or deliver for export to Great Britain or the British Colonies (othe than the Dominion of Canada and the Province of Newfoundland) or to the Continent of Europe any steel shot or shells whatever.

13. The Licensees will not acquaint any person or firm with the said system or any part thereof nor give such information to other parties as will enable them to make use of the said system or any part thereof but will to the best of their ability keep the said system strictly secret. This clause

shall not prohibit the inspection by officials of the Government of the United States of America of shells in process of manufacture in the same manner and to the same extent as allowed to the Inspectors of the British Government at Hecla Works Sheffield. The obligations of this clause shall remain in force until the thirty-first day of December one thousand nine hundred and three.

14. The Licensees will not use the said system or any part thereof at any time or at any place or for any purpose not authorized by the said License of the tenth day of August one thousand eight hundred and ninety-one or this License or any License which may hereafter be granted by the Licensor to the Licensees.

15. Provided always that if any royalties payable by the Licensees to the Licensor remain unpaid for sixty days after becoming due or in case of any breach or non-performance of any of the agreements herein contained on the part of the Licensees it shall be lawful for the Licensor (whether there shall have been any waiver of any previous breach or non-performance or not) at any time before the thirty-first day of December one thousand nine hundred and three to give notice in writing to the Licensees revoking the foregoing license from a day to be named in such notice and from and after such day the foregoing License shall be revoked and clauses 1, 2, 3 and 8 of this License shall cease to have any operation but all the other clauses shall remain in full force notwithstanding such revocation. In the event of such revocation the Licensees shall not prior to the said first day of January one thousand nine hundred and four make any steel shells either by the said system or any other method or sell any steel shells.

16. Provided also that the Licensor shall be at liberty at all times hereafter without the consent of the Licensees to make and file a disclaimer of any matter not essential contained or claimed in any letters patent relating to the said inventions or to apply for and procure a reissue of such letters patent or any of them.

17. This License shall not be assignable or transferable by the Licensees without the consent of the Licensor in writing which consent the Licensor is at liberty to grant or refuse as he may see fit.

18. All disputes and differences if any which shall arise between the said parties hereto shall be referred to and decided by three competent persons in or well acquainted with the trade one to be chosen by the Licensor (who if the Licensor so desire may be a British subject) one by the Licensees and one by the two persons so chosen and the decision of the said three arbitrators or of a majority of them shall in all respects be final and conclusive on both parties hereto. No action or legal proceedings shall be commenced or prosecuted by either of the parties hereto against the other touching any of the said disputes and differences unless the party to be made defendant to such action or proceedings shall have refused or neglected to refer such matters to arbitration as above provided.

19. This license is granted on the faith of a representation by the Licensees that they have obtained an Official Order from the Government of the United States of America for cast steel common shells (ten inches and twelve inches in diameter) of the value of one hundred thousand dollars and a duly certified copy of such order shall forthwith be sent to the Licensor or his Agent.

IN WITNESS WHEREOF the said Robert Abbott Hadfield has hereunto set his hand and seal and the said Company has caused this License to be signed by its President and attested by its Secretary and its corporate seal to be attached.

R. A. HADFIELD. [L. S.]
TAYLOR IRON & STEEL CO.,
LEWIS H. TAYLOR,
Prest.

Signed, sealed and delivered by the said Robert Abbott Hadfield in the presence of
GEO. BEARDSELL,
33 Rising Street,
Sheffield.

Attest:
T. F. BUDLONG,
[SEAL.] Secty.

Exhibit C 12.

I, ROBERT A. HADFIELD, of Sheffield, in the County of York, England, by Henry M. Howe, my attorney in fact, in consideration of the sum of One Dollar to me in hand paid by the Taylor Iron & Steel Co., of Highbridge, N. J. (hereinafter termed the Licensee), the receipt whereof is hereby acknowledged, do hereby give and grant unto the Licensee a non-transferable license, and the non-transferable right to manufacture, use and sell the several articles and products specified and set forth in certain Letters Patent, dated and numbered as hereinafter specified, and set forth as follows, to wit:

Letters Patent dated January 5th, 1886, and numbered 333,748 for self-hardening manganese steel.

Which Letters Patent were issued by the United States of America.

This license shall cover in and include any improvement or improvements on said patented inventions for which Letters Patent of the United States may hereafter be granted to said Hadfield during the term of said hereinbefore mentioned Letters Patent, as well as any re-issue or extension of said Letters Patent, or any Letters Patent which may be issued hereafter in lieu of them, provided said Hadfield have power to license any American licensee thereunder.

And in consideration of the sum of One dollar to it in hand paid, the licensee hereby agrees to keep a true and correct account of all Merchantable Steel Manufactured and used, or sold by it and after the date hereof, under and by virtue of any of the processes specified and set forth by the Letters Patent aforesaid. It agrees also to furnish samples of any Manganese Steel in dispute for determining liability to royalty, and it further agrees that it will, on the first day of July and the first day of January of each and every year, make a written report to the said Robert A. Hadfield or his assigns, and, if desired, will furnish affidavit as to the correctness of same, showing the amount of Merchantable Manganese Steel manufactured and used or sold by it for the preceding six months under said Letters Patent, and will pay a royalty to said Robert A. Hadfield, or his assigns, for all the Steel so reported by it to have been manufactured, and used or sold under this agreement, at the rate of three and one-half per centum of the gross selling price of said steel at said company's works.

Such reports, accompanied with a remittance therefor, to be made and sent, in each instance, within thirty days immediately next following

after the said first day of July and the first day of January.

This license to be good for the full life of the said Letters Patent, and of any extension or reissue thereof or substitution therefor and the agreement to report and pay royalty to be good for said term.

In case any of the royalties or license fees above set forth remain unpaid for sixty days after becoming due, said Hadfield is at liberty to revoke this license by serving a notice to that effect by registered letter, addressed to the licensee at High Bridge, New Jersey.

It is distinctly understood that said Letters Patent are in litigation, and that this license is issued subject to the liability of said Hadfield to be defeated in said litigation, and to the liability of said patent to be annulled. In such event the licensee is to have no claim whatsoever to any compensation or redress from said Hadfield on account of such annulling.

Witness our hands and seals this thirteenth day of December, 1892.

ROBERT A. HADFIELD,
By HENRY M. HOWE,
Atty. [L. S.]

Witness to signature
as to H. M. Howe,
HARRIETT P. BARTLETT.

TAYLOR IRON & STEEL CO.,
L. H. TAYLOR,
President. [L. S.]

Attest:
T. F. BUDLONG,
Secty.

Exhibit C 13.

THIS DEED, made the fifth day of July, Eighteen hundred and ninety-four, Between ROBERT ABBOTT HADFIELD, of Sheffield, in the County of York, in England, of the first part, HENRY MARION HOWE, of Boston, in the State of Massachusetts, in the United States of America, ROBERT EMMETT JENNINGS, of Jersey City, in the State of New Jersey, in the United States of America, and WILLIAM JOHNSTON TAYLOR, of Bound Brook, in the State of New Jersey, in the United States of America, of the second part, and THE TAYLOR IRON AND STEEL COMPANY, a corporation of the State of New Jersey, in the United States of America, of the third part, supplemental to the three following documents, namely:

(A) An Agreement, dated the tenth day of August, eighteen hundred and ninety-one, and made between the said Robert Abbott Hadfield (by the said Henry Marion Howe, his attorney in fact) of the first part, and the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor of the second part (hereinafter referred to as the said license):

(B) An Agreement dated the twenty-fourth day of December, eighteen hundred and ninety-one, and made between the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor of the first part, and the said Company of the second part; and

(C) An Indenture dated the ninth day of June eighteen hundred and ninety-two, and made between the said Company of the first part, the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor of the second part,

and the said Robert Abott Hadfield of the third part:

Witnesseth, that it is hereby mutually agreed and declared as follows:

PART I.

The said license shall be and is hereby altered and modified as follows:

(1) No royalties shall be payable under Clause 8 of the said license in respect of any steel castings or other steel or iron or manganese steel made, whether under the R. A. Hadfield system or the patents mentioned in the said license, or otherwise, and used or sold prior to the first day of January, eighteen hundred and ninety-five.

(2) The royalties of three and one-half per cent., mentioned in said Clause 8, shall be reduced to three per cent. and in the same clause three per cent. shall be substituted for three and one-half per cent.

(3) The period for which all royalties are payable shall be extended two years. In the said Clause 8, "the first day of January, nineteen hundred and one," shall be substituted for "the first day of January, eighteen hundred and ninety-nine." Notwihstanding the expiration of the patents, the patent royalty shall be payable for the extended two years in the same manner as if the patents were in force.

(4) The minimum annual royalty of Five thousand dollars, mentioned in said Clause 8, shall not be payable for the two years ending December thirty-first, eighteen hundred and ninety-four and eighteen hundred and ninety-five, but shall be payable for the five years ending December thirty-first, eighteen hundred and ninety-six, eighteen hundred

and ninety-seven, eighteen hundred and ninety-eight, eighteen hundred and ninety-nine, and nineteen hundred, and in the said Clause 8 "the five years ending December thirty-first, eighteen hundred and ninety-six, eighteen hundred and ninety-seven, eighteen hundred and ninety-eight, eighteen hundred and ninety-nine and nineteen hundred" shall be substituted for "the five years ending December thirty-first, eighteen hundred and ninety-four, eighten hundred and ninety-five, eighteen hundred and ninety-six, eighteen hundred and ninety-seven and eighteen hundred and ninety-eight."

(5) The powers to enter works, and all other powers conferred by Clause 11 of the said original license, upon the licensor, shall be exercisable for a further period of two years, and in the same clause "January first, nineteen hundred and one," shall be substituted for "January first, eighteen hundred and ninety-nine."

(6) That the proviso, in the fourth clause of the Indenture, dated the ninth day of June, eighteen hundred and ninety-two, between the said Taylor Iron and Steel Company of the first part, and the said Henry Marion Howe, Robert Emmett Jennings, and William Taylor of the second part, and the said Robert Abbott Hadfield of the third part, in the recital hereof referred to as "(C)," shall be so modified that the obligations and restrictions of the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, therein referred to, shall be in accordance with the changes in the terms and conditions of said license effected by this agreement, and, except as herein modified, the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor shall remain under the same restrictions and obligations regarding said license as heretofore.

PART II.

The said three Documents, to which this deed is supplemental, shall be read, construed and take effect as agreed and expressed to be altered and modified by Part I of this deed, and except as altered and modified by this deed, the same shall, in all other respects, remain and be in as full force and effect as though this deed had not been made; and the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, and the said Taylor Iron and Steel Company are hereby released and acquitted of and from any existing liability in damages or otherwise for the breach of any of the provisions of said Documents, which have been herein altered or modified, beyond the liability imposed by such provisions as altered or modified.

IN WITNESS WHEREOF the said Robert Abbott Hadfield and the said Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor have hereto set their hands and seals, and the said Taylor Iron and Steel Company has caused this deed to be signed by its President and attested by its Secretary, and its corporate seal to be hereto attached, the day and year first above written.

R. A. HADFIELD [L. S.]
HENRY M. HOWE [L. S.]
ROBT. E. JENNINGS [L. S.]
WM. J. TAYLOR [L. S.]
[SEAL] TAYLOR IRON AND STEEL CO.,
LEWIS H. TAYLOR, Prest.

Attest:
T. F. BUDLONG,
Secty.

In presence of:
G. H. HEMSOLL

As to H. M. Howe, R. E. Jennings and W. J. Taylor.
L. C. VOORHEES.

Exhibit C 14.

THIS INDENTURE, made the twelfth day of March 1897 between Robert Abbott Hadfield of Sheffield in the County of York in England of the one part and The Taylor Iron & Steel Company a Corporation of the State of New Jersey in the United States of America of the other part supplemental to a license dated the 9th day of June 1892 and made between the said Robert Abbott Hadfield of the one part and the said Company of the other part relating to the making of Shells Witnesseth that it is hereby mutualy agreed and declared as follows:

1. The minimum royalties specified in Clause 6 of the said License for the years ending 31 December 1893 and 31 December 1894 have been paid and satisfied by royalties paid under Clause 4 of the said License.

2. No part of the minimum royalties specified in Clause 6 of the said License for the years ending 31 December 1895, and 31 December 1896, has yet been paid, and such royalties and the royalties specified in that Clause for the seven following years, or such parts thereof as shall not be satisfied by royalties paid under Clause 4 of said License, shall not be payable at the dates specified in said Clause 6, but as hereinafter provided by Clause 4 of this supplemental agreement. The minimum royalties referred to in this Clause amount to an aggregate of $18,000, and all payments of royalties made under Clause 4 of said License shall apply on said minimum.

3. The royalties payable under Clause 4 of the said License shall be payable half yearly as specified in Clause 5 of that License.

4. The minimum amount payable for royalties for the 9 years ending 31 December 1903 shall be $18,000 (whether the shells sold in such years shall be sufficient to produce royalties to that amount or not) and if the said Company shall not between the date hereof and 31 December 1903 pay to the said R. A. Hadfield under Clause 4 of the said License at least sums equal to said minimum amount of $18,000 for royalties there shall then be due and payable by the said Company to the said R. A. Hadfield such part of the said $18,000 as shall not have been paid by royalties under Clause 4 of the said License between the date hereof and 31 December 1903.

5. The said License as modified by this Deed is hereby confirmed.

IN WITNESS WHEREOF the said Robert Abbot Hadfield has hereunto set his hand and seal and the said Company has caused this Deed to be signed by its President and attested by its Secretary and its Corporate Seal to be attached.

THE TAYLOR IRON & STEEL CO.,
LEWIS H. TAYLOR,
Prest.

[SEAL]

Attest:
T. F. BUDLONG,
Secty.

R. A. HADFIELD.

Witness:
G. H. HEMSOLL.

Exhibit C 15.

AGREEMENT, Between ROBERT ABBOTT HADFIELD, of Sheffield, in the County of York, in England, party of the first part, and THE TAYLOR IRON AND STEEL COMPANY, a corporation of the State of New Jersey, in the United States of America, party of the second part:

WHEREAS, the said party of the second part is now licensed to use in its works at High Bridge, New Jersey, and at other places in the United States and Canada, the methods of manufacturing and treating steel castings and other steel, known as the "R. A. Hadfield System," or "Hadfield System," being the system in use at the Hecla Works of the party of the first part, at Sheffield, England; and is also licensed to use in its said works the inventions described in Letters Patent of the United States, No. 303,150, dated August 5th, 1884; No. 303,151, dated August 5th, 1884; and No. 333,748, dated January 5th, 1886, all relating to manganese steel, together with any improvement or improvements thereon, for which letters patent of the United States or Canada have been or may hereafter be granted, during the term of said patents, and any renewal, extension or reissue thereof, or of any patents obtained for improvements as aforesaid, subject to the terms, conditions, restrictions and royalties fixed by agreements now in force between the parties hereto, which agreements are particularly described as follows:

(a) An agreement bearing date the tenth day of August, eighteen hundred and ninety-one, made between Robert Abbott Hadfield (by Henry Marion Howe, his attorney in fact) of the first part, and Robert Emmett Jennings, William Johnston

Taylor, and Henry Marion Howe, of the second part.

(*b*) An agreement bearing date the twenty-fourth of December, eighteen hundred and nine-one, made between Robert Emmett Jennings, William Johnston Taylor and Henry Marion Howe, of the first part, and The Taylor Iron and Steel Company, of the second part.

(*c*) An indenture, bearing date the ninth day of June, eighteen hundred and ninety two, made between The Taylor Iron and Steel Company, of the first part, Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, of the second part, and Robert Abbott Hadfield, of the third part:

(*d*) An indenture, bearing date the ninth day of June, eighteen hundred and ninety two, made between Robert Abbott Hadfield, of the one part, and The Taylor Iron and Steel Company of the other part.

(*e*) A license, bearing date the thirteenth day of December, eighteen hundred and ninety two, under Letters Patent of the United States, No. 333,748, made by Robert Abbott Hadfield to The Taylor Iron and Steel Company.

(*f*) A deed, bearing date the fifth day of July, eighteen hundred and ninety four, between Robert Abbott Hadfield, of the first part, Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, of the second part, and The Taylor Iron and Steel Company, of the third part.

(*g*) An indenture, bearing date the twelfth day of March, eighteen hundred and ninety seven, made

between Robert Abbott Hadfield, of the one part, and The Taylor Iron and Steel Company of the other part.

And Whereas, by the terms of said agreement (*a*) above referred to, the right to make projectiles under the Hadfield system is excepted, and the right to manufacture armor plate and projectiles, under the said letters patent of the United States is excepted.

And Whereas, by said indenture (*d*) above referred to, the right is conferred to make under the said "Hadfield System" and said letters patent of the United States, the following projectiles, viz.: (*a*) cast steel common shells, (*b*) cast steel shrapnel shells, (*c*) cast steel deck piercing shells, and (*d*) forged steel deck piercing shells, but no other kind of projectiles, the term "deck piercing shells" being defined by said indenture to mean shells fired from mortars for deck piercing purposes, armor piercing shells, other than the foregoing, being by express language not included.

And Whereas, the other agreements and indentures above referred to in no way include or waive such exceptions, except the license (*e*) under letters patent of the United States, 333,748, which license is a general one:

And Whereas, the said Robert Abbott Hadfield, party of the first part hereto, and the said Taylor Iron and Steel Company, party of the second part hereto, have agreed with each other upon the terms hereinafter stated to extend the licenses under said "Hadfield System and Patents" to include the use of said system and inventions in the manufacture of projectiles of all kinds and armor.

Now this agreement witnesseth: That in consideration of the premises and of the royalties

hereinafter agreed to be paid by the party of the second part, and of the covenants by the said party hereinafter contained, the party of the first part hereby grants unto the said party of the second part a license to use, and hereby licenses and permits it to use, in its said works at High Bridge, New Jersey, and at any other place in the United States, the method of manufacturing and treating steel castings and other steel, known as the "R. A. Hadfield System," perpetually, and for all purposes whatsoever, and also the inventions described in said letters patent of the United States No. 303,150, dated August 5th, 1884; No. 303,151, dated August 5th, 1884; and No. 333,748, dated January 5th, 1886, all relating to Manganese Steel, together with any improvement or improvements thereon, for which letters patent of the United States or Canada may hereafter be granted to the said party of the first part, or his legal representatives, during the term of said patents, and any renewal, extension or reissue thereof or of any patents obtained for any improvements as aforesaid, for all purposes whatsoever except brake shoes;

(2) In consideration of such license, and of the covenants by the party of the first part hereinafter contained, the party of the second part covenants and agrees to pay unto the party of the first part the several royalties fixed and reserved by the existing agreements between the parties hereto, as now in force, on the several steel products included in said existing agreements, at the times and in the manner by said agreements prescribed, unless hereby modified; and the party of the second part does further agree to pay to the said party of the first part, on all projectiles made under said "Hadfield System" or patents, and sold prior to

the first day of July, nineteen hundred and eight (except bursting shells on which royalties shall be paid as provided by agreements "D" and "G" in the recital of this contract referred to) royalties on the gross selling price, at the works of the party of the second part, per pound, calculated on the weight of the finished article, as per the following schedule:

Selling price cents per lb.	*Class One.* Projectiles 6 in. diameter and under.	*Class Two.* Projectiles between 6 in. and including 10 in. diameter.	*Class Three.* All projectiles above 10 in. diameter.
	Rate of Royalties.		
25c to 30 cts.	10%	11%	12%
20 to 25	8%	9%	10%
20 to 16.7	7%	8%	9%
16.7 to 13.3	6%	7%	8%
13.3 to 10	5%	6%	7%
Under 10	5%	5%	5%

And the said party of the second part does further agree to pay to the said party of the first part, on all manganese steel armour made under said Hadfield System or patents, and sold prior to the first day of July, nineteen hundred and eight, a royalty of three per cent. on the gross selling price at the works of the party of the second part.

(3) It is expressly understood and agreed that the term "bursting shells" used in this agreement includes unforged and untempered shells, and that all other kinds of projectiles of whatever character or description are, if made hereunder, subject to the royalties fixed by the preceding section; and it is further agreed and understood that the term "armor" as used in this agreement, includes not only what is now commonly known as "armor plate," but all kinds of protective construction,

now or hereafter in use on land or water or elsewhere, in whole or in part of steel, or in anywise designed as a means of protection or defense to man or anything of man's making, against projectiles or any other chance of war, or the elements, provided always, that if at any time steel, subject to the royalties of the last clause, shall be used in the manufacture of armor in combination or union with any other metal or substance, royalties shall be calculated on the steel only, the proportion of the selling price it represents to be ascertained in such case by reference of cost of steel to total cost.

(4) The royalties on projectiles and armor herein agreed to be paid, shall be due half yearly on each thirtieth day of June, and thirty first day of December, and shall be paid within thirty days of becoming due, and each half year's royalty shall be payable on the projectiles and armor sold during that half year; and it is expressly agreed and understood that if the royalties derived from sales of projectiles and armor under this agreement during the ten years ending on the first day of July, nineteen hundred and eight, shall not equal or exceed the sum of ten thousand dollars, which sum is hereby fixed as a minimum amount for the entire royalty period of the royalties payable under this agreement, whether such amount shall be actually derived from sales during the royalty period or not; then and in such case the party of the second part agrees to pay to the party of the first part, within thirty days after said first day of July, nineteen hundred and eight, any balance remaining of said minimum sum of ten thousand dollars after deduction therefrom of the royalties actually derived from sales during such period and paid or payable hereunder; provided always that nothing herein shall in any wise affect the min-

imum royalties payable under agreements "D" and "G" in the recital hereof referred to.

(5) The party of the first part hereby agrees to and with the party of the second part that he will not before the first day of July, nineteen hundred and eight, if this license shall so long continue, license any other person, firm or corporation to use the said system or said inventions in the United States of America, east of the Sierra Nevada, for the purpose of making projectiles or armor of any kind whatsoever.

(6) The party of the second part hereby agrees to and with the party of the first part that it will not at any time prior to the first day of July, nineteen hundred and eight, knowingly make or sell or deliver for export to Great Britain, or the British Colonies (other than the Dominion of Canada and the Province of Newfoundland) or to the Continent of Europe, any projectiles of any kind whatsoever, except with the consent of the party of the first part.

(7) It is hereby agreed that the party of the second part shall keep a clear record of the weight and price of all projectiles and armor made or sold by it prior to the first day of July, nineteen hundred and eight, within twenty days after the end of each half year, ending on the thirtieth day of June or thirty-first day of December (whether before or after the first day of July, nineteen hundred and eight), the said party of the second part will deliver to the said party of the first part, or his attorney, a statement of the weight and price of all projectiles and armor (made or sold before the first day of July, nineteen hundred and eight) sold by the party of the second part during such

half year, and such statement shall be made under oath if so requested.

(8) It is hereby further agreed, that the provisions of clauses 10, 11, 13, 14, 15, 16, 17 and 18 of Agreement "D" in the recital hereof referred to, shall be applicable to the manufacture of projectiles and armor under this agreement, such modifications in language in any of said clauses as are needed to include projectiles and armor made under this agreement being hereby understood and agreed to.

(9) All of the agreements in the recital hereof enumerated are hereby ratified and confirmed except as modified by this agreement, and said recited agreements and this agreement shall hereafter taken together, contain and constitute the agreement between the parties hereto, and said recited agreements and this agreement so far as required for the protection of either party in the rights intended to be secured, shall bind the heirs, executors, administrators and assigns of the party of the first part, and the successors and assigns of the party of the second part.

(10) Royalties shall be payable under this agreement on projectiles and armour agreed to be sold before the first day of July, nineteen hundred and eight, although not made or delivered by the party of the second part before that day.

(11) The party of the second part will, if practicable, make and send at its own cost copies of all future orders received by it from the United States Government, to the party of the first part.

In Witness Whereof, the party of the first part has hereto set his hand and seal, and the party of

the second part has caused this agreement to be signed by its President, and its corporate seal, attested by its Secretary, to be hereto affixed, this ninth day of November, eighteen hundred and ninety eight.

R. A. HADFIELD, [L. S.]

Signed, sealed and delivered by the above named Robert Abbott Hadfield, in the presence of

J. BARNES,
30 Bank St.,
Sheffield.

TAYLOR IRON & STEEL CO.,
LEWIS H. TAYLOR,
Prest.

Attest:
T. F. BUDLONG,
[SEAL] Secretary.

Exhibit C 16.

AGREEMENT Between ROBERT ABBOTT HADFIELD, of Sheffield, in the County of York, in England, of the first part, and the TAYLOR IRON AND STEEL COMPANY, a corporation of the State of New Jersey, in the United States of America, (hereinafter designated "the Company") of the second part:

WHEREAS, the Company is now licensed to use in its works at High Bridge, New Jersey, and at other places in the United States and Canada, the methods of manufacturing and treating steel castings and other steel known as the "R. A. Hadfield System," and is also licensed to use in its said works the inventions described in Letters Patent of the United States, No. 303,150, dated August

5th, 1884, No. 303,151, dated August 5th, 1884, and No. 333,748, dated January 5th, 1886, all relating to manganese steel, together with any improvement or improvements thereon, for which Letters Patent of the United States or Canada have been or may hereafter be granted to the said Robert Abbott Hadfield, or his representatives, during the term of said patents, and any renewal, extension or re-issue thereof, or of any patents obtained for improvements as aforesaid subject to the terms, conditions, restrictions and royalties fixed by agreements now in force between the parties hereto, which agreements are particularly described as follows:

(*a*) An agreement, bearing date the tenth day of August, one thousand eight hundred and ninety-one, made between the said Robert Abbott Hadfield, of the first part, and Robert Emmett Jennings, William Johnston Taylor and Henry Marion Howe, of the second part.

(*b*) An agreement, bearing date the twenty-fourth day of December, one thousand eight hundred and ninety-one, made between Robert Emmett Jennings, William Johnston Taylor and Henry Marion Howe, of the first part, and the Company, of the second part.

(*c*) An Indenture, bearing date the ninth day of June, one thousand eight hundred and ninety-two, made between the Company, of the first part, Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, of the second part, and the said Robert Abbott Hadfield, of the third part.

(*d*) An Indenture, bearing date the ninth day of June, one thousand eight hundred and ninety-two, made between the said Robert Abbott Had-

field, of the one part, and the Company of the other part.

(*e*) A license, bearing date the thirteenth day of December, one thousand eight hundred and ninety-two, under Letters Patent of the United States No. 333,748, made by the said Robert Abbott Hadfield, to the Company.

(*f*) A deed, bearing date the fifth day of July, one thousand eight hundred and ninety-four, between the said Robert Abbott Hadfield, of the first part, Henry Marion Howe, Robert Emmett Jennings and William Johnston Taylor, of the second part, and the Company, of the third part.

(*g*) An indenture, bearing date the twelfth day of March, one thousand eight hundred and ninety-seven, made between the said Robert Abbott Hadfield, of the one part, and the Company, of the other part.

(*h*) An agreement, bearing date the ninth day of November, one thousand eight hundred and ninety-eight, made between Robert Abbott Hadfield, of the first part, and the Company, of the second part:

AND WHEREAS, since the granting of the original license under the patents hereinbefore referred to was made, additional Letters Patent of the United Stats for improvements relating to manganese steel, have been granted to the said Robert Abbott Hadfield, as follows: No. 572,891, dated December 8, 1896, and No. 585,161, dated June 22, 1897, under which the Company has never been formally licensed, although entitled to use the same under the terms of said original license.

AND WHEREAS, many of the provisions of said agreements have already been performed and exe-

cuted, and as to others the said Robert Abbott Hadfield and the Company have mutually agreed with each other, upon certain modifications and extensions of royalty periods, and to consolidate the several agreements into one, which shall comprise the entire contract between them:

Now this Agreement WITNESSETH: That

(1) In consideration of the premises and of the royalties hereinafter agreed to be paid by the Company and of the covenants by the Company hereinafter contained, the said Robert Abbott Hadfield hereby grants unto the Company a license to use, and hereby licenses and permits it to use, in its works at High Bridge, New Jersey, and at any other place in the United States, but not elsewhere, the method of manufacturing and treating steel castings and other steel known as the "R. A. Hadfield System" perpetually, and also the inventions described in said Letters Patent of the United States, No. 303,150, dated August 5, 1884, No. 303,151, dated August 5, 1884, No. 333,748, dated January 5, 1886, No. 572,891, dated December 8, 1896, and No. 585,161, dated June 22, 1897, all relating to manganese steel together with any improvement or improvements thereon, for which letters patent of the United States or Canada may hereafter be granted to the said Robert Abbott Hadfield, or his legal representative, during the term of said patents and any renewal, extension or re-issue thereof, or of any patents obtained for any improvements as aforesaid, for all purposes whatsoever; Provided Always, that this license and the provisions herein contained shall not extend to any special steels, alloys, crushing, or other machines, invented, discovered or introduced by the said Robert Abbott Hadfield, and which were not, in August, 1900, made by the Company at its said works at

High Bridge aforesaid, under the documents hereinbefore mentioned.

(2) In consideration of the premises and of the said licenses, and of the covenants by the said Robert Abbott Hadfield hereinafter contained, the Company covenants and agrees to pay unto the said Robert Abbott Hadfield the following royalties:

(*a*) On all steel castings or other steel made by the "R. A. Hadfield System," and all manganese steel made by that system, or any other system, and used or sold prior to the first day of July, one thousand nine hundred and eight, one and one-half per cent. on the gross selling price at the works of the Company:

(*b*) On all projectiles made under the said "R. A. Hadfield System" or patents, and sold prior to the first day of July, one thousand nine hundred and eight, on the gross selling price at the works of the Company per pound, calculated on the weight of the finished article, as per the following schedule:

RATE OF ROYALTIES.

Selling price per pound.	*Class One.* Projectiles 6 in. diameter and under.	*Class Two.* Projectiles between 6 in. and 10 in. diameter.	*Class Three.* All projectiles above 10 in. diameter.
30 to 25 cts....	10%	11%	12%
25 to 20 cts....	8	9	10
20 to 16.7 cts..	7	8	9
16.7 to 13.3 cts..	6	7	8
13.3 to 10 cts...	5	6	7
Under 10 cts...	5	5	5

(3) The royalties herein agreed to be paid shall be due half yearly, on each thirtieth day of June and thirty-first day of December, and shall be paid within thirty days after becoming due, and each

half year's royalties shall be payable on castings and projectiles sold during that half year.

(4) The said Robert Abbott Hadfield hereby covenants and agrees to and with the Company, that he will not before the first day of June, one thousand nine hundred and eight, if this license agreement shall so long continue, license any person, firm, or corporation not now licensed, to use the said R. A. Hadfield system, or the said inventions, in the United States of America or any of its present possessions for making manganese steel or manganese steel castings, or for making projectiles, shell or armour, armour to include not only what is now commonly known as "armour plates," but all kinds of protective construction, now or hereafter in use on land or water, or elsewhere, in whole or in part of steel, or in anywise designed as a means of protection or defence to man or anything of man's making, against projectiles or any other chance of war, or the elements.

(5) The Company hereby covenants and agrees to and with the said Robert Abbott Hadfield, that it will not at any time prior to the first day of July, one thousand nine hundred and eight, knowingly make, sell or deliver for export to Great Britain or the British Colonies, (other than the Dominion of Canada and the Province of Newfoundland), or to the Continent of Europe, any steel manufactured by the said R. A. Hadfield System, or any part thereof, or any projectiles of any kind whatsoever, except with the consent of the said Robert Abbott Hadfield; Provided However, that nothing herein shall be construed to extend to machines and constructions which contain parts of steel manufactured by the said R. A. Hadfield System, and the said Robert Abbott Hadfield hereby covenants and

agrees to and with the Company, that he will not at any time prior to the first day of July, one thousand nine hundred and eight, knowingly make, sell or deliver for export to the United States or its present possessions or Canada and New Foundland, any manganese steel manufactured by the R. A. Hadfield System, or any part thereof, or otherwise, except with the consent of the Company.

(6) It is hereby agreed that the Company shall keep a clear record of the weight of steel made by the R. A. Hadfield System, and of all manganese steel made by whatever system, prior to the first day of July, on thousand nine hundred and eight, and shall also kep a clear record of the weight and price of all projectiles and armour, made or sold by it prior to the first day of July, one thousand nine hundred and eight, and will deliver to the said Robert Abbott Hadfield, or his attorney or agent, within twenty days after the end of each half year ending on the thirtieth day of June or thirty-first day of December, until and including the half year ending the first day of July, one thousand nine hundred and eight, a statement of the weight of steel made by the R. A. Hadfield System, and of all manganese steel and the gross collective sum of money for which said steel was sold, or otherwise disposed of, during such half year, and of the weight and price of all projectiles and armour made or sold by the Company during such half year, and such statement shall be made under oath if so requested by the said Robert Abbott Hadfield. And the Company will, at all times, prior to the first day of July, one thousand nine hundred and eight, permit the said Robert Abbott Hadfield, or his authorized representative, at all reasonable times, (not oftener than once in each calendar month without the consent of the Company), to enter the works of the Company at High Bridge, or elsewhere, for the

purpose of examining, at the expense of the said Robert Abbott Hadfield, the books containing such records and statements from which the same were made, and all vouchers relating thereto, and at the expense of the said Robert Abbott Hadfield, to weigh and test all manganese steel then found in the said works, and to do all other acts and things which may be necessary for examining and testing the accuracy of the accounts and statements to be kept and rendered as aforesaid; and the Company will also permit, during the whole of the same period, examinations at the works aforesaid, and at the expense of the said Robert Abbott Hadfield, for the purpose of ascertaining whether the said R. A. Hadfield System, or any part thereof, or the said patents, or any of them, is or are being used by the Company. And the Company, during the continuance of this license will use its best endeavors to protect any infringement of the said letters patent, and, in the event of the Company ascertaining or having good reason to suspect any such infringement, it will forthwith notify the same to the said Robert Abbott Hadfield, and will, at his expense, render all the assistance in its power to enable him to restrain further infringements, and to recover damages for any past infringements of said letters patent or either of them.

(7) It is understood and agreed that the Company will make no objection to the performance of this license or agreement on the ground that all or any part of the said R. A. Hadfield System is not novel, or that the castings produced by working such system are not satisfactory, or equal to what has been represented, or what is expected, and that no royalties or other monies which have been paid or shall be paid to the said Robert Abbott Hadfield hereunder shall be refunded in any event, and that, if

any of the said patents shall be declared invalid, the said Robert Abbott Hadfield shall be under no liability whatever in respect thereof.

(8) The parties hereto mutually agree to and with each other, that, until the first day of July, one thousand nine hundred and eight, neither will acquaint any other person, firm or corporation with the process of making manganese steel, or with the R. A. Hadfield System, or any part thereof, or give such information to other persons, firms or corporations as will enable them to make use of the said process of manufacturing manganese steel, or of the said R. A. Hadfield System, or any part thereof, but, to the best of their several abilities, keep the said process and the said R. A. Hadfield System strictly secret; but nothing herein contained shall prevent the said Robert Abbott Hadfield from granting any license, or giving information, to any person, firm or corporation to enable them to manufacture manganese steel, or use the said R. A. Hadfield System, for any purpose outside of the United States of America or its present possessions, or from granting any license, or giving information, to any person, firm or corporation to enable them to use the R. A. Hadfield System for making carbon steel castings and other steel, (excepting shell, projectiles, armour, as hereinbefore defined and manganese steel), in the United States of America and its present possessions; Provided, however, that in every license to be granted by the said Robert Abbott Hadfield to use the R. A. Hadfield System, or to make manganese steel, outside of the United States of America, or any of its present possessions, there shall be inserted, (*a*) a statement that the said Robert Abbott Hadfield has granted to the Taylor Iron and Steel Company, of High Bridge, New Jersey, U. S. A., an exclusive license to manufacture manganese steel, projectiles and

armour as hereinbefore defined, in the United States of America and its present possessions, until the first day of July, nineteen hundred and eight; (*b*) an admission that such license is taken subject, as regards manganese steel, projectiles and armour as hereinbefore defined, until the first day of July, nineteen hundred and eight, to the exclusive rights of the said Company, in the United States of America, and its present possessions; and (*c*) an agreement that the licensee will not prior to the first day of July, nineteen hundred and eight, sell or deliver for export to the United States of America, or any of its present possessions, any manganese steel, projectiles or armour as hereinbefore defined.

(9) It is further expressly agreed and understood, that the parties hereto shall have the right to use, until the first day of July, one thousand nine hundred and eight, any and all improvements hereafter made by either of them, whether patented or not, in the process of manufacturing manganese steel, steel castings and other steel, which the Company had, in August, one thousand and nine hundred, the right to manufacture by the said R. A. Hadfield System, and that information shall be interchanged between the parties hereto freely and reciprocally for their common advantage, and that accounts and descriptions of all ballistic and other tests of shell shall be sent regularly by each party to the other so far as may be consistent with honorable conduct and the relations of the parties to their respective governments, and also, so far as may be practicable, of other matters, and that each of the parties hereto shall pay to the other such royalty or royalties as may be hereafter agreed upon between them in case either party hereto may desire to continue to use after the first day of July, one

thousand nine hundred and eight, patentable improvements made by either, either actually patented or not patented by mutual consent, for the unexpired term of any patent or patents actually taken out for such patentable improvements, or, if not patented by mutual consent, for what would have been the unexpired term if the patents had been taken out, and that, without such agreement as to royalties, neither of the parties hereto shall use after the first day of July, one thousand nine hundred and eight, any patented improvement, or patentable improvement not patented by mutual consent, which shall have been discovered by either during the unexpired term of any patent or patents actually taken out, or what would have been the unexpired term if patents had been taken out.

(10) It is hereby expressly agreed and understood, if any of the royalties herein fixed to be paid by the Company to the said Robert Abbott Hadfield on account of projectiles or armour made under this agreement shall remain unpaid for sixty days after becoming due, or in case of any breach or non-performance of any of the covenants herein contained on the part of the Company as to the making of projectiles or armour hereunder, it shall be lawful for the said Robert Abbott Hadfield, whether there shall have been any waiver of any previous breach or non-performance or not, to give notice in writing to the Company to terminate this license and contract, as to the making of projectiles and armour hereunder, at a day to be named in such notice, and from and after such day, as to such projectiles and armour, this license and agreement and all obligations of the parties hereto under this agreement as to the making of projectiles and armour shall cease, except that Paragraph 8 hereof, as to maintaining the said R. A. Hadfield System and the process of

New Jersey State Library

making manganese steel secret, shall continue in force, whether such license be revoked or not, until the first day of July, one thousand nine hundred and eight; Provided, however, that nothing herein contained shall limit or affect the right of the Company to manufacture manganese steel, or use the said R. A. Hadfield System, for the making of projectiles or armour, or for any other purpose after the first day of July, one thousand nine hundred and eight, and nothing herein shall be construed as releasing the Company from paying to the said Robert Abbott Hadfield the herein stipulated royalties up to the time of such termination, or to prevent the said Robert Abbott Hadfield from recovering the same by suit or otherwise, or to release the Company from liability, should it continue thereafter to make projectiles or armour in accordance with any of the above named patents, should the same be then existent. And the Company shall not, after the termination of this agreement as to projectiles and armour by notice as aforesaid, use the said system or any part thereof for making projectiles and armour as aforesaid, prior to the first day of July, one thousand nine hundred and eight, but if it shall, after such termination by notice, so use the said system or any part thereof for the making of projectiles or armour, it shall be liable to pay, as damages, the same royalties in respect of all projectiles and armour which it shall make by the said system, or any part thereof, which it would have been liable to pay in case this agreement had not been terminated.

(11) It is understood between the parties hereto, that some of the United States patents herein mentioned have expired, and that they are mentioned in this agreement for the purpose of preserving to the Company any rights it may have in patents for im-

provements that may hereafter be issued to the said Robert Abbott Hadfield, and it is further expressly agreed and understood that either party hereto shall be at liberty at all times hereafter, without the consent of the other and without prejudice to the reservations, covenants and conditions herein contained, or any of them, to make and file disclaimers of any matters not essential contained or claimed in any letters patent, which have been or may be hereafter issued to either, in which the other may have any right hereunder, and without prejudice to the right of either to apply for and procure reissue of such letters patent.

(12) It is further understood and agreed, that the Company shall not knowingly employ any person who is now, or shall hereafter be in service at the Hecla Works, Sheffield, without the written consent of the said Robert Abbott Hadfield, and that the said Robert Abbott Hadfield shall not knowingly employ any person who is now, or shall hereafter be in service at the High Bridge Works of the Company, without the written consent of the Company.

(13) It is further agreed and understood, that the parties hereto shall pay each other for all samples of goods supplied, or to be supplied by either to the other.

(14) It is hereby further expressly agreed by and between the parties hereto, that all disputes and differences, if any, which shall arise between the said parties hereto, shall be referred to and decided by two arbitrators not connected with the trade, one to be chosen by the said Robert Abbott Hadfield, who, if he shall so desire, may be a British subject, and one by the Company, and an umpire not connected with the trade to be appoint-

ed by the two arbitrators so chosen, and the decision of the said arbitrators, or, in case of their disagreement, of the Umpire, shall in all respects be final and conclusive on both parties hereto, and it is expressly agreed and declared, that no action or legal proceedings shall be commenced or prosecuted by either of the parties hereto against the other, (except an action or proceeding for the purpose of enforcing payment of royalties actually due) touching any of said disputes and differences, unless the party to be made defendant to such action or proceeding shall have refused or neglected to refer such matters to arbitration as above provided.

(15) It is further agreed and understood, that, so far as required for the protection of either party hereto in the rights intended to be secured, this agreement shall bind the heirs, executors, administrators and assigns of the said Robert Abbott Hadfield, and the successors and assigns of the Company.

(16) This agreement is entered into on the understanding that the Company is to make reasonable effort to push the sale of all manufactures covered by this agreement, except ordinary carbon steel castings, and so far as practicable of the latter castings also.

(17) This agreement shall take effect and continue to operate as from the first day of January one thousand nine hundred and one.

(18) All the rights of either party under the documents hereinbefore recited are terminated, except in respect of any claims which have arisen under the same documents prior to the first day of January, one thousand nine hundred and one.

In Witness Whereof, the said Robert Abbott Hadfield has hereto set his hand and seal, and the Company has caused this agreement to be signed by its President and its corporate seal, attested by its Secretary to be hereto affixed, this sixteenth day of December, one thousand nine hundred and one.

R. A. HADFIELD. [L. S.]

Signed, sealed and delivered by the said Robert Abbott Hadfield, in the presence of—

J. BARNES, Clerk
to Messrs. Rodgers & Co,
Solrs., Sheffield.

TAYLOR IRON & STEEL CO.,
[SEAL.] LEWIS H. TAYLOR,
President.

Attest:
T. F. BUDLONG,
Secretary.

The corporate seal of The Taylor Iron and Steel Company was duly affixed hereto by proper authority.

Exhibit C 17.

Tabulation of results of tests made by Harry M. Stewart of steel rails.

Exhibit C 18.

Sheet of diagrams showing comparative wear of commercial steel rail and manganese steel.

Exhibit C 19.

Drawings showing sections of wear of steel rails of ordinary steel and manganese steel.

Exhibit C 20.

Blue print showing diagrams of wear of the hard steel and the nickel.

Exhibit C 21.

Comparative tabulation on life of frogs and switches of rolled rail against manganese rail.

Exhibits C 22 to C 29, both inclusive, were marked for identification and not offered.

Exhibit C 30.

Letter from M. B. Justis to W. G. Nichols, dated July 28, 1905, quoting letter from American Brake Shoe & Foundry Co., Otis H. Cutler, Pres., to W. G. Nichols, dated July 28, 1905.

(Printed on pages 468, 469.)

Exhibit C 31.

Sheet from memorandum book showing address of W. G. Nichols.

Exhibit C 32.

Card bearing name of W. G. Nichols on one side and Stratton & Cox Co. on other side.

DEFENDANT'S EXHIBITS.

Exhibit D 1.

Patent No. 189,273. Dated April 3, 1877.

C. W. Siemens Process of Converting Cast Iron into Cast Steel.

The claim is as follows:

"The process of manufacturing steel by tapping, turning, pouring, or otherwise transferring the charge of a furnace, or other apparatus for refining cast iron, into a heated ladle lined with refractory material, and containing ferro-manganese in a solid condition, as and for the purposes described."

The specification contains the following:

"When the metal is sufficiently decarburized, as may be ascertained by chemical test, and by the appearance of a chilled and fractured sample, the charge is tapped into a movable ladle lined with fire-clay, and heated internally by means of a gas-flame, or otherwise, to low redness. Before tapping, rich spiegeleisen or ferro-manganese is broken up into small pieces and distributed over the bottom of the ladle, where it becomes and is kept heated by the continuous action of the flame and heated lining, and thus is readily melted by the stream of liquid metal from the furnace. The quantity of ferro-manganese required depends upon the percentage desired in the metal, and one of

the principal advantages realized by this mode of working consists in not allowing the manganese any opportunity of oxidizing, and thus a definite proportion of manganese is insured in the metal produced. At the same time a saving of ferro-manganese is effected, and the process of manufacture is simplified."

Patent of Robert Hadfield, No. 303,150. *Dated Aug.* 5, 1884.

The specification and claim are as follows:

"My improvement consists in the admixture of a large percentage of manganese with molten iron in a decarburized or nearly decarburized condition, or to molten steel, whereby I produce a new description of steel of great toughness and hardness, and possessing several peculiar and valuable distinguishing characteristics.

The use of manganese in the manufacture of steel has been known and practiced, but only in proportions not generally exceeding one to one and one-half per cent., it having been always supposed, previous to my invention, that the presence of any larger percentage of manganese would be injurious to the steel and result in an utterly worthless product. I have discovered, however, as the result of extensive experiments, that when manganese is added to the metal or to melted steel in the process of manufacture in any proportions not less than about seven nor more than twenty parts of manganese, which said per cent. is obtained by the use of ordinary commercial ferro-manganese, in one hundred parts of molten metal nearly or wholly decarburized, or to melted steel, most beneficial effects are produced, and a new product results, which has the valuable qualities of ordinary steel while differing from it in several important re-

spects, so that my new manufacture of steel is distinguishable from the grades of steel produced by any of the ordinary processes heretofore known in the following particulars: first, in its freedom from honeycomb and other similar defects; second, in its great toughness and extreme hardness, by reason of which the hitherto indispensable processes of rolling, forging, hammering, hardening, and tempering become unnecessary and may be in many cases entirely dispensed with, though of course this material can, if desired, be rolled or forged in the usual manner; third, in its greater thinness and fluidity, whereby fine steel castings can be made without misrunning, and which will be nearly, if not quite, as smooth as the so-called metal castings; fourth, that when cast it does not settle much, and does not draw like ordinary castings, particularly at the junction of the thin and thick parts of the casting. These characteristics of my improved steel render it specially adapted for the manufacture of steel rolls to be used in place of chilled rolls; also, for casting guns and armor-plates, and for wheels for railroad-cars and street-cars, and for the railway plant generally; also, for the manufacture of various implements and parts of machinery, and for making articles known in the trade as "steel toys," and for the larger edged tools, which, when cast of my improved steel, need only to be ground, as they can be used without forging or tempering.

In carrying my invention into effect the ordinary ferro-manganese of commerce may be used; but I prefer in all cases a rich ferro-manganese as high as possible in manganese, containing about eighty per cent. of manganese, and as low as possible in carbon, silicon, and other foreign bodies. And here I may remark that my improved process

for the manufacture of steel renders the presence of silicon unnecessary for producing soundness.

The ferro-manganese to be used in my process is first carefully melted in a reverberating or other suitable furnace before adding it to the molten decarburized iron or steel, into which it is poured in a melted or highly-heated state.

I need not describe the process of preparing the iron or steel for receiving the addition of manganese, as such processes are well known, and my invention is applicable to any method of melting and decarburizing cast-iron or making steel in reverberating or other furnaces, and by the Bessemer process, or that known as the "open-hearth" process. When the metal is decarburized, or nearly so, or the steel melted, as the case may be, in any desired manner, the melted or heated ferro-manganese is poured into it, or the melted decarburized metal or steel may be poured into the melted ferro-manganese. The mixed molten mass is then well stirred by any known means, so as to incorporate the manganese thoroughly with the molten decarburized iron or the steel. When this has been effected, nothing remains but to pour out my improved steel thus produced into ingot or other suitable molds, when, after cooling, it is ready for use without tempering, rolling, forging or hardening, though it may be forged or rolled in the usual manner.

It remains only to state the proportions in which the manganese should be mixed with the iron or steel to produce the desired result. This will depend on the purpose for which the steel is desired to be used. To produce a steel suitable for armor-plates, I add such a quantity of rich ferro-manganese (containing about eighty per cent. of manganese) as to obtain in the steel, decarburized iron, &c., under treatment about ten per cent. of man-

ganese. If the steel is to be used for making car-wheels or railway-plant, I add such a quantity of ferro-manganese which yields a steel containing about eleven per cent. of manganese. In edge-tools and steel toys I add such a quantity of ferro-manganese as to obtain a steel containing about twelve per cent. of manganese. More or less ferro-manganese may be used, according to the hardness of steel required. The range of proportions which I have found to produce beneficial results, and which I desire to include in my invention, is from about seven to twenty per cent. of manganese.

The steel thus produced I have found to be harder, stronger, denser, and tougher than steel now made, even when the latter has been forged and rolled.

I am aware that in British Patent No. 1,728 of 1863 it proposed to "combine with crushed iron ores as much oxide or carbonate of manganese as will produce a metal containing five to eight per cent. of metallic manganese"; but this differs from my improvement not only in the process, but also because it is inapplicable to the manufacture of steel, for the reason that the resultant product would contain too high a percentage of carbon to make steel.

I herein refer in the claims to the use of ferro-manganese containing eighty per cent. of manganese; but I do not limit myself to the percentage of ferro-manganese therein given, because it is less rich in manganese the amount added to the molten metal must be increased proportionately, in order that the resultant product shall contain the proper amount of manganese.

Having thus described my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In the process of making steel, adding to and thoroughly mixing with the molten steel from

eight to twenty-five per cent. of melted ferro-manganese containing eighty per cent. of manganese, whereby the resultant product shall contain from about seven to twenty per cent. of manganese, substantially as and for the purposes described.

2. The process of making steel, consisting of adding to molten pig metal previously either wholly or partially decarburized by any desired method from eight to twenty-five per cent. of melted ferro-manganese containing eighty per cent. of manganese, whereby the resultant product shall contain from about seven to twenty per cent. of manganese, substantially as and for the purposes described."

Patent of Robert Hadfield, No. 303,151. *Dated Aug.* 5, 1884.

The specification is the same as that in the last-stated patent, and the claim is as follows:

"As a new article of manufacture, steel containing a proportion of from 7 to 20% of manganese."

Patent of Robert Hadfield, No. 333,748. *Dated Jan.* 5, 1886.

For Self-Hardening Manganese Steel.

"My improvement consists of a self-hardening steel containing from 2½ to 7% of manganese."

"As an example of manufacture, I add to 2,000 pounds of decarbonized and desiliconized iron, 80 pounds of ferro-manganese, containing 80% manganese. Such improved self-hardening steel may be manufactured by any of the steel manufacturing processes. I preferably use an eighty per cent. ferro-manganese and produce a self-hardening steel, to wit, a hard steel which may be used for

cutting tools without requiring the usual hardening and tempering operations of heating and quenching in water—containing at least two and one-half per cent. and less than seven per cent. of manganese, and preferably as little carbon as .40. In this it is totally different from the present practice, as all the self-hardening steels now in use contain a very large amount of carbon, averaging from one to one and a half per cent."

The claim is as follows:

"As a new article of manufacture, self-hardening steel containing from two and one-half up to but not including seven per cent. of manganese."

Patent of William W. Snow, No. 435,050. *Dated Aug.* 26, 1890.

Composition of Manganese and Iron for Brake-Shoes.

The claim is as follows:

"A brake-shoe of cast metal made from a mixture of iron and manganese, in which the proportion of manganese is from five to fifteen per cent. of the amount of iron, substantially as set forth."

The specification contains the following:

"The ingredients may be placed in the cupola, hot-air furnace or crucible, or the manganese may be added as a powder to and mixed with the iron after it has been melted, or the powdered manganese may be thrown into the metal in a converter by means of the blast from the tuyeres."

Patent of Robert A. Hadfield, No. 585,161. *Dated June* 22, 1897.

For Method of Manufacturing Manganese Steel.

The specification describes the uncertainty of the process previously used of weighing the ferro-

manganese when cold, because of the losses occurring during its melting, and the invention is stated to be weighing it when melted.

"The heat of steel may be made in any convenient manner, such as the Bessemer, open-hearth, basic, or other method, and it may be made either by first more or less completely decarburizing the charge and then making final deoxidizing and preferably slightly-carburizing additions, or by arresting the Bessemer, open-hearth, or other process when the charge has been sufficiently decarburized and purified to yield, without addition, metal of the composition desired for mixing with the ferro-manganese. All of the heat, after weighing, or a determined quantity thereof divided out by weight is then incorporated with the necessary quantity by weight of molten eighty per cent. or other suitable ferro-manganese, according to the percentage required in the product of manganese steel, pouring either material into the other, as may be most convenient, or both together into a third ladle or other vessel, the slag being separated during the pouring."

The claim is as follows:

"The method of manufacturing manganese steel, which consists in preparing a heat of steel, dividing out and weighing a portion thereof and casting the remainder as carbon steel, and thereafter incorporating with the weighed portion of steel a melted and subsequently-weighed quantity of ferro-manganese."

Patent of Robert A. Hadfield, No. 572,891. *Dated December* 8, 1896.

Method of Toughening Manganese-Steel Castings.

Specification and claim are as follows:

"In actual practice after the manganese steel castings have been cleaned of any excess of sand

from the molds they are put into the heating furnace in which they are to be heated before the fire is started and while the furnace is still cold. A small fire is then started in the furnace and heat is thereby applied to the castings very gradually. The first heating must be conducted at a very slow rate. This rate depends upon the thickness of the castings, that is to say, the thicker the casting the slower must be the rate of heating. By way of illustration I may say that the rate of heating should be such for thick castings, say those from two to four inches thick in their thickest parts, that one hour would be consumed in raising the casting to heat of about 400° Fahrenheit. In two hours the casting may reach, say 800° Fahrenheit, and in three hours 1,200° Fahrenheit. After the casting, heated at this slow rate, has become visibly red I believe there is no further danger of internal rupture, and the heating may then be carried on at a more rapid or moderately rapid rate until the desired temperature is reached, say about 1,700° Fahrenheit, or, in other words, orange heat. The castings are then taken from the furnace as quickly as possible and plunged into a tank of cold water, by which the toughening process is completed.

"I claim as my invention:

"The process herein described of toughening manganese-steel castings, consisting in heating them, beginning with the furnace in a cold state, applying the heat very gradually until the casting is visibly red, then continuing the heat to an orange heat and finally plunging in cold water, substantially as described."

Patent of Robert A. Hadfield, No. 731,450. *Dated June* 23, 1903.

Method of Toughening Manganese Steel.

The specification and claim are as follows:

"My present invention has reference to improvements in the method of toughening manganese steel, which forms the subject of my prior patent, No. 572,891.

As the result of costly and exhaustive experiments I have found that exceptional toughness and tenacity can be obtained by the following treatment—that is to say, the manganese steel is put into a heating furnace the temperature of which is gradually raised, so that heat will be applied very gradually to the steel in order to prevent sudden expansion thereof, this preliminary heating being (as stated in the specification of my beforementioned patent) conducted at a very slow rate, dependent upon the thickness of the steel, the thicker the steel the slower the rate of heating. Having been slowly heated to a temperature of from 750° to 800° centigrade, the heating is forthwith expedited, so as to raise the steel as quickly as possible to the temperature at which it is to be plunged in cold water, which temperature, according to my present invention, while varying within certain limits, dependent upon the character of the particular steel and the product required, is not less than 940° centigrade or more than 1,125°, preferably from 980° to 1,050° centigrade in the case of castings, and from 940° to 1,000° centigrade in the case of forged manganese steel.

I find that by treating manganese steel in the manner described the percentage of hardening carbon remaining in the toughened product varies according to the temperature to which the manganese steel was raised previous to its being plunged

into cold water, the higher the said temperature the less being the amount of hardening carbon present in the finished product. For example, by heating different manganese steel castings, each composed of manganese steel of the same original composition, to 850° centigrade, 900° centigrade, and 1,000° centigrade respectively, the amount of hardening carbon present in the toughened manganese steel was found to be .45 per cent., .36 per cent., and .32 per cent. The less the amount of hardening carbon present in the finished product the tougher and less hard will be the product, and the greater the amount of hardening product present the harder and less tough will be the product. Consequently it will be seen that by suitably and carefully regulating the temperature to which the manganese steel is raised—as, for example, by a pyrometer—the percentage of hardening carbon present in the finished product can also be regulated with considerable accuracy, with the result that toughened manganese steel of a more uniform character and reliable quality can be produced according to this invention than has heretofore been usual.

I claim—

1. The herein-described process of toughening manganese steel, which consists in slowly heating the steel to a temperature from about 750° to about 800° centigrade, and then raising the temperature rapidly to from 940° to 1,125° centigrade, and finally plunging the highly-heated steel in cold water.

2. The herein-described process of toughening manganese steel by varying the amount of hardening carbon therein, which consists in slowly heating the steel to a temperature of at least 750° centigrade, and then quickly raising the tempera-

ture to at least 940° centigrade, increasing the temperature above said limits the tougher and less hard the desired product, and finally plunging the highly-heated steel in cold water."

Patent of Walter Brinton, No. 812,811. *Dated Feb.* 20, 1906.

Process of Treating Manganese Steel.

Specifies that it is an improvement on the method described in the Hadfield Patents No. 572,891 and No. 731,450.

"Under the processes set forth in said patents the cast article is placed in a cold furnace and then slowly heated up to a predetermined temperature and then comparatively rapidly heated. I have found, however, that by permitting the casting to become cold, it is not practicable to successfully treat and perfect heavy manganese-steel castings by such processes. * * * *"

"I have found that the castings, forgings, or other manganese-steel articles to be treated should never become cold after the commencement of manufacture until after the final toughening process has been accomplished. When the casting or forging is permitted to become cold after it has been cast, forged, or rolled before reheating for toughening, dangerous internal strains set up, causing cracks, and therefore rendering the finished product valueless and dangerous for all purposes. * * * *"

"In carrying out this improved method, if it is a casting which is to be treated after the casting has remained undisturbed in the mold a sufficient length of time to become solidified, or, in other words, has reached the point where its strength is sufficient to retain its own weight without warping, it is released and freed from any parts of the

mold which would have a tendency to retard the contraction and shrinkage, which begins very soon after the casting. After having been released and freed from all binding influences, the casting is so treated as to retain therein a sufficient amount of heat, to prevent the same from becoming cold, such amount of heat being determined according to the size, character, and design of the casting. This may be done in one way by covering the product with sand or preferably placing the product in a pit specially prepared for the purpose where drafts of air are entirely excluded, whereby the process of shrinkage and contraction is largely retarded, while all parts of the casting are kept at a uniform temperature throughout until they have cooled down to the right degree of heat for the final toughening, which degree depends upon the character, size and design of the casting. It may range between a point about 100° Fahrenheit, and substantially 1,000° Fahrenheit. * * *"

"The casting or other product is then heated up to a predetermined point preparatory to the final toughening operation, and I have found that by this method of treatment this heating step even from its commencement may be comparatively rapid. After it has reached a predetermined high temperature now well known in the art, as disclosed, for instance, in the Hadfield patents hereinbefore referred to, it is removed and immersed in a cooling bath of brine-water, although other means may be used for rapidly cooling the casting. By this method I have found that dangerous strains are eliminated."

The final claim is as follows:

"The method of toughening manganese steel, which consists in first casting the steel into its final finished shape, then permitting the same to

solidify to a point where it can be handled, then treating the article by covering it with sand to check the cooling thereof and maintain therein a part of its original temperature, determined by the size, character and design of the article and ranging above normal atmospheric temperature and below substantially 1,000° Fahrenheit, then placing the article in a furnace heated to a temperature substantially corresponding to the temperature remaining in the article and heating the same rapidly up to a predetermined high heat, and then immersing the article in water."

Exhibit D 2.

Telegram from W. G. Nichols to Mr. Cutler, Amer. Brake Shoe Co., dated July 20, 1905.

(Printed on page 478.)

Exhibit D 3.

Letter from American Brake Shoe & Foundry Company, Otis H. Cutler, President, to W. G. Nichols, dated July 20, 1905.

(Printed on pages 479, 480.)

Exhibit D 4.

A.

SUMMARY OF CAST SAMPLES.

GROUND BARS CAST OR CUT FROM CASTINGS FOR TENSILE STRENGTH.

STRESS.

MARK.	MAKER.	HIGHEST □"	AVERAGE □"	ELONGATION AVERAGE %	REMARKS.
3A to 3M	Am. Brake Shoe & Fdy. Co.	105,030	77,550	13.57	13 Samples.
2 N. O. P. Q	" " " " "	111,070	103,435	23.58	4 "
6-G to J	" " " " "	132,540	94,124	16.31	7 "
5-A to H	" " " " "	108,200	95,059	12.54	9 "
S-5-6-7	" " " " "	71,500	70,340	7.63	3 "
					*Total 36. Av. Tensile, 87,-425. Av. Elong., 14.46
3 N	Taylor Co.	78,210	78,210	9.09	1 Sample.
4 A. B. C	" "	65,060	53,200	3.58	3 "
T–T2	" "	63,100	59,220	2.67	2 "
S1–S2	" "	93,340	85,250	Broke 1 / 8.12	2 "
					*Total 8. Av. Tensile, 65,-844. Av. Elong., 5.17
4-F, G	Penna. Steel Co.	20,870	17,410	2.85	2 Samples.
PA–B	" " "	27,600	20,460	1.12	2 "
P–H	" " "	69,540	69,540	.61	1 "
					*Total 5. Av. Tensile, 29,-056. Av. Elong., 1.43

* Written in red ink.

40 30 20 10

40 30 20 10

Exhibit D5.

B.

Summary of Cast Samples.

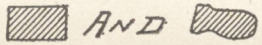
STRAIGHT 1" ROUNDS. SAND CAST TENSILE.

MARK.	MAKER.	STRESS. HIGHEST □"	STRESS. *AVERAGE □"	*ELONGATION AVERAGE %	REMARKS.
1–A, B, C, D.....	Johnson Co.	83,260			4 Samples. 2 Broke in Jaw.
*Average.....	" "		*78,938	*5.60	*Total 4 samples.
14	American B. S. & F. Co.	61,050			1 Samples.
M–1, M–2.....	" " "	68,600			2 "
*Average.....	" " "		*63,400	*7.29	*Total 3 samples.

1.5 x .7

RECTANGULAR BARS. ROUGH. TENSILE.

O–A, C, D, E, F...	Am. Brake Shoe & Fdy. Co.	69,520			5 Samples.
*Average.....			*64,608	*7.56	*Total 5 samples.
8A–8C.....	Johnson Co.	83,920			2 Samples.
*Average.....			*82,475	*14.87	*Total 2 samples.



SQUARE BARS & IRREGULAR SECTION. TENSILE.

11A to E.....	Am. Brake Shoe & Fdy. Co.	82,900	76,258	11.19	5 Samples.
Z–1, 2, 3, 4.....	" " " " "	73,770	69,960	7.41	4 "
*Average.....	" " " " "		*73,459	*Av. 7 Bars 9.57	*Total 9 samples.
S3–S4.....	Taylor Co.	64,330	62,215	1 Bar 2.5	2 Samples.
*Average.....	" "	*64,330	*62,215	*Av. 1 Bar 2. 0	*Total 2 samples.

* Written in red ink.

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Exhibit D6.

C.

Summary of all the Samples of Cast Manganese Steel Irrespective of Shape.

Mark.	Maker.	Highest Single Test.	Average of Each Lot.	No. of Samples.	Av. Elong.
6-C to J.....	Am. Brake Shoe & Fdy. Co.	132,540	94,124	7	16.31
14 & M1-M2..	" " " " "	68,600	63,400	3	7.29
O-A to F.....	" " " " "	69,520	64,608	5	7.56
11-A to E.....	" " " " "	82,900	76,758	5	11.19
3-A to M....	" " " " "	105,030	77,550	13	13.57
2-N to Q.....	" " " " "	111,070	103,435	4	23.58
5-A to H.....	" " " " "	108,200	95,059	9	13.64
S5–, 6–7.....	" " " " "	71,600	70,340	3	7.03
Z1 to 4.....	" " " " "	73,770	73,116	4	7.41
*Average of.		53 bars	81,540	53	12.79
1 A to D.....	I. G. Johnson & Co.	83,260	78,938	4	5.60
8 A to G.....	" " "	83,920	82,475	2	14.87
*Average of		* Six bars	*80,116	*6	*10.23
3 N	Taylor Iron & Steel Co.	78,210	78,210	1	9.09
4A-B-C.....	" " " "	65,060	53,200	3	3.58
T–T1.....	" " " "	63,100	59,220	2	2.67
S1–S2.....	" " " "	93,340	85,250	2	8.12
S3–S4.....	" " " "	64,330	62,215	2	2.50
*Average of		* Ten bars	*65,118	*10	*4.92
4 F,G,P,A,B } P–H ..... }	Penna. Steel Co.	69,540	29,056	5	1.43
*Average of		*Five bars	*29,056	*5	*1.43

*Written in red ink.

Exhibit D7.

D.

Crushing Manganese Steel Wheels.

Mark.	Diameter.	Maker.	Max. Load at Which Cracked.	Average Max. Load.*	Deflection.	
						10
					For 165,000	
A. A. A.	12″	Am. Brake Shoe & Fdy. Co.	165,580		.646	
C. C. C.	"	" " " "	132,250	144,202*	.485	.565
U.	"	" " " "	121,980		.520	
R.	"	" " " "	157,000		.610	
D. D. D.	"	Johnson Co.	166,370	158,185*	1.420	1.11
H. H. H.	"	" "	150,000		.800	
					For 125,000	
T. 1.	"	Taylor Co.	125,590	125,590*	.537	
T. 2.	14″	" "	116,570		.535	
T. 3.	"	" "	105,050	114,822*	.550	.546
T. 4.	"	" "	120,670		.720	
T. 5.	"	" "	117,000		.380	
W. 1.	"	Am. Brake Shoe & Fdy. Co.	131,700		.270	
W. 2.	"	" " " "	137,400	146,337*	.347	.457
W. 3.	"	" " " "	157,250		.590	
W. 4.	"	" " " "	159,000		.620	

Summary of Wheels.

Maker.	12″ Max. Load Av.	12″ Def. Av.	Max. Load Av.	Def. Av.
Am. Brake Shoe & Fdy.	144,202	.565	146,337	.457
Johnson Co.	158,185	1.110		
Taylor Steel Co.	125,590	.537	114,822	.546

* Written in red ink.

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Exhibit D8.

E.

Bending Tests of Cast Manganese Steel.

Mark.	Angle.	Approximate Sizes and Shape.	Character of Sand Cast, Rough.	Maximum Load.	Deflection.	Av. Load □"*
11-F	45°	□ 1.5 Square	American B.S. & F. Co.	52,570	For 41,000 Def. =.53	45,785*
11-C	14°	□ 1.5 Square	" " " " " "	39,000	For 38,000 Def. =.378	
8-B	48°	▭ 1.5 x .7	Johnson Co.	10,700	For 8,500 Def. =.500	10,200*
8-D	50°	▭ 1.5 x .7	" "	9,700	For 8,200 Def. =.530	
0-B	53°	▭ 1.5 x .7	American B.S. & F. Co.	8,360	For 6,750 Def. =.530	8,285*
0-G	52°	▭ 1.5 x .7	" " " " " "	9,780	For 8,000 Def. =.481	
0-E	57°	▭ 1.5 x .7	" " " " " "	7,000	.480	
0-D		▭ 1.5 x .7	" " " " " "	8,000	.550	

*Written in red ink.

Exhibit D9.

F.

REVIEW OF THE LITERATURE OF MANGANESE STEEL.

AUTHORITY OR MAKER.	NATURE OF SAMPLE.	TENSILE TONS PER □"	TENSILE POUNDS □"	ELONGATION %
Brit. Inst. 1884 p 209 Vol 2 p 41-70	Ingot Rolled	42	94,080 103,040	20.85
R. A. Hadfield	Forged Quenched	46 to 53	To 118,720	22 to 29
Ditto	Ditto	61	136,640	37
1890 Vol 2 D. Campridon	Direct from Forge	51.6	115,584	1 25
Ditto	Water Quenched	57.90	129,696	35
From Trans Am Inst. M. E. 1886-87 Vol 15 Weeks p. 461	Water Quenched	Av of 12 49.667	111,254	25.09
1894 Vol 23 Hadfield	Kirkaldy & Son	58.8	131,712	39.2
Ditto		62.75	140,560	
Hadfield	Forged Quenched	To 73.80	To 165,312	20 to 49.2
Ditto Brown Bailey	Forged not Quenched	41.84	93,722	3.50
Ditto		63.83	142,979	
	After Quenching	To 69.48	To 155,635	43 to 49.20
Ditto pg 180	.....	58.8	131,712	39.20
*Average	.....	.....	126,475*	29.53*

* Written in red ink.

Exhibit D10.

H.

Rolled and Forged Metal. Tensile.

Mark.	Shape.	Character of.	Av. Elong.	Per □" Highest.	Lowest.	Average.
6A–6B.....	□ .75" Sq 2 Samples	Rolled—Scale left on.	2.81	123,780	111,500	117,640
13A–13B.....	" "	Rolled.	23.58	99,540	87,820	93,680
XXX A to E.....	.6" Round 5 Samples	Rolled & Slightly Ground.	28.62	147,290	111,880	131,603
XX A. B. C. D. E.....	1" Round 5 Samples	Rolled & Ground.	20.	125,750	117,180	122,454
XXXX.....	.6" Round 1 Sample	Hammered & Ground.	5.50	62,710	62,710	62,710
XXXX.....	.8" Round 1 Samples	Rolled & Ground.	12.50	83,420	83,420	83,420
XXXX A to B.....	8" Round 2 Samples	Hammered Rough & Ground.	25.45	143,730	127,330	133,617
X. X: X:	1" Round 3 Samples	Rolled & Ground.	19.60	139,040	136,600	137,867
XXX.....	.8" Round 1 Sample	Rolled & Ground.	Broke.	Broke outside. 56,720	56,720	56,720
XIX, XIIX.....	Small long bars 2 Samples	Hammered & Ground.	Broke.	128,420	102,280	115,350
	2" Round	Rolled.	.....	Absolute. 300,000	Did not	Break.
	*All of the above	were made by the Am. Brake	Shoe &	Fdy. Co.		
		*Average of 26 bars	20.59	.....	.....	103,203

* Written in red ink.

Exhibit D 11.

Sheet No. 1, showing record of best single specimen of each maker's cast manganese steel and record of all the averages of all the samples from each maker's cast manganese steel.

Exhibit D 12.

Sheet No. 2, record of crushing tests of Manganese steel wheels, showing record of best samples and record of averages.

Exhibit D 13.

Sheet No. 3, showing comparison of rolled and hammered bars from sheets F and H.

Exhibit D 14.

Report of Tests of Manganese Steel, at Chicago, January, 1906, by Robert W. Hunt & Co.

Marks	3-A	3-B	3-C	3-D	3-E	3-F
			Cast and ground			
Original Dimensions	.924	.890	.833	.986	.796	.851
Dimensions after Fracture.	.883	.806	.719	.815	.675	.808
Original Area, sq. in.	.670	.622	.545	.631	.498	.569
Fractured Area, sq. in.	.612	.510	.406	.521	.358	.513
Elastic Limit, lbs. actual	33,850	33,400	33,260	34,970	29,590	30,060
Maximum Load, lbs. actual.	35,100	49,280	54,730	52,000	52,310	38,140
Elongation in 6 inches	.16	.97	1.54	.91	1.54	.46
Elastic Limit per sq. in.	50,520	53,700	61,030	55,420	59,420	52,830
Tensile Strength per sq. in.	52,390	79,230	100,430	82,410	105,030	67,030
Per cent. Elong. in 6 inches	2.67	16.16	25.16	15.16	25.67	7.50
Per cent. Reduction of Area	8.65	18.00	25.50	17.43	28.11	9.84
Character of Fracture	Coarse Burned.	Open Grain	Light color Fine grain	Open Grain	Light color Fine grain	Very open grain Coarse Burned

Marks	3-G	3-H	3-I	3-J	3-K	3-L
Specimens cut from			Cast and ground			
Original Dimensions	.871	.870	.866	.875	.826	.824
Dimensions after Fracture.	.845	.736	.751	.828	.781	.805
Original Area, sq. in.	.596	.594	.589	.601	.536	.533
Fractured Area, sq. in.	.561	.425	.443	.538	.479	.509
Elastic Limit, lbs. actual.	31,870	33,630	33,180	32,380	30,270	29,400
Maximum Load, lbs. actual.	32,350	60,470	57,990	35,100	40,100	30,430
Elongation in 6 inches.	.17	1.51	1.43	.26	.65	.20
Elastic Limit per sq. in.	53,470	56,620	56,330	53,880	56,470	55,160
Tensile Strength per sq. in.	54,280	101,800	98,450	58,410	74,810	57,100
Per cent. Elong. in 6 inches	2.83	25.16	23.83	4.33	10.83	3.33
Per cent. Reduction of Area	5.87	28.45	24.79	10.47	10.63	4.50
Character of Fracture.	Coarse 25% flaw	Light color Fine grain	Grey. Slightly coarse	Coarse Burned	Slag. Partly burned	Hot check

Marks	3-M	3-N	2-N	2-O	2-P	2-Q
			Cast and ground			
Original Dimensions	.885	.675	.791	.890	.784	.935
Dimensions after Fracture.	.835	.608	.721	.745	.679	.795
Original Area, sq. in.	.615	.358	.491	.622	.483	.687
Fractured Area, sq. in.	.548	.290	.408	.436	.362	.496
Elastic Limit, lbs. actual.	32,660	23,240	28,610	35,080	38,310	36,630

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	30		20		10	
Maximum Load, lbs. actual.	47,220	28,000	52,120	63,430	53,640	64,950
	$5\frac{1}{2}$	.50				
Elongation in 6 inches.....	.83		1.32	1.38	1.71	1.25
Elastic Limit per sq. in....	53,100	64,920	58,270	56,400	79,320	53,320
Tensile Strength per sq. in.	76,780	78,210	106,150	101,980	111,070	94,540
	$5\frac{1}{2}$	9.09				
Per cent. Elong. in 6 inches	13.83		22.	23.	28.50	20.83
Per cent. Reduction of Area	10.90	18.99	16.91	29.8	25.05	27.80
Character of Fracture.....	Moderately Coarse	Granular Blow Holes	Grey Fine grain	Fine grain Several slag holes	Light color Fine grain	Slag holes Fine grain

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Marks	1-A	1-B	1-C	1-D
		Sand cast		
Original Dimensions	.883	.856	.879	.879
Dimensions after Fracture	.810	.775	.748	.752
Original Area, sq. in.	.612	.575	.607	.607
Fractured Area, sq. in.	.515	.472	.439	.444
Elastic Limit, lbs. actual	26,400	26,980	26,080	25,000
Maximum Load, lbs. actual	49,680	40,280	50,540	49,320
Elongation in 5 inches	Broke in jaw	.20	.36	Broke in jaw
Elastic Limit per sq. in.	43,140	46,920	42,970	41,190

Tensile Strength per sq. in.			81,180	70,050	83,260	81,260
Per cent. Elong. in 5 inches				4.00	7.20	
Per cent. Reduction of Area			15.85	17.9	27.67	26.85
Character of Fracture			Grey. Slag holes	Grey. Slag holes	Grey white Slag holes	Grey Porous.
Marks	5	5-A	5-B	5-C	5-D	6
Specimen cut from			Cast and ground			
Original Dimensions	.970	1.013	1.017	1.004	1.026	.965
Dimensions after Fracture.	.924	.957	.974	.960	.999	.934
Original Area, sq. in.	.739	.806	.812	.791	.818	.731
Fractured Area, sq. in.	.671	.719	.745	.724	.784	.685
Elastic Limit, lbs. actual.	49,010	49,630	52,430	45,640	48,410	47,180
Maximum Load, lbs. actual.	67,950	87,200	78,930	76,710	66,800	76,080
Elongation in 6 inches	.43	.70	.46	.48	.30	.57
Elastic Limit per sq. in.	66,320	61,580	64,570	57,670	59,180	64,540
Tensile Strength per sq. in.	91,950	108,200	97,210	96,980	81,670	104,080
Per cent. Elong. in 6 inches.	7.16	11.67	7.67	8.00	5.00	9.5
Per cent. Reduction of Area	9.2	10.79	8.35	9.47	4.15	6.3
Character of Fracture	Moderately Coarse	Fairly fine Grey.	Coarse Grey.	Fairly fine	Coarse Grey.	Fine grain Grey.

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Marks	6-A	6-B	13-A	13-B
Original Dimensions	.748 x .742	.767 x .753	.887 x .904	.887 x .903
Dimensions after Fracture	.740 x .725	.747 x .738	.806 x .810	.792 x .797
Original Area, sq in.	.555	.578	.802	.801
Fractured Area, sq. in.	.537	.551	.653	.631
Elastic Limit, lbs. actual	53,020	48,310	40,280	45,150
Maximum Load, lbs. actual	68,700	64,440	70,430	79,730
			Broke	Broke
Elongation in 8 inches	.25	.20	in jaws	in jaws
Elastic Limit per sq. in.	95,530	83,580	50,230	56,370
Tensile Strength per sq. in.	123,780	111,500	87,820	99,540
Per cent. Elong. in 8 inches	3.12	2.50		
Per cent. Reduction of Area	3.24	4.67	18.58	21.23
Character of Fracture	Velvety Dark	Velvety Dark	Grey Moderately Coarse	Grey Fine.

Marks	6-C	6-D	6-E	6-F
		Cast & ground		
Original Dimensions	1.022	.992	.965	1.028
Dimensions after Fracture	.902	.923	.909	.960
Original Area, sq. in.	.820	.773	.731	.830
Fractured Area, sq. in.	.639	.669	.649	.724

Elastic Limit, lbs. actual			35,330	29,850	38,210	41,720
Maximum Load, lbs. actual			84,330	53,220	53,640	66,400
Elongation in 6 inches			1.33	.43	.40	.40
Elastic Limit per sq. in			43,090	38,620	52,270	50,260
Tensile Strength per sq. in			102,840	68,850	73,380	80,000
Per cent. Elong. in inches			22.17	7.17	6.67	6.67
Per cent. Reduction of Area			22.07	13.45	11.22	12.78
Character of Fracture			Yellowish white close	Coarse grain flaw	Coarse Somewhat spongy.	Dry grain check.
Marks	11-A	11-B	11-C Sand Cast	11-D	11-E	14
Original Dimensions	1.512 x 1.536	1.52 x 1.51	1.499 x 1.522	1.557 x 1.504	1.616 x 1.515	.966
Dimensions after Fracture	1.430 x 1.438	1.385 x 1.36	1.385 x 1.40	1.422 x 1.420	1.516 x 1.400	.915
Original Area, sq. in.	2.322	2.295	2.281	2.342	2.448	.733
Fractured Area, sq. in.	2.056	1.884	1.939	2.019	2.122	.658
Elastic Limit, lbs. actual	119,800	111,670	118,330	128,460	135,070	32,120

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Maximum Load, lbs. actual	163,530	160,770	189,100	192,970	184,840	44,750
Elongation in 8 inches 6″	.63	1.15	1.05	Broke in jaws	.75	.15
Elastic Limit per sq. in.	51,600	48,660	51,880	54,850	55,180	43,820
Tensile Strength per sq. in. 6″	70,430	70,050	82,900	82,400	75,510	61,050
Per cent. Elong. in 8 inches	7.87	14.38	13.12		9.38	2.50
Per cent. Reduction of Area	11.46	17.91	15.00	13.79	13.31	10.23
Character of Fracture	Moderately Fine grain	Coarser than 11-A	Grey Fine grain	Grey Fine grain	Coarser than 11-D	Crystaline
Marks		O-A	O-C	O-F	8-A	8-C
				Sand Cast.		
Original Dimensions		1.480 x .735	1.525 x .723	1.496 x .712	1.535 x .776	1.502 x .771
Dimensions after Fracture		1.418 x .695	1.363 x .655	1.361 x .633	1.346 x .710	1.316 x .649
Original Area, sq. in.		1.088	1.102	1.065	1.191	1.158

Fractured Area, sq. in.	.985	.893	.862	.956	.854
Elastic Limit, lbs. actual.	48,960	52,980	51,180	61,770	67,400
Maximum Load, lbs. actual.	66,950	71,090	64,850	96,510	97,180
Elongation in 8 inches.		.92	.62	1.13	1.25
Elastic Limit per sq. in.	45,000	48,080	48,060	51,860	58,200
Tensile Strength per sq. in.	61,540	64,520	60,900	81,030	83,920
Per cent. Elong. in inches.		11.50	7.75	14.12	15.62
Per cent. Reduction of Area.	9.46	18.96	19.06	19.73	26.25
Character of Fracture.	Shrinkage flaws	Burnt one side	Slag hole Hot check	Grey white Fine grain	Grey white Fine grain

933

Marks.	4-A	4-B	4-C	4-F	4-G
			Cast & ground		
Original Dimensions	1.085	1.086	8.90	1.029	9.75
Dimensions after Fracture.	1.029	1.051			.965
Original Area, sq. in.	.925	.926	.622	.832	.747
Fractured Area, sq. in.	.832	.868			.731
Elastic Limit, lbs. actual.	55,340	52,650	19,160	11,610	15,590
Maximum Load, lbs. actual.	58,960	60,240	19,160	11,610	15,590
$3\frac{1}{2}$					.10
Elongation in 6 inches.	.20	.20	.23		
Elastic Limit per sq. in.	59,830	56,860	30,800	13,950	20,870

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Tensile Strength per sq. in.....		63,740	65,060	30,800	13,950	20,870
Per cent. Elong. in 6 inches.....		3.33	3.83	Broke outside small section.	Broke in fillet	2.85
Per cent. Reduction of Area.....		10.05	6.26			2.14
Character of Fracture.....		Coarse grain Flaws	Coarse grain Blowholes.	Coarse Blowholes.	Coarse Blowholes.	Coarse Blowholes.
Marks.....	T-1	T-2	5-E	5-F	5-G	5-H
			Cast and ground			
Original Dimensions	.995	1.005	.992	1.005	.967	.963
Dimensions after Fracture.		.967	.852	.835	.900	.888
Original Area, sq. in.....	.777	.793	.773	.793	.734	.728
Fractured Area, sq. in.....		.734	.570	.548	.636	.619
Elastic Limit, lbs. actual..	38,700	42,680	27,930	25,370	34,270	34,870
Maximum Load, lbs. actual.	43,000	50,040	73,330	82,970	73,210	58,440
Elongation in 6 inches.....		.16	1.18	1.73	.92	.57
Elastic Limit per sq. in....	49,800	53,820	36,130	31,990	46,690	47,900
Tensile Strength per sq. in.	55,340	63,100	94,870	104,630	99,740	80,280
Per cent. Elong. in 6 inches.	Broke outside measure	2.67	19.67	28.83	15.33	9.50

Per cent. Reduction of Area.. section.		7.44	26.26	30.90	13.35	14.97
Character of Fracture.....	Coarse Shrink holes	Coarse Shrinkage	Medium Coarse	Medium Coarse	Coarse Grey	Coarse Grey
Marks.....	XXX-A	XXX-B	XXX-C	XXX-D	XXX-E	XXXX
			Hammered & ground			
Original Dimensions	.662	.584	.608	.631	.591	.601
Dimensions after Fracture.	.577	.551	.473	.495	.547	.589
Original Area, sq. in.....	.344	.268	.290	.313	.274	.284
Fractured Area, sq. in.....	.261	.238	.176	.192	.235	.272
Elastic Limit, lbs. actual...	22,310	22,350	17,000	19,680	23,220	10,500
Maximum Load, lbs. actual.	44,600	29,980	41,400	46,100	34,640	17,810
6″						
Elongation in 8 inches.....	1.96	.73	3.78	3.93	1.05	.33
Elastic Limit per sq. in....	64,860	83,400	58,620	62,880	84,740	36,970
Tensile Strength per sq. in.	129,670	111,880	142,760	147,290	126,430	62,710
6″						5.50
Per cent. Elong. in 8 inches.	24.50	9.12	47.25	49.12	13.12	
Per cent. Reduction of Area	24.13	11.20	39.31	38.66	14.23	4.22
Character of Fracture.....	Fine grain Light grey.	Fine Grey.	Fine Light grey Piped	Fine silky grain Piped	Slightly coarser.	Coarse Burnt.

Marks	XX-A	XX-B	XX-C
	Rolled & ground.		
Original Dimensions	.949	.946	.946
Original Area, sq. in.	.707	.703	.703
Elastic Limit, lbs. actual.	37,120	35,230	32,650
Maximum Load, lbs. actual.	82,840	88,400	87,400
Elongation in 6 inches.	1.08	1.40	1.23
Elastic Limit per sq. in.	52,500	50,110	46,440
Tensile Strength per sq. in.	117,180	125,750	124,330
Per cent. Elong. in 6 inches.	18.00	23.33	20.50
Per cent. Reduction of Area.		Broke in jaws	
Character of Fracture.	Fine grain Grey	Slightly Coarse	Slightly Coarse.

NOTE:—Fracture occurred outside of points used for measuring elongation.

Marks	XX-D	XX-E	XXX	XXXX
Original Dimensions	.846	.886	.840	.825
Dimensions after Fracture.	.778	.791		.734
Original Area, sq. in.	.562	.616	.554	.535
Fractured Area, sq. in.	.475	.491		.423
Elastic Area, lbs. actual.	34,580	25,100	28,000	29,170
Elastic Limit, lbs. actual.	69,540	74,700	31,420	44,630
Elongation in 6 inches.	1.23	1.06		.75

Elastic Limit per sq. in.	61,530	40,750	50,540	54,530
Tensile Strength per sq. in.	123,730	121,280	56,720	83,420
Per cent. Elong. in 6 inches	20.50	17.67	Broke in jaw	12.50
Per cent. Reduction of Area	15.48	20.29		20.94
Character of Fracture	Fine grain Grey Fracture occurred at punch mark.	Fine grain Piped	Burnt	Burned Piped

Marks	XXXX-A	XXXX-B	XXXX-C	XXXX-D
	Hammered and ground.			
Original Dimensions	.690	.704	.713	.664
Dimensions after Fracture	.607	.598	.622	.570
Original Area, sq. in.	.374	.389	.399	.346
Fractured Area, sq. in.	.289	.281	.304	.255
Elastic Limit, lbs. actual	21,170	21,510	19,400	18,850
Maximum Load, lbs. actual	48,490	55,910	50,800	46,280
Elongation in 8 inches	1.87	2.50	2.00	1.78
Elastic Limit per sq. in.	56,600	55,290	48,620	54.480
Tensile Strength per sq. in.	129,650	143,730	127,330	133,760
Per cent. Elong. in 8 inches	23.37	31.25	25.00	22.25
Per cent. Reduction of Area	22.72	27.76	23.81	26.30

937

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Character of Fracture	Brownish Grey Fine grain Longitudinal crack.		Dark grey Fine grain	White grey Center crack	Grey. Piped
Marks	XIX	XIIX	X	X	X
	Hammered & ground		Rolled & ground.		
Original Dimensions	.312	.351	.858	.846	.856
Dimensions after Fracture	.271	.303	.793	.773	.777
Original Area, sq. in.	.076	.097	.578	.562	.575
Fractured Area, sq. in.	.057	.072	.494	.469	.474
Elastic Limit, lbs. actual	4,610	5,360	38,650	35,890	34,850
Maximum Load, lbs. actual	9,760	9,920	78,950	78,140	79,330
Elongation in 6 inches	1.73	1.10	1.15	1.13	1.25
Elastic Limit per sq. in.	60,660	55,250	66,870	63,860	60,610
Tensile Strength per sq. in.	128,420	102,280	136,600	139,040	137,960
Per cent. Elong. in 6 inches	28.83	18.33	19.16	18.83	20.83
Per cent. Reduction of Area	25.00	25.78	14.53	16.55	17.57
Character of Fracture	Hammer flaws	Hammer flaws.	Very fine. Grey.	Very fine. Grey.	Very fine. Grey.

Marks	6-H	6-J	P-A	P-B
Original Dimensions	.967	1.030	.997	.986
Dimensions after Fracture	.837	.880	.995	.977
Original Area, sq. in	.734	.833	.781	.764
Fractured Area, sq. in	.550	.608	.777	.750
Elastic Limit, lbs. actual	35,250	39,100	21,560	10,180
Maximum Load, lbs. actual	97,290	80,950	21,560	10,180
4″			.04	.05
Elongation in 6″ inches	2.21	1.51		
Elastic Limit per sq. in	48,030	46,940	27,600	13,320
Tensile Strength per sq. in	132,540	97,180	27,600	13,320
4″			1.00	1.25
Per cent. Elong. in 6 inches	36.83	25.16		
Per cent. Reduction of Area	25.07	27.01	.51	1.82
Character of Fracture	Fine Grey white	Coarser.	Coarse Blowholes	Coarse Hot check

Marks	O-D	O-E	M-1	M-2
Original Dimensions	1.517 x .704	1.510 x .733	.945	.916
Dimensions after Fracture	1.442 x .680	1.453 x .700	.857	.845
Original Area, sq. in	1.068	1.107	.701	.659
Fractured Area, sq. in	.981	1.017	.577	.561

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Elastic Limit, lbs. actual			48,080	41,250	25,400	22,310
Maximum Load, lbs. actual			74,240	73,670	48,090	39,900
Elongation in 8 inches			.48	.40	.85	.70
Elastic Limit per sq. in			45.020	37,260	36,230	33,860
Tensile Strength per sq. in			69,520	66,560	68,600	60,550
Per cent. Elong. in 8 inches			6.00	5.00	10.63	8.75
Per cent. Reduction of Area			8.14	8.13	17.69	14.86
Character of Fracture			Coarse Dark Grey	Coarse Dark Grey	Spongy Center	Spongy Piped
Marks	S-1	S-5	S-6	S-7	S-2	P-H
			Cast and ground			
Original Dimensions	.818	.943	.955	.852	.872	.996
Dimensions after Fracture	.805	.837	.840	.782		.992
Original Area, sq. in	.526	.698	.716	.570	.597	.779
Fractured Area, sq. in	.509	.550	.554	.480		.773
Elastic Limit, lbs. actual	30,160	35,470	35,640	29,670	46,070	54,170
Maximum Load, lbs. actual	49,100	48,500	50,150	40,750	46,070	54,170
	7″	.58				.04 in 6½″
Elongation in 8 inches	.65		.60	.57		
Elastic Limit per sq. in	57,340	50,820	49,780	52,060	77,170	69,540
Tensile Strength per sq. in.	93,340	69,480	70,040	71,500	77,170	69,540
	7″	8.28			Broke	

Per cent. Elong. in 8″ inches	8.12		7.50	7.12	outside	.61 in 6½″
Per cent. Reduction of Area.	3.24	21.20	22.62	15.79	small section	7.70
Character of Fracture.....	Fine White	Fine Grey white Shrinkage flaws	Coarser Grey white Shrinkage flaws	Coarse Grey. Shrinkage flaws	Grey. Hot check	Coarse Grey.
Marks.....	S-3	S-4	Z-1	Z-2	Z-3	Z-4
Original Dimensions			Casting not trued up Irregular shape			
Original Area, sq. in.....	2.29	2.22	1.66	1.74	1.71	
Fractured Area, sq. in.....	2.07				1.34	
Elastic Limit, lbs. actual...	88,790	71,560	75,630	89,730	66,590	101,840
Maximum Load, lbs. actual.	147,320	133,410	122,460	124,370	124,170	118,350
Elongation in 8 inches....		.20		.68	.75	.35
Elastic Limit per sq. in.....	38,770	32,230	45,560	51,570	38,985	53,390
Tensile Strength per sq. in..	64,330	60,100	73,770	71,480	72,620	61,970
Per cent. Elong. in 8 inches..	Broke at jaw	2.50	Broke at jaw	8.50	9.31	4.37
Per cent. Reduction of Area.	9.6	Broke outside smallest section		Broke outside smallest section	22.80	Broke outside smallest section
Character of Fracture.....	Grey. Coarse Shrinkage flaw.	Grey. Coarse Casting flaw.	Grey. Fine.	Grey. Small crystaline.	Grey. Fine.	Grey. Fine. One corner burned.

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Marks	10-B	
	2″ Rolled	
Original Dimensions	1.983	2.00
Dimensions after Fracture	1.906	
Original Area, sq. in	3.088	3.141
Fractured Area, sq. in	2.853	
Elastic Limit, lbs. actual	152,500	164,170
Maximum Load, lbs. actual	270,800	
Elongation in 8 inches	.50	1.00
Elastic Limit per sq. in	49,380	52,260
Tensile Strength per sq. in	87,690	
Per cent. Elong. in 8 inches	6.25	12.50
Per cent. Reduction of Area	7.61	
Character of Fracture	Fine grain Grey.	

Tested to limit of mch. 300,000# or 95,500 per sq. in. without fracture. 1″ elongation under this load.

REPORT OF TRANSVERSE TEST OF MANGANESE STEEL SUBMITTED BY AMERICAN BRAKE SHOE & FOUNDRY CO.

All bars were tested by laying bars on rounded knife edge, 8″ center to center, and applying the load in the center. Deflections were read for different loads until a deflection of about ½″ had been obtained, after which loading was continued until maximum load was obtained. After testing the piece was measured to determine the angle of the bend.

TEST No. 1.
Mark, 11-F
Width .....1.530″
Depth .....1.528″

Load.	*Deflection.*	*Load.*	*Deflection.*
2,000lb	.007″	24,000lb	.064″
4,000	.011	26,000	.075
6,000	.018	28,000	.093
8,000	.023	30,000	.115
10,000	.027	32,000	.155
12,000	.030	34,000	.212
14,000	.033	36,000	.283
16,000	.040	38,000	.368
18,000	.045	40,000	.475
20,000	.052	41,000	.530
22,000	.057	52,570	Maximum Load

Small cracks on corners.

Angle of bend at maximum load, 45°.

TEST No. 2.
Mark, 11-C
Width .....1.545″
Depth .....1.501″

Load.	*Deflection.*	*Load.*	*Deflection.*
2,000lb	.004″	22,000lb	.064″
4,000	.013	24,000	.072
6,000	.020	26,000	.084
8,000	.030	28,000	.098
10,000	.030	30,000	.123
12,000	.035	32,000	.164
14,000	.044	34,000	.217
16,000	.050	36,000	.288
18,000	.051	38,000	.378
20,000	.060	39,000	Maximum Load.
			Cracked.

Angle of bend at maximum load, 14°.

TEST No. 3.
Mark, 8-B
Width .....1.533″
Depth ..... .778″

Load.	*Deflection.*
2,000lb	.028″
4,000	.064
5,000	.088
6,000	.113
7,000	.170
8,000	.357
8,500	.500
10,700	Maximum Load—Bar checked.

Angle of bend at maximum load, 48°.

TEST No. 4.
Mark, 8-D
Width .....1.567″
Depth ..... .750″

Load.	*Deflection.*
2,000lb	.033″
3,000	.055
4,000	.078
5,000	.100
6,000	.141
7,000	.223
8,000	.444
8,200	.530
9,700	Maximum Load—bar checked.

Angle of bend at maximum load, 50°.

TEST No. 5.
Mark, 0-B
Width .....1.503″
Depth ..... .746″

Load.	*Deflection.*
2,000lb	.022″
3,000	.049
4,000	.068
5,000	.114
6,000	.235
6,500	.419
6,750	.530
8,360	Maximum Load—Checks in bar.

Angle of bend at maximum load, 53°.

TEST No. 6.
Mark, 0-G
Width .....1.515″
Depth ..... .738″

Load.	*Deflection.*
2,000lb	.026″
3,000	.040
4,000	.050
5,000	.073
6,000	.112
7,000	.217
7,500	.310
8,000	.481
9,780	Maximum Load
	Crack in bar.

Angle of bend at maximum load, 52°.

TEST No. 7.
January 12th, 1906.
Mark, 0-E
Width .....1.448″
Depth ..... .739″

Load.	*Deflection.*
2,000lb	.023″
4,000	.061
6,000	.205
7,000	.480

Angle of bend when bar checked, 67°.

TEST No. 8.
January 12th, 1906.
Mark, 0-D
Width .....1.524″
Depth ..... .727″

Load.	*Deflection.*
2,000lb	.019″
4,000	.051
5,000	.080
6,000	.140
7,000	.270
8,000	.550

After deflecting bar about ½″, the bar was further bent by pressing the two ends together. The angle of bend was 128° when the bar cracked.

REPORT OF CRUSHING TESTS ON MANGANESE STEEL WHEELS SUBMITTED BY AMERICAN BRAKE SHOE & FOUNDRY CO.

The wheels were tested by supporting the wheels on a flat bar under the tread and applying the load on another flat bar laid on the tread.

Before beginning reading for deflection a load of 50,000 lb was applied to each wheel to bring all bearing surfaces to a true bearing, after which the test was begun at a load of 5,000 lb.

TEST NO. 1.

Mark, AAA
Size Wheel .... 12″
Weight 39lb

Load.	*Deflection.*	*Load.*	*Deflection.*
5,000lb	.000″	90,000lb	.092″
10,000	.010	100,000	.127
20,000	.023	110,000	.158
30,000	.035	120,000	.198
40,000	.037	130,000	.254
50,000	.043	140,000	.325
60,000	.046	150,000	.423
70,000	.052	160,000	.552
80,000	.080	165,000	.646
		165,580	Maximum Load, Crack in hub.

After testing to maximum load the wheel flattened to a height of 7⅝″. A crack in flange tore into tread.

TEST No. 2.
Mark DDD
Size wheel ..... 12″
Weight 38lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*
5,000lb	.000″	80,000lb	.088″	130,000lb	.377″
10,000	.008	90,000	.110	135,000	.440
20,000	.017	100,000	.149	140,000	.520
30,000	.025	105,000	.170	145,000	.613
40,000	.031	110,000	.195	150,000	.723
50,000	.040	115,000	.228	155,000	.848
60,000	.050	120,000	.268	160,000	1.030
70,000	.069	125,000	.313	165,000	1.33
				166,370	1.42 Maximum Load.

Checks in hub and cracks in two spokes.

After testing to maximum load this wheel was flattened to a height of 6⅜″. No cracks in tread or flange.

TEST No. 3.
Mark T
Size wheel ..... 12″
Weight 38lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*
5,000lb	.000″	60,000lb	.054″	110,000lb	.207″
10,000	.009	70,000	.072	115,000	.243
20,000	.018	80,000	.093	120,000	.309
30,000	.030	90,000	.120	125,000	.537
40,000	.038	100,000	.156	125,590	Maximum Load,
50,000	.046	105,000	.179		

Crack in hub.

After testing to maximum load this wheel was flattened to a height of 6¼″. No cracks appeared in tread or flange.

TEST No. 4.

Mark CCC
Size wheel ..... 12″
Weight 39lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	60,000lb	.021″	110,000lb	.185″	
10,000	.009	70,000	.039	115,000	.225	
20,000	.010	80,000	.060	120,000	.283	
30,000	.012	90,000	.089	125,000	.335	
40,000	.014	100,000	.128	130,000	.394	
50,000	.015	105,000	.154	132,250	.485	Max. Load.

Checks & small crack in hub.

After testing to maximum load this wheel was further flattened down to a height of 8¾″. There was one crack through the flange and two cracks across the tread.

TEST No. 5.

Mark HHH
Size wheel ..... 12″
Weight .....

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	70,000lb	.043″	120,000lb	.220″	
10,000	.009	80,000	.060	125,000	.268	
20,000	.018	90,000	.083	130,000	.335	
30,000	.021	100,000	.115	135,000	.383	
40,000	.025	105,000	.134	140,000	.460	
50,000	.030	110,000	.159	145,000	.560	
60,000	.037	115,000	.188	150,000	.800	Max. Load.

Cracks in Hub.

After testing to maximum load the wheel was further flattened down to a height of 7″. No cracks appeared in tread or flange.

TEST NO. 6.

Mark U
Size wheel .... 12″
Weight 36lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	60,000lb	.051″	110,000lb	.355″	
10,000	.008	70,000	.075	115,000	.460	
20,000	.014	80,000	.104	120,000	.607	
30,000	.023	90,000	.152	121,980	.720	Max. Load.
40,000	.032	100,000	.226			
50,000	.039	105,000	.283			Crack in Hub.

After testing to maximum load the wheel was further flattened down to a height of 8⅞″. There was one crack through the flange with several checks across the tread.

TEST NO. 7.

Mark T 2
Size wheel .... 14″
Weight 42lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	50,000lb	.040″	100,000lb	.222	
10,000	.007	60,000	.063	105,000	.269	
20,000	.015	70,000	.090	110,000	.346	
30,000	.024	80,000	.121	115,000	.442	
40,000	.033	90,000	.162	116,570	.535	Max. Load.
						Cracks in Hub.

After testing to maximum load the wheel was flattened down to a height of 5⅛″. A crack appeared in the flange about ½″ deep.

TEST No. 8.

Mark T 3

Size wheel ..... 14″

Weight 42lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	40,000lb	.031″	80,000lb	.100″	
10,000	.004	50,000	.039	90,000	.138	
20,000	.015	60,000	.054	100,000	.262	
30,000	.023	70,000	.073	105,050	.550	Max. Load.
					Crack in hub.	

TEST No. 9.

Mark T 4

Size wheel ..... 14″

Weight 41lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	60,000lb	.060″	110,000lb	.280″	
10,000	.009	70,000	.078	115,000	.342	
20,000	.019	80,000	.100	120,000	.441	
30,000	.029	90,000	.132	120,670	.520	Max. Load.
40,000	.039	100,000	.189			
50,000	.046	105,000	.228		Crack in hub.	

TEST No. 10.

Mark R

Size wheel ..... 12″

Weight 40lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	40,000lb	.015″	80,000lb	.075	
10,000	.000	50,000	.021	90,000	.106	
20,000	.003	60,000	.031	100,000	.129	
30,000	.010	70,000	.050	105,000	.144	
110,000	.160	130,000	.259	150,000	.428	
115,000	.180	135,000	.294	155,000	.525	
120,000	.200	140,000	.340	157,000	.610	Max. Load.
125,000	.228	145,000	.381		Check in hub.	

After testing to maximum load this wheel was further flattened down to a height of 9″ when the tread broke into two pieces.

TEST No. 11.

Mark T 5
Size wheel ..... 14″
Weight 44lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	50,000lb	.032″	100,000lb	.150″	
10,000	.004	60,000	.043	105,000	.182	
20,000	.010	70,000	.061	110,000	.220	
30,000	.020	80,000	.080	115,000	.288	
40,000	.027	90,000	.109	117,000	.380	Max. Load.
						Check in hub.

TEST No. 12.

Mark W-1
Size wheel ..... 14″
Weight 46lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	60,000lb	.030″	110,000lb	.127″	
10,000	.002	70,000	.038	115,000	.144	
20,000	.008	80,000	.053	120,000	.163	
30,000	.012	90,000	.071	125,000	.185	
40,000	.019	100,000	.096	130,000	.210	
50,000	.023	105,000	.110	131,700	.270	Max. Load.
						Check in hub.

TEST No. 13.

Mark W-2
Size wheel ..... 14″
Weight 46lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	30,000lb	.013″	60,000lb	.031″	
10,000	.005	40,000	.019	70,000	.044	
20,000	.010	50,000	.025	80,000	.062	
90,000	.083	110,000	.149	125,000	.220	
100,000	.112	115,000	.170	130,000	.262	
105,000	.130	120,000	.194	135,000	.300	
				137,400	.347	Max. Load.
						Check in hub.

TEST No. 14.

Mark W-3
Size wheel ..... 14″
Weight 47lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	80,000lb	.068″	130,000lb	.240	
10,000	.003	90,000	.088	135,000	.275	
20,000	.010	100,000	.113	140,000	.311	
30,000	.014	105,000	.130	145,000	.362	
40,000	.021	110,000	.148	150,000	.420	
50,000	.033	115,000	.169	155,000	.495	
60,000	.038	120,000	.191	157,250	.590	Max. Load.
70,000	.051	125,000	.212		Check in hub.	

TEST No. 15.

Mark W-4
Size wheel ..... 14″
Weight 46lb

Load.	*Def.*	*Load.*	*Def.*	*Load.*	*Def.*	
5,000lb	.000″	70,000lb	.039″	120,000lb	.196″	
10,000	.003	80,000	.054	130,000	.255	
20,000	.010	90,000	.080	140,000	.330	Spoke buckling.
30,000	.018	100,000	.112	145,000	.380	
40,000	.022	105,000	.130	150,000	.432	
50,000	.025	110,000	.150	155,000	.511	
60,000	.030	115,000	.172	159,000	.620	Max. Load.
					Check in hub.	

Opinion.

(Filed January 23, 1907.)

Mr. JOHN R. HARDIN and Mr. R. V. LINDABURY, for the complainant.

Messrs. COLLINS & CORBIN (Mr. C. L. Corbin) and Mr. JOHN B. GOODE, of the New York Bar, for the defendants.

Submited January 17, 1907.
Decided January 23, 1907.

BERGEN, *V. C.:*

The complainant is the owner of a plant at Highbridge, New Jersey, where it is engaged in the manufacture of steel. The prominent feature of complainant's business, and that in which it appears to have been very successful, is the manufacture of Manganese steel, a material of unusual hardness and toughness, which, together with other qualities it possesses, renders it a valuable agent where resistance to wear is required.

The discovery of the method to be generally followed in the manufacture of this steel was made by R. A. Hadfield, of Sheffield, England, who had issued to him patents there, and in the United States, protecting the use of his discovery from infringements, and the complainant, in 1892, commenced to manufacture this steel at Highbridge under a license from the patentee, he sending from England to Highbridge a skilled workman who remained there about nine months instructing the complainant's officers and superintendents in its manufacture. Since that time, the complainant alleges that it has, through experience and by experiment, introduced new methods in the manufacture of the article, which were not known to the patentee, nor disclosed in his patents, by which it

has greatly improved the excellence of the steel, and that these new methods and processes are secrets of its trade which it has successfully preserved as such, and which it has not communicated to any but trusted employees, under an express or implied promise not to reveal them. The principal patents expired in 1902, so that since that date the basic principle of the manufacture of this steel has been open to adoption by any one choosing to use it, but the complainant insists that the method and processes discovered by it, which have been kept secret, are necessary to give to the product the high commercial value which it has attained since it has been manufactured according to their secret processes.

In 1896, and before most of these alleged secret processes had been discovered, the defendant Nichols was employed by the complainant as an assistant superintendent, and, during his service, was taught by the company most of its discoveries. At the time of his employment, Nichols entered into the following written agreement:

"To the TAYLOR IRON AND STEEL CO., and R. A. HADFIELD:

"In consideration of the said Taylor Iron and Steel Co. allowing me to inspect its steel works on the R. A. Hadfield System, at Highbridge, N. J., giving me information in relation to the R. A. Hadfield System, I promise and give my word of honor that I will not, before January 1st, 1902, make known to any person whomsoever, except the officials of the said Taylor Iron and Steel Co., any information which I shall receive at the said works, nor any information or knowledge which I may obtain from said inspection, nor will I adopt or use, except on behalf of the said company, all or any part of any process or system or any mixture or combination of mixtures in use at the said works,

whether what I shall see or be informed or learn may be novel or not. And that if I shall act contrary to my promise, then and in each case I will pay to each of you the sum of $2,500 as liquidated damages, and not by way of penalty.

Provided always that notwithstanding anything herein contained, I shall be at liberty to do any work which does not relate to steel castings of any kind, or Manganese steel or other steel, covered by the said R. A. Hadfield patents.

"WESLEY G. NICHOLS."

"Witness:

J. M. SHERRERD."

This written promise limited the term of secrecy to the year 1902, at which date the Hadfield patents then in force and under which the complainant was licensed expired, and plainly shows that it was intended to protect the patentee against disclosure of such processes and methods as he might communicate to the complainant, for it relates only to the "Hadfield System," and does not include discoveries by the complainant of such methods and processes as its experience and experiment might thereafter disclose; these were not within the scope of this promise, for all secret methods and processes so discovered were the property of the complainant and not of the patentee; such discoveries made by the complainant, and used by it to more perfectly work out the results expected under the patent were in the nature of improvements, and if the complainant chose to take the chances of preserving them as trade secrets, rather than seek the protection of a patent for the improvement, such secrets became its property, and the confidential relation existing between Nichols and his employer was such as to raise an implied promise that he would not disclose such of them as he learned,

or was taught while in complainant's employ. Even if it was the duty of complainant, under its agreement with Hadfield, to disclose such discoveries in confidence in him, that did not change the obligation of Nichols to preserve such additional methods as secrets of the complainant.

Nichols remained in the employ of the complainant until July 31, 1905, when he left them to enter the employment of the American Brake Shoe and Foundry Company, one of the defendants here. This corporation had a foundry at Chicago Heights, near the City of Chicago, and some time in the summer of 1904 began, under the direction of Mr. Potter, its superintendent, experiments looking to the manufacture of Manganese steel, under the formula disclosed in the Hadfield patents, and Mr. Potter testified that he had so far succeeded as to be able to produce a commercial product, but the evidence satisfied me that he had not been able to produce an article which met the requirements demanded of this special product as satisfactorily as that of the complainant, for it appears that up to the time of the trial of this cause the complainant was furnishing ninety-five per cent. of the total amount used in this country of certain special articles for which the use of Manganese steel is particularly desirable. Mr. Potter, by his testimony, demonstrates that he is a person of intelligence, and of great ability in the manufacture of steel, and while he testifies that he was able to produce Manganese steel of a good quality as the result of his experience at Chicago Heights, it appears that for some reason he was not able to produce the quality of steel manufactured at Highbridge, necessary for special uses, nor did the amount sold by the company indicate that it was able to satisfy the trade needing that quality of steel that he had done so.

Mr. E. J. Snow, one of the officers of the defendant corporation, testifies that in March, 1905, he went to Highbridge to visit a Mr. Estes, who was in the employ of the complainant company, and took with him a letter of introduction to Mr. Chrystie who was in charge of the complainant's foundry. The letter was from an old friend of Mr. Chrystie and sought permission for Mr. Snow to visit the complainant's works at Highbridge. Mr. Snow was kindly received, but told Mr. Chrystie that they permitted no one to enter the foundry where the Manganese steel was being made, but gave him permission to visit all other parts of the works. With this permission, Mr. Snow, in company with Mr. Estes, visited all parts of the works except the foundry, and after they had concluded their visit the defendant Nichols, who was at work in the foundry, was sent for by Mr. Estes. Mr. Snow testifies that he had never before seen or even heard of Nichols; that when he went to Highbridge he had no knowledge that there was any such person living, and yet in his interview with Nichols, which he testifies did not last more than ten minutes, he made him a very liberal offer to leave the complainant and enter the employ of his company. Precisely what this offer was, the evidence does not settle; some of the witnesses testify that Nichols said he was offered $7,000 a year and a bonus of $10,000 in stock of the company, while Mr. Snow says that he offered him only $5,000 a year, which was $2,000 more than they were then paying Mr. Potter, and just double the amount the complainant was paying Nichols. The admitted offer is sufficiently large to justify the conclusion that something more than the ordinary service of a superintendent was expected. Mr. Potter was only commanding a salary of $3,000, is undoubtedly a person of much greater learning and ability, in

steel making, than Nichols, who, so far as this case shows, had no scientific education, and was only a workman of more intelligence than is usually found among people of that class, being bright, alert, and able to pick up the different branches of the business, and to receive and retain instruction in the line of work with which he was familiar with greater aptitude than the ordinary class of workmen, and the offer made by Mr. Snow to this man within ten minutes after he had first seen him, and of whose capacity he had no knowledge, leads me to the conclusion that he was not seeking an ordinary superintendent, but rather a person familiar with the methods and processes in use at Highbridge, which he could take to Chicago Heights with him, and there teach the workmen of the defendant corporation the special methods and processes used at Highbridge, in order that the defendant might be able to produce the same character of material as that made at Highbridge, and thus facilitate competition, and, notwithstanding the denial by Mr. Snow of such intention, the proper inference to be drawn from the evidence is, that Potter had failed at Chicago Heights in producing a steel similar in character and quality to that made at Highbridge, and the only way to enable defendant to compete with the complainant was to secure some one from Highbridge who was in possession of the knowledge of the methods and processes in use there, of sufficient intelligence to communicate what he knew, and that the primary object of Mr. Snow in going to Highbridge was, if possible, to secure such a person. The defendant Nichols, after consulting with Mr. Brinton, declined the offer, whereupon the complainant and Nichols entered into a written contract by the terms of which he agreed to remain with the complainant for the term of five years, at a salary of $4,500, $3,000 of it to be paid

to him annually and $1,500 at the termination of the agreement, if he should live so long, and in the event of his death prior thereto, so much of the sum reserved as might then have accrued should be paid to his representatives. Another clause of the agreement provided:

> "(2) The said Wesley G. Nichols agrees that he will devote his entire time, skill, labor and attention during the term of his agreement to the service of the Taylor Iron & Steel Company, and that he will at all times faithfully perform the duties that may be assigned to him by the management of the said Taylor Iron & Steel Company, to the best of his skill and ability for the compensation aforesaid, and that he will not at any time, directly or indirectly, during the term of this agreement or afterwards, divulge to any person, firm, or corporation, except to the Taylor Iron & Steel Company, and its officers, any information of any nature now known to him, or hereafter acquired by him during the term of this agreement, relating to or regarding any processes of steel making or moulding or treating steel that may have been, is now, or may be hereafter, during the term of this agreement, used in the works of the Taylor Iron & Steel Company, and that he will at all times hold inviolate the treatment, processes and secrets known to or used by him in the works of the said Taylor Iron & Steel Company."

By the terms of this agreement, Nichols was to devote his entire time during its existence to the service of the complainant, and was not during the term of his agreement, or afterwards, to divulge, except to the complainant, any information then

known to him, or thereafter acquired by him during the term of the agreement, relating to the processes of making steel, that might have been or might thereafter be used by the complainant, and also that he would at all times hold inviolate the treatment, processes and secrets known to or used by him in the works of the complainant, until the expiration of the agreement.

The defendants assail this agreement, insisting that it is void as contrary to public policy because, as they claim, it restricts the defendant Nichols, for an unlimited time, from divulging, except to the complainant, all information of any nature known to him, regarding any process of steel making in use at the complainant's works, when it is admitted that some of the processes in use there are in general use in all steel foundries, and were known to Nichols before he entered the employment of the complainant, and they argue that if the contract should be strictly enforced, Nichols would be deprived of the means of making a livelihood through the use of knowledge which he had acquired before the complainant employed him, and which related to well known methods of steel manufacture. That the parties to this agreement intended to limit its application to processes in use by the complainant, which were not known to the defendant Nichols, until they were disclosed to him by the complainant, or to others, is clearly manifested. Contracts should be construed so as to sustain them "if such construction does no violence to their language, and the subject of the contracts is to be considered, and their terms are to be construed in reference thereto." *Trenton Pottery Co.* v. *Oliphant, 13 Dick., 507-517.* The portion of the contract objected to does not restrain the defendant Nichols from following his chosen avocation, he only contracts not to divulge

any information then known to, or to be thereafter acquired by him, during the term of his agreement, relating to the making of steel used by the complainant, and to hold inviolate the treatment, processes and secrets known to, or used by him in the works of the complainant, and my construction of this contract is that Nichols agreed not to divulge any of the treatments, processes and secrets which he had learned or might thereafter ment, processes and secrets of the complainant Still, if it be admitted that the covenant treated two subject matters, one relating to information known to the defendant Nichols before he entered the service of the complainant, and another that he would hold inviolate complainant's secrets, the covenant would be separable, and so much of it requiring Nichols to preserve inviolate the treatment, processes and secrets of the complainant would be enforceable even if part was void for the reasons urged by the defendants; under either view it is a valid contract made by Nichols to keep secret the processes of the complainant. The defendants also urge that the contract ought not to be upheld because it was signed by Nichols without full knowledge of its contents, and under circumstances which justify him in now insisting that he signed it through a mistake, and under a misapprehension of its effects, and that, in equity, he ought not now to be held to a performance of its conditions. It is sufficient to say on this branch of the case, that after the contract was signed, Nichols had it in his possession for some days when, he testifies, he took it to Mr. Brinton, his superior officer and personal friend, and complained of its terms, and that he was not aware of the extent to which he had bound himself. It it not disputed that at this time he fully understood the extent of the obligations he had assumed, yet notwithstanding this he retained

the contract, worked under it some months, accepted the increased compensation which it gave him, and made no further complaint until after he had left the service of the complainant. If the contract did not fully express his understanding of the agreement, it was his duty to rescind it promptly after discovering his mistake, and he cannot be allowed to accept the benefits which the contract conferred, with full knowledge of the obligations he had assumed on his part, and now, when he finds it convenient to be rid of it, set up the defense that he was mistaken as to its effect when he entered into it. If he chose to accept its benefits, as he did, he is estopped from setting up the defence which he now interposes. My conclusion on this branch of the case is, that the defendant Nichols entered into a contract to serve the complainant for five years, from March, 1905, and that he agreed that he would not divulge any of the secret processes relating to the manufacture of steel as practiced by the complainant, which he had acquired by instruction or observation, during the time he was in the service of the complainant, whether acquired before or after the making of the contract, and that he should be compelled to observe his pledge of secrecy.

After the making of this contract, and until the thirty-first day of July following, a period of over four months, Nichols remained with the complainant, and on the latter date he resigned his position for the avowed purpose of entering the service of the American Brake Shoe and Foundry Company, the other defendant in this cause. Previous to the date of his resignation, Nichols had been in consultation with the officers of the defendant corporation. He had exhibited to them his contract with the complainant, which they had submitted to counsel, who advised Nichols that he

could commit a breach of his contract with the complainant, without fear of injunctive restraint, and that the utmost liability he subjected himself to, if he pursued such a course, would be a suit for damages. The negotiations between Nichols and the defendant corporation resulted in an agreement between them that they would take him into their service at a salary of approximately $6,000 a year, if, after a visit to their works at Chicago Heights, he was satisfied to go to Chicago, and act as superintendent of that plant, whereupon Nichols went to Chicago Heights, and examined the works, but before taking charge he was enjoined by the order of a Court of the State of Illinois, from further visits to the plant, and from divulging complainant's secrets; subsequent to this, the bill of complaint in this cause was filed, and upon the hearing of an order to show cause, allowed thereon, a preliminary injunction was allowed by this Court, restraining the defendant corporation from employing Nichols, and also enjoining Nichols from divulging the trade secrets of the complainant. *Taylor Iron and Steel Co.* vs. *Nichols et al., 61 Atl., 946.* The cause is now to be disposed of on final hearing on pleadings and proofs.

The first important question to be determined is, has the complainant shown that it has secret methods and processes, important to its interest in the conduct of its business, of such a character as to entitle it to the aid of a court of equity in preventing a disclosure of them, by one of these defendants having knowledge of them to any one, and particularly to the other defendant seeking that knowledge for the purpose of applying it in competition with the complainant's business? Some of the complainant's witnesses, after describing the ordinary methods of producing what is

commercially known as Manganese steel, testified that certain other methods and processes were used at complainant's works, known only to complainant and its trusted servants, one of whom was the defendant Nichols, which were not known to the public, and were held as secrets belonging exclusively to the complainant, the use of which produced a character of steel practically beyond successful competition for use where material which will resist the effects of abrasion as far as possible is required. A disclosure of the secrets was sought by the defendant, by the cross-examination of complainant's witnesses, and on refusal by the witnesses to answer because, as claimed, it would disclose the secrets of the complainant, objection being interposed by complainant's counsel, all questions having for their object the disclosure of such secrets, were overruled, and testimony tending to the same result was excluded when it was sought to have the defendant Nichols describe the methods and processes claimed by the complainant to be secrets which he had learned while in the employ of the complainant. The exclusion of this evidence, while lacking the support of any reported case in this State, is not without authority elsewhere, and so far as I have been able to ascertain, has not been condemned by our Courts. The object of this suit is the preservation of complainant's property, and one of the means to accomplish that result is the restraining of the defendant Nichols from divulging complainant's secrets, which are property, to anyone, and especially to the defendant corporation, an intended competitor of the complainant in a line of goods in the manufacture of which these secrets are in the highest degree valuable and a necessary aid. To me it seems destructive of complainant's rights if the very secrets which it is seeking to

preserve are to be disclosed, under compulsion, in the presence of the party most interested in obtaining the knowledge, because the character of the business, the impossibility of discovery by analysis of the methods used, added to the ordinary secrecy observed by all manufacturers of goods of this class, would render almost hopeless the discovery of infringement, should the defendant take advantage of information thus acquired. It is admitted that the defendant corporation, seeking to employ the defendant Nichols, has not yet obtained complainant's secrets, and one of the principal objects of this proceeding is to prevent it from doing so, a futile effort, if its officers, representing it as parties, may sit by and hear in detail what it is intended, if the complainant shall make a case, they are not entitled to know. As was well said by Judge Colt in *Moxie Nerve-Food Company* vs. *Beach et al., 35 Fed., 465, 466:* "If these questions must be answered, every manufacturer will be at the mercy of anyone who desires to extort from him an account of his processes, for an attempt to restrain an infringer would result in the disclosure of all that makes the invention valuable." In *Stones Bros. Manf'g Co.* vs. *Heller et al., 56 Fed., 297,* an application was made to the court for an order allowing the complainant to inspect the machinery of the defendant and their processes for manufacturing rasps and files, in the making of which it was charged they were infringing complainant's patents, in order manifestly to enable the complainant to furnish evidence that the methods and processes of the defendant were those covered by complainant's letters patent. Judge Green denied the application, upon the ground that to compel defendant to submit their machinery to the inspection of their rivals, and to disclose to them the processes by which for so many years

they had made their business successful, would be unjust and inequitable. If it be admitted that the defendants sought to be restrained have already acquired complainant's secrets, it might be possible to try the cause *"en camera"* and restrict the extent to which the evidence should be printed for the use of the parties and the court, with the hope that the knowledge of the secret processes would be confined to those already in possession of them. My own view is that the attempt seldom meets with unqualified success, but I am quite satisfied that where the defendant has not obtained the secret knowledge, and the effort is to prevent him from doing it, the complainant's refusal to disclose such secrets, in support of his case, should be respected, for it rests with him to satisfy the court that he has a secret. A very instructive case on this subject is that of *Eastman* v. *Reichenback, 20 N. Y. Sup., 110,* which was subsequently affirmed on the opinion of Judge Adams in the court below. The complete record of this case shows that witnesses were not compelled to disclose the secrets sought to be preserved.

The solving of the question whether the complainant here has such a secret as equity will assist it in preserving is not, of course, as easy as if the secrets were disclosed, and it was shown that they were not known to or used by others; still if complainant has without disclosing them satisfied the Court that it has secrets of value which it uses in its trade, and they have been imparted to or obtained by its servant under a contract express or implied not to divulge them, the complainant will be entitled to relief. It is a question simply of sufficiency of evidence.

Witnesses were produced by the complainant who were persons skilled in steel making, among them being Henry M. Howe, Professor of Metal-

lurgy of Columbia University, all of whom had personal knowledge of the methods and processes in use at complainant's works, and also a general knowledge of those used in other steel foundries, which were not deemed secrets of the trade in the respective foundries. These witnesses declare that the complainant has in use at its works, methods and processes in the manufacture of Manganese steel not known to or used by others, and are the secret property of complainant, discovered by it through years of experiment. The witnesses, Mr. Brinton and Dr. Howe, testify that these secrets relate to the initial mixture; the method of treatment in the cupola, and during transference from cupola to converter; to the regulating of the temperature while in the converter, and to the determining of when the process is complete; to the making of patterns, and the treatment after the molten steel has been cast into moulds, both as to the temperature at which the casting shall be removed from the moulds to the annealing furnace, and at what heat they are to be taken from the latter furnace. If these witnesses are to be believed, the complainant has methods and processes for the production of finished Manganese steel, known only to the complainant, and the use of which results in a product not matched by any other Manganese steel on the market for uniformity in hardness and toughness, qualities which have commanded for the complainant substantially the entire market of the United States where such qualities are needed, particularly for crushed jaws on stone crushers and lips on mining buckets, where great resistance against wearing is necessary.

The defendant Nichols as a witness denied that the methods and processes in use at Highbridge by the complainant were secrets, but it is ap-

parent that this statement must be taken with some modification, for when he went to that place he had no knowledge whatever regarding the manufacture of Manganese steel, all his training had related to the making of ordinary steel, and all he knew about the making of Manganese steel, was taught to him by the complainant at Highbridge, he remained with them there nine years and until he sought to take employment with the defendant corporation, nor is there any evidence that he had the opportunity to learn or know what methods were in use in other foundries, so that what he learned from day to day at Highbridge was an ordinary incident of his occupation and the constant increase of knowledge, and the improvements which he admits they were making in the manufacture of this special steel may not have impressed him as a matter to be kept secret, although he admits a constant improvement in the quality of complainant's products, and that "the natural tendency would be to develop something better each day, as we were endeavoring all the time." It is not without significance that Nichols in 1905, after he had been with the complainant for many years, entered into a contract, by the terms of which, among other things, he agreed that he would "at all times hold inviolate the treatment, processes and secrets known to, or used by him in the works of" the complainant. It is difficult to understand why this defendant would enter into a solemn obligation in writing, to keep inviolate the secrets of his employer, if there were no secret in existence. The inference to be drawn from the testimony of Nichols is, that by experiment and constant effort to improve their products, the complainant had discovered methods and processes of value in the manufacture of Manganese steel, not in use elsewhere, or known to others, which tended to pro-

duce a higher grade of that article than was manufactured by any other steel maker, results which the defendant corporation, with the advantage of the use of the Hadfield patents, which had expired, was not able to reach, for its officer, Mr. Snow, during his first interview with Mr. Nichols, told him that they were having trouble in making Manganese steel at Chicago Heights. In further support of the complainant's claim, that in addition to the information contained in the Hadfield patents, they had discovered improvements in the processes, treatments and methods in the manufacture of Manganese steel containing the non-abrasive qualities which made it a valuable material for "crusher jaws" and 'bucket lips," not known to other manufacturers of those articles, is the fact that they produce an article so superior to all others that they have practically a monopoly of the trade in this country, and it is impossible to believe that if these secrets were well known, they would not be applied and used by others, and particularly by the defendant corporation, which is endeavoring to secure a portion of this particular trade. That the defendant company do make Manganese steel, after the formula described in the Hadfield patents, is not disputed, but that they lack something which the complainant possesses, necessary to produce the same grade of article, is reasonably established by the testimony, not the least significant portion of which is that they have taken so much pains and trouble to secure from the foundry of the complainant a workman who, to say the least, they have reason to believe has a knowledge of the methods used by the complainant. It is perfectly clear, from all this evidence, that the complainant has some secret special knowledge which the defendant corporation is so anxious to obtain, that its officers were willing to

advise Nichols to commit a breach of his written agreement.

I am satisfied that the complainant is possessed of methods and processes which produce an improved character of Manganese steel; that such methods and processes have been kept secret in the ordinary acceptation of the term relating to trade secrets; that they were communicated to Nichols in trust and confidence, and that he has no right to violate his agreement; and should be restrained from divulging them to any one.

The remaining question is, ought this defendant corporation be restrained from employing the defendant Nichols? This question was considered and passed upon when the preliminary injunction was allowed, and nothing has been developed on final hearing which leads me to any different conclusion than the one then reached, the reasons for which I expressed in *Taylor Iron and Steel Company* vs. *Nichols et al., supra.* The evidence on final hearing in my judgment, has only tended to intensify the inequitable position occupied by the defendant corporation. It now appears that that corporation, notwithstanding the skill and efforts of their very able superintendent, Mr. Potter, was not able to reach satisfactory results; that Mr. Snow, one of the officers of the defendant corporation, with the aid of a friendly letter to the complainant, succeeded in entering the complainant's works, and while there tempted Nichols to leave the complainant by an offer which he was unable ultimately to resist. That Mr. Snow went to Highbridge primarily to visit Mr. Estes I do not believe, the condition of affairs at Chicago Heights demanded someone who could manufacture steel of a grade to compete with the complainant. There was no better place to look for the necessary party than at Highbridge, and he admits that he was

anxious to visit complainant's plant "to gain any information that I could pick up as to general practices in the shop." At that interview he offered Mr. Nichols an annual salary, according to his own story of $5,000, double that being paid to him by the complainant, and $2,000 a year more than they were then paying Mr. Potter, who, as I have said, was greatly the superior in learning and intelligence of Mr. Nichols, and also a steel maker of more than ordinary capacity. A few months later and after Nichols had made his written contract with the complainant in March, 1905, the defendant corporation again entered into negotiations with him, and with full knowledge of his contract with the complainant were ready to employ him. They assert their offer was not to be effective until he had dissolved his relations with the complainant, but this was a mere pretense, because manifestly they expected him to do so, and advised him that he might do so without fear of restraint. It also appears that the officers of the complainant called upon the officers of the defendant corporation and protested against the conduct they were pursuing, and in every possible way endeavored to induce them to desist from their efforts to entice Nichols from them, and when the complainant became satisfied that the defendant corporation intended to take Nichols from them, the preliminary injunction was applied for and allowed in this cause, since which time Nichols has not, so far as it appears, visited the works at Chicago Heights, although he has since that time been supported with money furnished by the defendant company. The statement made by Nichols on this subject is that he has borrowed the money from the American Brake Shoe and Foundry Company, but that this is a genuine loan I am unwilling to credit, on the contrary I am satisfied that the

money has been advanced to him for the purpose of keeping him in a position to enter its service, if the result of this litigation be such as to permit it. Whatever may be the truth on this subject, it does appear that Nichols remained in Chicago for a long time, first boarding at a hotel, afterwards living with his family at another place, and that shortly after the injunction was issued a person by the name of Leonard, who had formerly worked at Highbridge and was known to Nichols, left his place of employment in Newark and went to Chicago; that he was there employed by the defendant corporation ostensibly as inspector of castings, but practically, as I find the fact to be, as a messenger between Nichols and the foundry at Chicago Heights. He and Nichols met frequently, and in such manner as to avoid, as far as possible, the disclosure of the fact that they did meet. Leonard had some knowledge of the way business was conducted at Highbridge, and I have no doubt that it was the expectation of the defendant to acquire from Nichols, through Leonard, sufficient knowledge of complainant's methods to aid them in successfully making steel of the standard produced at Highbridge. That the employment of Leonard was not in good faith or intended to be permanent is sufficiently shown by the fact that when it was ascertained that the litigation was likely to be prolonged, Leonard left Chicago and returned to his work in Newark. Leonard, as a witness, was a lamentable failure, and not the slightest reliance can be placed upon any of his statements, which are in conflict with those of other witnesses. The bringing of Leonard to Chicago under the circumstances disclosed, is strongly indicative of an intention on the part of the defendant corporation to obtain complainant's secrets, and their failure is perhaps due to their

inability to use the formulas without a personal demonstration, which Nichols could, and Leonard could not give.

But one reasonable conclusion can be drawn from these acts of the defendant corporation, and that is, a determination to secure the services of Nichols, and through him, knowledge of complainant's secrets, by tempting him to violate his agreement to remain with the complainant, for without his aid, and a disclosure of complainant's secrets, it could not hope to successfully compete with the complainant. What should a Court of Equity do under all these circumstances? There can be no doubt, it seems to me, that to permit the defendant corporation to employ Nichols, notwithstanding he may be enjoined from disclosing complainant's secret methods and processes, would afford it an easy opportunity to obtain from Nichols, in spite of the injunction against him, the knowledge which they seek, and which could be so used as to make discovery very difficult, if not impossible. The persistent effort to obtain the services of Nichols, whose only special qualification is his knowledge of the complainant's secrets, warrants the Court in preventing, as far as possible, the success of this attempt to induce a trusted servant to commit a breach of confidence, by the disclosure of complainant's secrets. If the defendant corporation suffers any injury in being denied the right to employ Nichols in work that does not require a disclosure of complainant's secrets, it is an injury resulting from an inequitable attempt to injure the complainant, and if a defendant, by its own conduct, can put itself in such a position as to lose the advantage of future independent experiments, as was held in *Stone* vs. *Grasselli Chemical Co., 65 N. J. Eq., 756-762*, a defendant may, in my opinion, be denied the right to take into its employment for

any purpose one whom the Court is satisfied has been enticed to leave his master under such conditions as to justify the conclusion that the ulterior purpose of the employment is to acquire the trade secrets of his master. We have here a servant possessed of his master's secrets, which he is bound not to divulge, and another seeking him for the purpose of employing him where those secrets may be put to use to the injury of his master, the servant can only be restrained from divulging, for the power to enforce the specific performance of his agreement, to remain with his master, is not possessed by the Court, but equity ought not to stop short of giving full relief, and that in this case can only be certainly done by restraining the defendant corporation from employing the seduced servant during the term of his contract with the master whose property he has in charge and thus render its transfer troublesome, if not impossible.

There will be a decree for an injunction restraining Nichols from divulging to anyone the secret methods and processes used in the manufacture of Manganese steel by the complainant which he acquired, or were taught to him by the complainant, and restraining the defendant the American Brake Shoe and Foundry Company from disclosing or making use of any such secrets that may have been communicated to it by the defendant Nichols, and from employing Nichols during the unexpired term of his contract with the complainant.

Final Decree.

(Filed February 21, 1907.)

This cause coming on to be heard in the presence of John R. Hardin and Richard V. Lindabury, of counsel with the complainant, and of Charles L.

Corbin (and John B. Goode and Edward H. Fallows, of the New York Bar), of counsel with the defendants, and the pleadings and proofs having been read and heard, and the arguments of the respective counsel having been heard and considered, and the Court having duly considered the said pleadings, proofs and arguments; and it appearing to the Court that the complainant is entitled to an injunction restraining the defendant Wesley G. Nichols from divulging to any one the secret methods and processes used in the manufacture of Manganese steel by the complainant, which he acquired from or which were taught to him by the complainant, and restraining the defendant the American Brake Shoe and Foundry Company from disclosing or making use of any such secrets that may have communicated to it by the defendant Wesley G. Nichols, and from employing the said Wesley G. Nichols during the unexpired term of his contract with the said complainant;

It is on this nineteenth day of February, nineteen hundred and seven, by William J. Magie, Chancellor of the State of New Jersey, ordered, adjudged and decreed, and the said Chancellor, by virtue of the power and authority of this Court, does hereby order, adjudge and decree that an injunction do issue restraining the defendant Wesley G. Nichols from divulging or disclosing, directly or indirectly, to any person, firm or corporation the secret methods and processes used by the complainant in the making, moulding, treatment or manufacture of Manganese steel taught to or acquired by the said Wesley G. Nichols while in the employment of the said complainant; and also restraining the defendant the American Brake Shoe and Foundry Company, its directors, officers, agents and attorneys, from disclosing or making use of any information relating to the secret

methods and processes used by the complainant in the making, moulding, treatment or manufacture of Manganese steel that may have been communicated to the said defendant the American Brake Shoe and Foundry Company by the said Wesley G. Nichols; and further restraining the said defendant the said American Brake Shoe and Foundry Company, its directors, officers, agents and attorneys, from employing, directly or indirectly, in the service of said company the said Wesley G. Nichols during the term of the agreement between the said Wesley G. Nichols and the said complainant Taylor Iron & Steel Company, bearing date the fifteenth day of March, nineteenth hundred and five, in the bill of complaint in this cause set out.

And it is further ordered and decreed that the defendants pay to the complainant the costs of this suit to be taxed, and that execution issue therefor according to the practice of this Court.

W. J. MAGIE,
C.

Respectfully advised,
J. J. BERGEN, *V. C.*

Appeal.

(Filed February 28, 1907.)

The defendants jointly and severally hereby appeal from the whole and every part of the decree of this Court made in the above-stated cause on the nineteenth day of February, nineteen hundred and seven, to the Court of Errors and Appeals in the last resort in all causes.

Dated February 27, 1907.

COLLINS & CORBIN,
Solicitors of Defendants.

GILBERT COLLINS,
Of Counsel.

I conceive there is good cause for appeal in the above-stated cause.

GILBERT COLLINS,
Of Counsel with the Defendants.

Petition of Appeal.

Filed April 10, 1907.

NEW JERSEY COURT OF ERRORS AND APPEALS.

BETWEEN— TAYLOR IRON AND STEEL COMPANY, Complainant-Respondent, AND WESLEY G. NICHOLS and THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY, Defendants-Appellants.	On Appeal from Chancery. Amended Petition of Appeal.

TO THE HONORABLE THE COURT OF ERRORS AND APPEALS IN THE LAST RESORT IN ALL CAUSES:

The joint and several petition of Wesley G. Nichols and The American Brake Shoe and Foundry Company, the appellants in the above-stated cause, shows:

That your petitioners find themselves aggrieved by a final decree made in the Court of Chancery by his Honor William J. Magie, bearing date the nineteenth day of February, A. D. nineteen hundred and seven, in a cause wherein the said Taylor Iron and Steel Company was complainant and your petitioners were defendants, in this respect: That thereby it was ordered, adjudged and decreed that an injunction do issue restraining your petitioner Wesley G. Nichols from divulging or disclosing, directly or indirectly, to any person, firm or cor-

poration, alleged secret methods and processes used by said complainant in the making, moulding, treatment or manufacture of Manganese steel, taught to or acquired by your petitioner Wesley G. Nichols while in the employment of the said complainant; and also restraining your petitioner The American Brake Shoe and Foundry Company, its directors, officers, agents and attorneys from disclosing or making use of any information relating to alleged secret methods and processes used by the said complainant in the making, moulding, treatment or manufacture of Manganese steel that may have been communicated to your petitioner The American Brake Shoe and Foundry Company by your petitioner Wesley G. Nichols; and, further, restraining your petitioner The American Brake Shoe and Foundry Company, its directors, officers, agents, and attorneys, from employing directly or indirectly in the service of said company your petitioner Wesley G. Nichols during the term of the agreement between your petitioner Wesley G. Nichols and the said complainant, bearing date March fifteenth, nineteen hundred and five, in the bill of complaint in said cause set out.

And your petitioners jointly and severally appeal from the whole and every part of said decree upon the grounds that the same is erroneous and that the Court on the hearing improperly rejected material evidence offered by defendants relating to the processes of complainant, and that the Court improperly refused to permit the defendant, Nichols, to testify concerning the processes used by the complainant, and that the Court improperly refused to permit the cross-examination of the witnesses of complainant relating to said processes, and that the Court improperly overruled questions and rejected testimony offered by defendants tending to show that the complainant had no secret processes

requiring the protection of the Court, and on the ground that it appears by the testimony that there are no such secret methods and processes used by the complainant as are recited in the decree, and on the ground that the agreement set forth in the Bill of Complaint, so far as it restricts your petitioner Wesley G. Nichols from other employment than by said complainant, is against public policy, illegal and void, and should have been so adjudged.

Your petitioners therefore pray that the said decree of the said Chancellor may be in the particulars aforesaid reversed, set aside and for nothing holden; and that your petitioners may have such relief in the premises as to this Honorable Court shall seem meet.

COLLINS & CORBIN,
Solicitors for and of Counsel
with Appellants.

We consent to the filing of the foregoing amended petition of appeal as in time.

PITNEY, HARDIN & SKINNER,
Solicitors of Complainant-Respondent.

(Formal Answer.)