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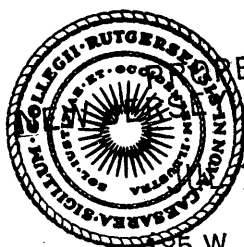
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# NEW JERSEY MANUFACTURES, 1899-1927,

*By*

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## PREFACE

It is generally admitted that there is a dearth of useful regional economic statistics and hence of adequate regional analyses for the United States, a country embodying sections of extremely diverse economic structures in various stages of development. Since most of our indexes of economic activity are national in scope, we are prone to attribute to all parts of the country the movements revealed by these aggregates, failing to realize that they reflect merely the combined activities of different areas which are often undergoing very different or even opposite experiences.

Recognizing this need, the Bureau of Economic and Business Research of Rutgers University planned to construct a monthly index of the physical volume of manufacturing production in New Jersey. This called for a preliminary analysis of manufactures in New Jersey, and a survey of available material. In view of the paucity of data revealed by the latter survey, it was found necessary to indefinitely postpone construction of the proposed index. It was felt, however, that the results of the preliminary analysis of manufactures would be of some general interest. The report presented in this bulletin sprang from this analysis.

It might be suggested that sectional studies, which for practical purposes must necessarily be confined to political areas or to groupings of such areas, should cover groups of states representing economic entities, rather than be limited to individual states which may possibly not constitute in themselves distinct economic units. New Jersey, from this standpoint, is generally grouped with Pennsylvania and New York. However, the census figures show that since the turn of the century, New Jersey has been pushing ahead in her manufactures more rapidly than have these two states. In view of this unusual growth as compared with that of the other Middle Atlantic States, New Jersey would seem to warrant special study.

J. M. S.

June 30, 1930.

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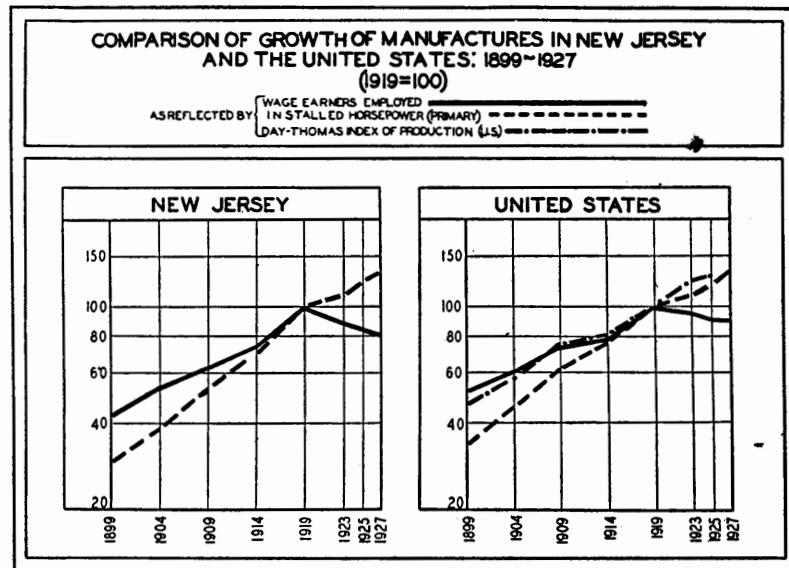
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## A SUMMARY

Since 1900, manufacturing in New Jersey has not followed the steady rate of growth characteristic of American manufactures, but has experienced two distinct periods of expansion. From the beginning of the century and through the World War, New Jersey ranked with the states adding most rapidly to their manufactures; and since the war the expansion in her manufacturing output has been similar to the milder growth of the neighboring states.

### THE EARLY PERIOD

Far outstripping the gradual growth of the other Eastern states, New Jersey's manufacturing development during the first twenty years of the century paralleled that of the East North Central states. Many new industries were being introduced into American manufacturing and were settling in New Jersey. Chief of these was the chemical industry which had already been established in New Jersey, but which was becoming increasingly diversified. The advent of the World War, with its increased demands and the shutting off of the chief source of chemicals, served to augment this diversification.

Copper was being refined in increasingly large quantities to meet the demands of the newer industries. And one of the chief consumers of copper—the electrical machinery, apparatus, and supply industry—was growing even more rapidly. The production of rubber tires and inner tubes and the refining of petroleum were following the rapid introduction of the automobile. While the automobile industry had not been attracted to New Jersey to the extent of many of the other new industries, marked advances in its production were recorded.

Other industries which grew rapidly were the manufacture of paper and paper boxes, slaughtering and meat packing, and the canning of fruits and vegetables. While certain of the ceramic industries and cast-iron pipe manufacture were suffering a war-time depression due to the lull in construction activity, the production of steel was reach-

ing new limits and shipbuilding was being spectacularly pushed to a record production far exceeding any pre-war activity.

But if the newer industries were enjoying such exceptional growth, the traditional New Jersey textile industry was faring less well. Expansion of the silk industry, predominant in New Jersey textile manufacture, was not keeping pace with the rest of the country. But at the same time the dyeing and finishing of textiles were expanding steadily and rapidly, and the production of woollens and worsteds and of knit goods was undergoing marked increases. Other industries, those producing fur felt hats, boots and shoes, and jewelry, were curtailing production throughout the greater part of the period.

All of this appreciably altered the internal structure of New Jersey's manufactures. The textiles still retained their lead although their position was already being menaced by the rapid strides of the chemical and machinery industries. While several of the other newer industries were accounting for a greater share of New Jersey's output, the relative importance of the manufactures of foods, metal products, ceramic goods, leather and leather goods was declining.

#### THE POST-WAR PERIOD

Since the war, it is the Southern and Western states whose manufactures have grown most rapidly while New Jersey has settled down to the more gradual growth of the other Eastern states. But the growth of the Southern and Western states has not been to any great extent at the expense of New Jersey, for this growth has been largely either in those industries which have also grown in New Jersey or in those industries which have never played an appreciable rôle in her manufactures.

Most of the newer industries established in New Jersey during the earlier period have continued to prosper. But the textile industry has displayed a sluggish growth. Not only has the silk industry evidenced only slight increases but the production of woollens and worsteds has declined. The dyeing and finishing of textiles, however, has persisted in its previous growth until New Jersey is now unconditionally the national center of this industry.

The chemical industry, so artificially stimulated by the war, has continued to expand, having, by the aid of research, discovered new outlets for its products. The most phenomenal growth of an allied industry has been experienced in the manufacture of paints and

varnishes. The continued development of the combined chemical industries and the retarded growth of the textiles have resulted in the latter's decline in relative importance within the state and an advance in the chemical industry to share with the textiles the leading rôle in the manufactures of New Jersey.

The machinery industry has continued to grow in relative importance. Most marked has been the increase in the output of the electrical goods industry which has continued to place new products upon the market.

While the refining of copper and the manufacture of non-ferrous alloys have increased, the production of steel has declined. But the manufacture of the products of iron and steel has greatly increased. Recoveries from the war-time depression have been experienced by the ceramic and cast-iron pipe industries, and shipbuilding has again returned to "normal" levels.

Printing and publishing, which had shown little sign of progress in the earlier years, have grown rapidly since the war. The food industry, which had been declining in importance, is regaining its lost position largely as a result of the expansion of the canning and ice-cream industries. Production of fur felt hats and of boots and shoes continues to be curtailed, while the manufacture of men's clothing is growing rapidly.

#### RECENT INCREASES IN MECHANIZATION

This rapid growth of the newer industries over the whole period has brought with it an increased dependence upon power for it is the older industries which are large employers of labor. Witness the textile industry which employs more labor than any other group, and the chemical industry which, in approximately equalling the dollar output of the textiles industries, employs less than half as many wage earners. But New Jersey's manufactures have not become more dependent upon power merely because of the changing distribution of her industries; many of the industries themselves have become increasingly mechanized. Since 1919 most of the industries have installed primary horsepower more rapidly than they have increased employment, or they have continued the installation of primary horsepower while curtailing employment.

It is the latter movement which is typical. This has resulted in an actual decline in total employment since 1919 accompanied by a

marked increase in installed horsepower. But if employment has declined, production has increased as it has under similar conditions in the country as a whole.

Whether this contraction of New Jersey's manufacturing employment has been compensated by added employment in other industries does not come within the scope of this report. But it may be observed that the great amount of labor dropped from the payrolls of the shipyards was largely labor which had been diverted from the construction trades. And it is to be assumed that a considerable proportion of the labor released by the manufactures of the state has found employment in the merchandising, transportation, construction, and service industries.

## NATURE AND SCOPE OF STATISTICS

Before proceeding further, it will be well to consider the possible limitations of available statistics and to discuss the materials which are significant for our purposes. The Census Bureau reports on many aspects of manufacturing activity. The most important of these are: value of product, cost of materials, value added by manufacture, primary horsepower installed, average number of wage earners employed, and wages. Selection from this material will vary with one's interests.

### SELECTION OF CRITERIA

If the growth of physical production is to be estimated, it will be necessary to eliminate all value series, since such series reflect the combined movements of both prices and physical quantities.<sup>1</sup> There are only two purely physical series available for all industries—"primary horsepower installed" and "average number of wage earners employed."

Both installed primary horsepower and the number of employed wage earners are merely indirect indexes of production. Primary horsepower, as reported by the Bureau of the Census, represents the amount of primary horsepower existent at the time of reporting the census, regardless of whether or not it is then being employed. This series is insensitive to cyclical change and is therefore valueless as an indicator of production for short-time purposes. Thus, production may be appreciably curtailed with the same primary horsepower operating at a marked decrease in per cent of capacity, or else there may be an installation of power not at once accompanied by an expansion of output. But over a long period of time, if there has been a steady increase in the installation of power, it might reasonably be inferred that production has been following a somewhat similar course, were it not for another factor: this newly installed power may merely be replacing labor. It would seem that, if the statistics dealing with the increase in power were supplemented by those showing the trend of employment, it would be possible to reach a fairly significant long-time estimate of the trend of physical production.

<sup>1</sup> If an index number of wholesale prices for New Jersey manufactures were available, it could be applied to the "value added by manufacture" series to give some idea of changes in the physical volume of production. However, only national wholesale price indexes are available. And only too often are they applied as correctives to selected value-series without any regard for the comparability of the sample used in constructing the index with the composition of the particular series being studied.

The Bureau of the Census reports for census years the annual average of the number of wage earners employed on the fifteenth day of each month. The series, if it is used as an indicator of production increments over a short period of time, involves hazards akin to those in the primary horsepower series for it represents, not the number of man-hours employed, but rather the number of wage earners on the payrolls. Thus production may increase temporarily with no increase in the employment of men, but, rather with a resort to overtime; and it may decrease temporarily, again with no change in the force employed; the men being merely placed on part-time.

Edmund E. Day and Woodlief Thomas, who have prepared an excellent monograph on the growth of manufactures in the United States from 1899 to 1925,<sup>1</sup> were fortunate enough to have available sufficient statistics of physical production to construct a significant index of manufacturing production for that period. When primary power and wage earners are compared with this index, it is found that, prior to 1919, production increased at somewhere between the rate of increase of employment and of the installation of power. On the other hand, since 1919, changes in the installation of power and in the employment of labor have both understated the growth of production (Chart 1). On the basis of this finding, it may be assumed in this study that production of manufactures increased in New Jersey from 1899 to 1919 at a rate somewhere between the rates of increase of horsepower installed and wage earners employed, and that, since that year, production increased at least as rapidly as the installation of power. These two indexes will not be combined into a single index for there is no justifiable basis for apportioning weights between them.

The statistics of physical volume of manufacture used in the Day-Thomas study are available by states in a few cases only. All of these reported for New Jersey have been assembled, but they are by no means sufficiently representative to warrant constructing an index for all industries. However, in a very few cases, these statistics will be most valuable as supplementary measures for specific industries.

The possible criteria for determining the relative importance of the constituent manufactures of a given region are legion. Industries may be ranked according to their employment of labor, consumption of materials, consumption of power, contribution to the total net product, or by any number of other criteria. But, while each may be significant to an individual investigator, contribution to the total net product more nearly approaches a social evaluation of an industry's importance. This will necessarily be expressed in terms of value units since no other applicable common denominator exists. Among manufacturing industries, such a criterion, in its pure form, would be computed by subtracting from the total value of product of each manufacture, all of the costs representing values created by other manufactures and by industries other than manufactures. Deductions would include such quantities as the cost of materials, the cost of fuel

<sup>1</sup> Day and Thomas, *The Growth of Manufactures, 1899-1923*, Census Monographs VIII. The index number for 1925 is included in Appendix C.

and power, the depreciation of equipment and buildings, the cost of distribution of the product, taxes, and interest. But if the validity of such a criterion be granted, the figures for computing it are not available. Hence, there is need for a more workable definition of "contribution to the total net product."

The Bureau of the Census reports the "value added by manufacture" which is the difference between the value of the product and the combined costs of materials, fuel and power, and mill supplies. But there seems no defence for including, for example, the depreciation of machinery in the "value added by manufacture" and excluding the cost of fuel and power, since they both represent values created by industries other than those under consideration, and are both catalytic agents, serving, as they do, to convert the materials without themselves entering into the finished fabric. And since an arbitrary definition must be reached, it would seem that a concept, which represents the total value added to the materials entering into fabrication, would best serve our purpose. For example, if two plants manufacturing the same product were to be compared, they would be judged of equal importance if they both were to convert the same value of raw silk into the same value of yarn regardless of the relative contributions of the various factors of production within each plant. Such a criterion is not possible for every census year, but can be more nearly approached for 1927 when the "cost of fuel and power" was reported separately. Hence, when any comparison of relative importance is made for 1927, the criterion is the sum of "value added by manufacture" and the "cost of fuel and power" which, for want of a better term, has been designated "refined value added by manufacture."<sup>1</sup>

#### SCOPE OF STATISTICS

In 1904, the Bureau of the Census changed the scope of its reports to include only industries operating under the factory system and to exclude the neighborhood industries previously reported. The state totals for 1899 were corrected for this change but many detailed statistics were not. In order, then, that our figures may be comparable, many series of industries or groups of industries have been carried back to 1904 only. In some cases, it has not been possible to carry them back this far, due to a change in classification or to the policy of the Bureau of the Census not to publish figures which will reveal the operations of individual establishments.

The several hundred divisions of manufactures reported by the census are combined into sixteen major industrial groups, but the totals for these groups are not reported by states. For computing the New Jersey totals, the 1925 grouping has been used. No correction has been made for the introduction of new, or for the dying out of old, industries since we shall be interested, not in the movements of fixed samples of manufactures, but in the movements of certain gen-

<sup>1</sup> The cost of mill supplies and certain catalysts reported under "materials" are still excluded from the "refined value added by manufacture."

eral types of manufactures. However, where the Census Bureau has dropped certain industries from its reports because of an apparent change of policy, we have also eliminated them from our totals. Other industries have been excluded from the group totals when the reports for New Jersey were discontinued for any census year with the apparent purpose of avoiding the disclosure of operations of individual plants.

Prior to 1919, and for that year, reports were collected from establishments having an annual value of product of \$500 or more, but since then reports have been collected only from establishments having a yearly value of product of \$5,000 or more. No corrections have been made for this change since the difference that this would make in the totals is practically negligible.

The statistics for 1927 which are charted, or recorded in the Appendix, were obtained by special communication with the Census Bureau in the early stages of tabulation. In the event that there has been any revision in these figures prior to final publication, the figures here presented will not agree with the published reports.

In interpreting any of the statistics presented, it must be remembered that the years for which the census is reported have been marked by different phases of the business cycle. Hence, before any comparisons are made between two census years, the characteristics of those years should be taken into consideration. The National Bureau of Economic Research reports the following characteristics for these years: 1899—Prosperity; 1904—Mild depression, revival; 1909—Revival, mild depression; 1914—Depression; 1919—Revival, prosperity; 1921—Depression; 1923—Prosperity, recession; 1925—Prosperity; and 1927—Mild contraction.

## GROWTH OF MANUFACTURES IN NEW JERSEY AND SELECTED STATES

In recent years, there has been much discussion of the relative decline of the industrial East in manufacturing supremacy. New manufacturing regions have sprung up; it has been found profitable to locate factories nearer their ultimate markets, or to move them away from the East with its relatively high wage rates to sections of cheaper labor and freedom from more advanced labor legislation. Particular attention has been called to the rapid growth of the Southern textile mills at the expense of New England, long established as the textile center of the United States, and to the migration of the shoe manufacturing establishments away from Massachusetts to the Middle West. Most of the discussion of regional shifts of manufactures centers around these shifts in specific industries. This tends to exaggerate the growth of manufactures in the new areas and the relative decline in the older ones. Attention is also called to the recent introduction of numerous new products requiring peculiar manufacturing techniques which, for one reason or another, have resulted in the creation of centers for these products in the newer regions. A striking example is the location of the automobile industry in Michigan.

### MIDDLE ATLANTIC AND NEW ENGLAND STATES

The Middle Atlantic states, along with the New England states, are the regions that are said to have suffered most in their manufactures. While the states within the larger geographical sections often evidence marked resemblances in their manufacturing growth, New Jersey grew, from 1899 to 1919, far more rapidly in manufactures, as gauged by employment of wage earners and installation of power, than the other Middle Atlantic states (Chart 2). From the same chart it will be observed that manufactures during this period increased more rapidly in New Jersey than in the industrial states of New England.

It is well to point out that the 1919 peak for employment in New Jersey is exaggerated by the exceptional employment in ship yards. This does not represent, then, any permanent development in the state's manufactures, but reflects merely a temporary growth. It was not deemed advisable to make correction for this fact in the charts for it is not known how the other states were affected by the same sort of accidental growth.



It was observed in the preceding chapter that it is far more difficult to infer the growth of manufactures from the selected indices subsequent to 1919 than prior to that year. Changes in employment are particularly misleading. It will be noticed from Chart 2 that employment in New Jersey has fallen off at a greater rate during the post-war period than in any other of the Eastern manufacturing states. And while the drop in employment is not, in view of other evidence, sufficient to suggest an actual decline in New Jersey's manufactures, it does suggest a slower rate of growth than in these other states. Nevertheless, it is believed that, were corrections made for the tremendous drop in shipbuilding, the decline in New Jersey employment would be found to have proceeded at more nearly the same rate as that in the other states, more especially since this is found to have been true, without correction, from 1923 to 1927.

This change in relative growth is corroborated by the chart for installed horsepower, which as stated in the preceding chapter, more nearly approaches a fair index of production for this period. The installation of power in New Jersey, which, prior to 1919, had increased at a more rapid rate than in any of the other Eastern states was suddenly curbed after that date but still proceeded at a rate slightly more rapid than in these other states.

#### EAST NORTH CENTRAL STATES

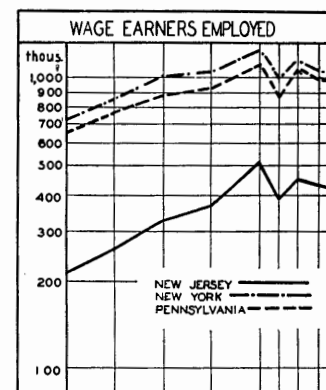
The East North Central states are generally believed to have gained from the shifts of manufactures. During the first twenty years, New Jersey manufactures followed a course singularly parallel to that of Ohio with respect to both employment and horsepower (Chart 3). But, since 1919, New Jersey has employed relatively fewer wage earners and installed relatively more horsepower than that state. It would appear that manufacturing development in the two states has progressed at much the same rate during the entire period. On the other hand, Illinois, whose manufactures grew at a milder rate than that of New Jersey prior to 1919, has pushed ahead far more rapidly since that date, experiencing only a slight contraction in employment.

Michigan's unusually rapid growth since 1914 reflects in large part introduction into that state of a new industry, the manufacture of automobiles and their parts, rather than an absorption of manufactures of the Eastern states. While the "furniture," "hardware," and "paper and woodpulp" industries of Michigan have added to their employment since 1919, these additions have been dwarfed by the great increases in employment by the combined "motor vehicle" and "motor vehicle bodies and parts" industries. Chart 3 shows that while the manufactures of New Jersey progressed at about the same rate as those of Michigan up to 1914, they have been greatly surpassed since then. Michigan, and to a less extent Indiana, are the only two states in the East North Central group to have experienced higher employment in recent years than in 1919.

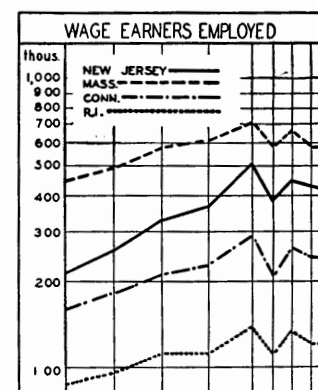
CHART 2

### COMPARISON OF GROWTH OF MANUFACTURES IN NEW JERSEY AND SELECTED STATES 1899-1927

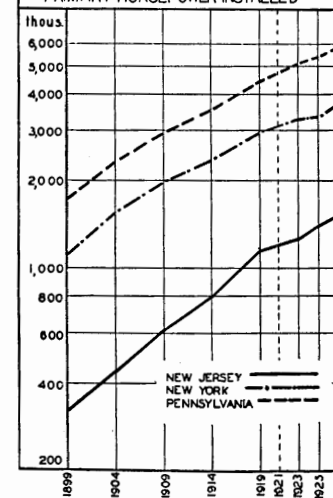
#### MIDDLE ATLANTIC STATES



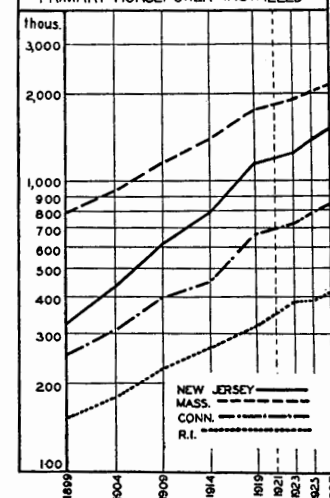
#### NEW ENGLAND STATES



#### PRIMARY HORSEPOWER INSTALLED



#### PRIMARY HORSEPOWER INSTALLED



It would seem, then, that New Jersey's growth in manufactures previous to 1919 has more nearly approximated that of certain of the East North Central States than that of any of the Eastern industrial states, although it has failed to keep up with any of them save Ohio since 1919.

#### SOUTHERN AND WESTERN STATES

It is unfortunate that lack of space prohibits charting many more of the remaining states. We have selected a few, however, which, unlike the Eastern states, have shown marked increases in employment since 1919 (Chart 3).

With the exception of California, which has experienced unusual growth over the whole period, these states—North Carolina, Alabama, and Georgia—grew, prior to 1919, at least no more rapidly, and, in the case of Georgia, less rapidly, than New Jersey. However, if the depression of 1921 is discounted, every one of them has increased its employment since 1919, while in New Jersey employment has dropped.

California's most marked increases in employment since 1919 have not been concentrated in any particular division of industry. Those industries showing the most marked gains attending, to be sure, decreases in other industries, were the "bread and bakery products," the "brick and other clay products," the "canning, fruits and vegetables," and the "lumber and timber products" industries.

The manufactures of North Carolina since the war have experienced even more rapid increases than those of California: employment increased at a decidedly more rapid rate and horsepower at about the same rate. But the expansion of North Carolina has been concentrated in one class of manufactures to a greater extent than in California. Thus, there were 16,800 more wage earners employed in the manufacture of cotton goods and 3,500 more in the manufacture of knit goods in 1925 than in 1919. Substantial increases were experienced also by the furniture industry and the cigar and cigarette industry.

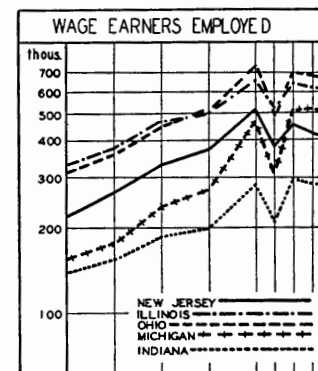
Postwar growth in the other selected Southern states has not been so pronounced as in North Carolina. And while in these states, employment has increased, horsepower has not been installed as rapidly as in New Jersey. The increase of employment in the manufactures of Georgia is accounted for, for the greater part, by the "cotton goods," the "turpentine," and the "lumber and timber products" industries. In Alabama increases have occurred in the "cast-iron pipe" industry, the "cotton goods" industry, and the "lumber and timber products" industry.

Of the other Southern states not charted, the only states showing additions to employment since 1919 are South Carolina, where increases occurred mainly in "cotton goods" and "lumber and timber products"; Tennessee, characterized by increases in "cotton goods" and "knit goods"; and Kentucky by increases in "steel works and rolling mills," and "men's clothing" industries.

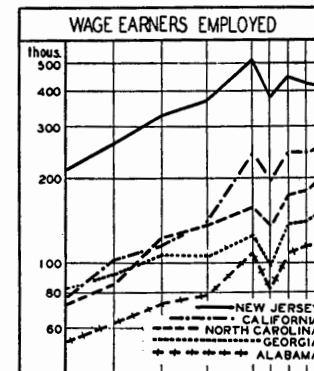
CHART 3

### COMPARISON OF GROWTH OF MANUFACTURES IN NEW JERSEY AND SELECTED STATES 1899~1927

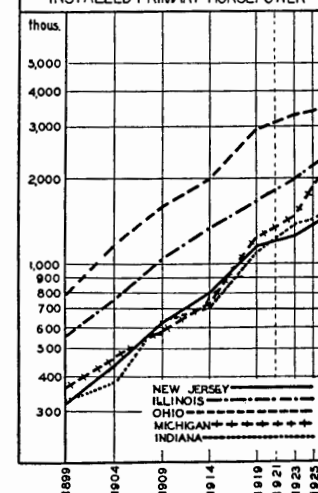
#### EAST NORTH CENTRAL STATES



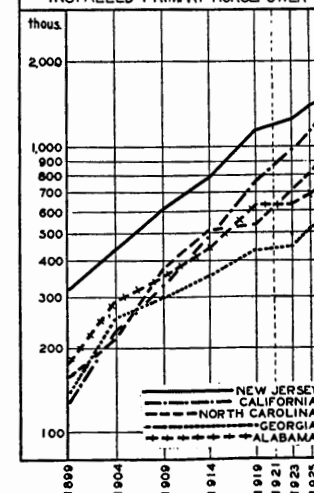
#### MISCELLANEOUS STATES



#### INSTALLED PRIMARY HORSEPOWER



#### INSTALLED PRIMARY HORSEPOWER



It would appear from this rather cursory examination that those states which, in increasing their employment since 1919, have shown unusual development relative to the rest of the country, have not, on the whole, enjoyed this growth at the expense of New Jersey, for most of the industries in which these states have added to their employment since 1919 are either industries which have never been of any importance in New Jersey or industries in which New Jersey has also added to her payrolls since 1919, such as "furniture," "paper and wood pulp," "bread and bakery products," "cast-iron pipe," "canning fruits and vegetables," and "brick and other clay products" industries. An exception is the New Jersey "cotton goods" industry which has curtailed employment but installed more horsepower since 1919.

This is not to suggest that New Jersey has not lost any ground to other states in some of her manufactures but rather that the unusual growth of the newer industrial states as characterized by increased post-war employment has not been to any perceptible extent at the expense of New Jersey. If there has been a migration of certain manufactures away from New Jersey, it has been rather to the states experiencing less sensational growth. Such movements can not be isolated from the census data. To be sure, certain journals report the transference of individual plants. Inference of the movement of entire industries from such reports, however, tends to accord an exaggerated importance to the migration of a particular establishment.

## GROWTH OF MANUFACTURES BY INDUSTRIAL GROUPS

That the several broad industrial groups of New Jersey have not shared equally in the growth of manufacture may be seen from Charts 4a and 4b. Rather has the growth of New Jersey manufactures been the resultant of rapid expansion of some industries, of moderate growth of others, and of stagnation of still others.

Prior to 1919, the industries which grew most rapidly were those producing "chemicals and allied products," "equipment for land transportation," "rubber products," and "musical instruments and phonographs."<sup>1</sup> Shipbuilding, which expanded at such a phenomenal rate during the war, can hardly be classed along with the industries whose growth was steady throughout the period. These rapidly growing industries have little in common except that they all have introduced new products.

Rapid growth, less marked than in the above industries, was experienced by the manufactures of "machinery," "food and kindred products," and of non-ferrous "metals and metal products," and by "railroad repair shops." These groups, which are perhaps rather broader in scope than those previously mentioned, can not be said to embrace preponderantly new industries, but they do include industries manufacturing many new products and producers' goods employed by the newer industries.

Industries which grew only mildly in comparison with the aforementioned industries during this period were the established "textile and allied products" and "paper and printing" industries. Little change was experienced by the "lumber and its products" industry during the decennial period ending with 1919, and by the "stone, clay, and glass products" and "leather and its products" industries during the entire earlier period.

Conclusions as to post-war growth would only be misleading here, and will be reserved until later chapters where the component industries of each group are discussed. It should be noted, however, that between 1919 and 1927 there has been a decline in practically every group in employment, while installed power has increased. For two groups—non-ferrous "metals and their products" and "leather and its products"—this spread occurred as early as 1909. The only groups to increase employment between 1919 and 1927 are manufac-

<sup>1</sup> The "musical instruments and phonographs" group has not been charted since comparable figures are not available for all years. No comparison can be made on the basis of installed power. The number of wage earners employed in this industry increased from 3,542 in 1904 to 14,028 in 1919, and dropped to 5,648 in 1925.

CHART 4-a

# RATE OF GROWTH OF NEW JERSEY MANUFACTURES BY INDUSTRIAL GROUPS: 1904~1927

1909=100

AS DETERMINED BY: WAGE EARNERS EMPLOYED ———  
PRIMARY HORSEPOWER INSTALLED - - - - -

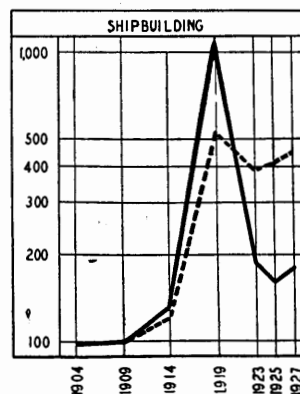
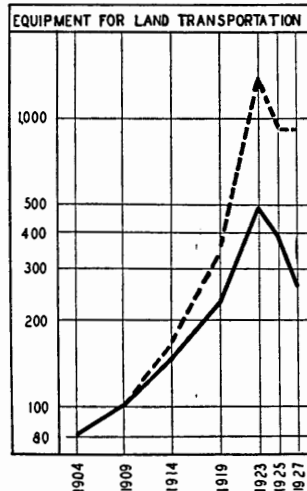
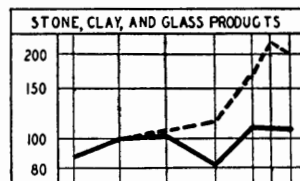
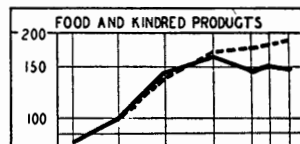
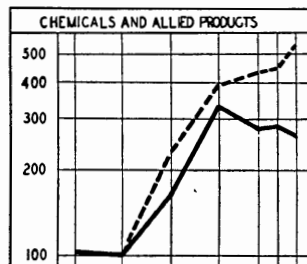
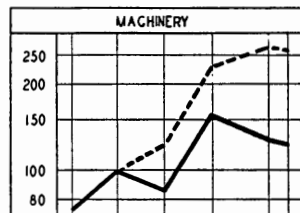
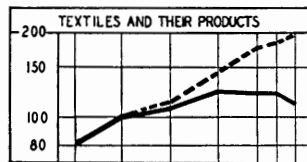
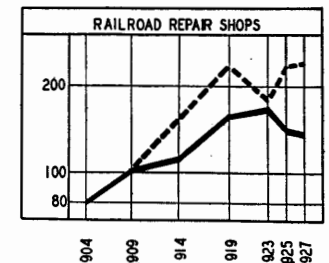
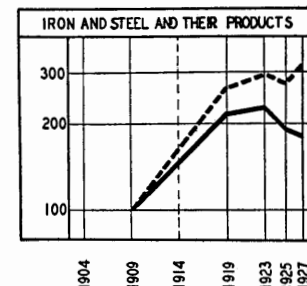
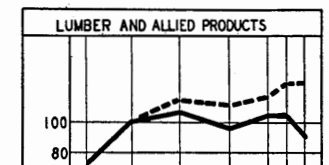
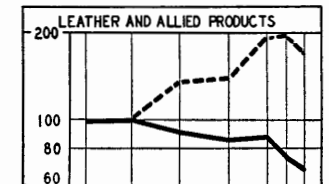
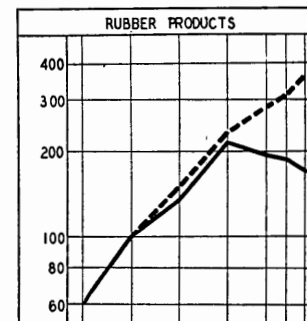
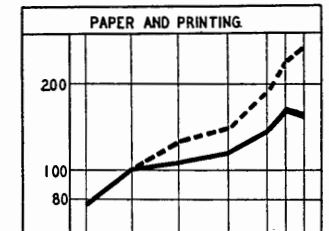
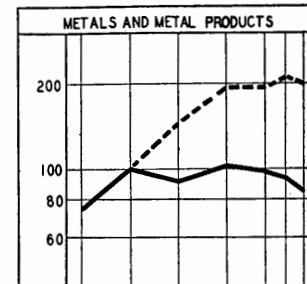


CHART 4-b

# RATE OF GROWTH OF NEW JERSEY MANUFACTURES BY INDUSTRIAL GROUPS: 1904~1927

1909=100

AS REFLECTED BY: INSTALLED PRIMARY HORSEPOWER - - - - -  
WAGE EARNERS EMPLOYED ———

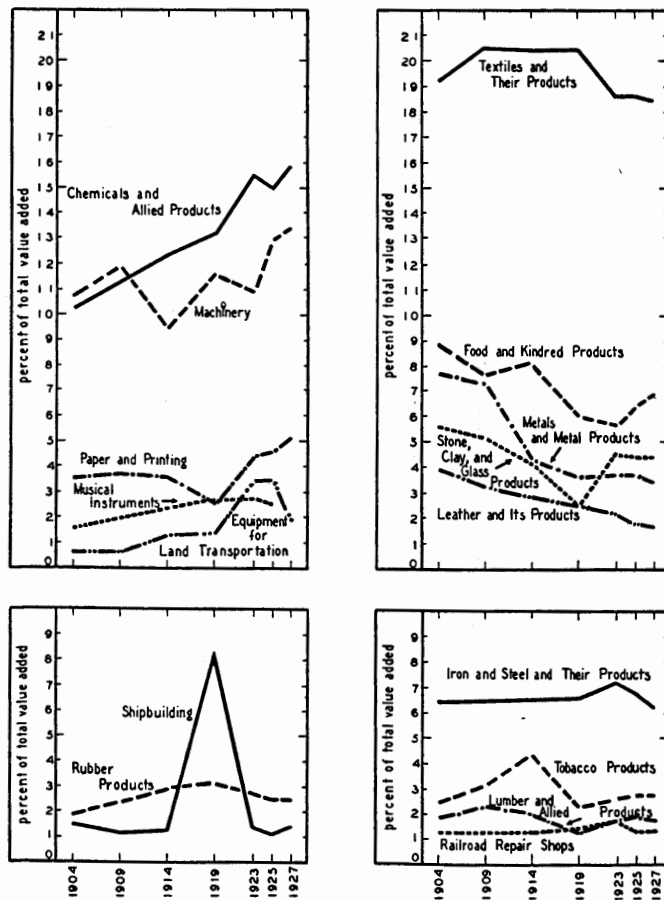


Iron and Steel and Their Products: The 1909 figures have been estimated in order that later years may be charted. Hence, this chart may be interpreted for only the post-war years.

CHART 5

# CHANGES IN RELATIVE IMPORTANCE OF INDUSTRIAL GROUPS IN NEW JERSEY DURING THE PERIOD: 1904-1927

As reflected by changes in percentage of value added by manufacture for each group to total value added by manufacture for all New Jersey manufactures.



tures of "paper and printing," "equipment for land transportation," and "stone, clay, and glass products." However, while employment in "equipment for land transportation" expanded through 1923, it has been sharply curtailed since that date, and increases in the "stone, clay, and glass products" group have resulted in little more than a recovery from wartime depression. Curtailment of employment in the "textiles and their products" group has been less marked than in many of the other groups.

The changing importance within the state of the several industries is revealed in Chart 5. Those which have increased in relative importance are plotted in the upper left block and those which have declined are in the upper right block. The lower blocks include those industries which have experienced little change, on the whole, in relative importance.

Textiles are seen to be relinquishing their hold as the dominant New Jersey manufactures in the face of the steady and rapid growth in importance of the chemical and machinery industries. Because of the close relation of certain products of the "machinery" and "iron and steel and their products" industries, the figures for the earlier years may not present a true picture. It is thought that the plotting of the "machinery" industry subsequent to 1914 more nearly approximates the change in importance of that group. "Chemicals and allied products" have not been plotted for 1909 nor "iron and steel and their products" for 1909 or 1914 because of lack of comparable figures.

While textiles have declined in importance, their loss of position has been recent. On the other hand, the decline in importance of the metals, and leather industries has persisted throughout the whole period. And although there has been an over-all decline in importance of the ceramic industry and the food industry, the first has increased in importance since 1919 and the latter since 1923. Industries which have shown increases in relative importance without at the same time reaching an appreciable importance are those manufacturing motor vehicles and their parts, and musical instruments. The increased importance of the paper and printing industry has come since the war. Industries which have undergone little change in importance over the entire period regardless of fluctuations within the period are: the iron and steel, tobacco, lumber, shipbuilding, and railroad repair industries. The rubber industry accounted for an increasingly large share of the total products up to 1919 but has declined in importance since that date.

It has been seen that the groups which have experienced the greatest growth have been those producing new goods and that certain of these are becoming New Jersey's most important industries. The growth in the separate industries of these groups will be discussed in the following chapters.

## THE TEXTILE INDUSTRY

It was shown in an earlier chapter that the textile industry of New Jersey, when treated collectively, has grown at a relatively slow rate over the whole period and that it has declined progressively since 1919 from its dominance in New Jersey manufactures. But since this group covers a diversity of industries ranging from those converting raw stuffs into yarns to those fabricating clothing; it is only to be expected that the component industries have experienced varying fortunes.

The "textiles and their products" group may be classified into three general sub-groups: those industries which convert raw materials into yarns, and yarns into fabrics; those which bleach, dye, and finish the products of the first group; and those which convert the fabrics into finished products. The first group may in turn be reduced to several classes according to the basic fibre consumed. Thus the Census Bureau reports "silk manufactures," "cotton goods," and "woolen and worsted goods." These three classes do not include goods which are knitted from their respective materials—such products are reported as "knit-goods" regardless of the material used. The second group—the dyeing and finishing of textiles—is not further classified. While the isolation of this industry has been based upon its process and not upon the material it consumes, it should be noted that it has been assigned to the "textiles and their products" group because of its principal material and not because of the nature of its process which is essentially a chemical one. The Census Bureau sub-divides the third group into such classes as: "women's clothing, not elsewhere classified," "men's clothing, not elsewhere classified," and "shirts."

### TEXTILE-MILL PRODUCTS

*Silk Manufactures.* The leading textile industry of the state, the manufacture of silks, has grown at a rate even slower than that for the total textile group. Employment has declined since 1919, falling in 1927 to the low level of 1899 (Chart 6). But in view of technological improvements, the growth of this industry may be somewhat understated by the chart. Certainly the production of broad silks, which increased from some forty-one million linear yards in 1899 to one hundred and twenty-one million linear yards in 1927 (Table 1), is not adequately reflected by Chart 6, and the difference is too great to be explained by the use of the unsatisfactory criterion of

linear yardage which takes no account of variations in characteristic weights and widths of fabrics.

However, the silk manufacturing industry embraces two distinct processes: the throwing of raw silk into threads or yarns for weaving, and the weaving of this thrown silk into broad silks, ribbons, and other fabrics. It has been seen that the yardage of broad silks is

TABLE 1  
PRODUCTION OF SILK MANUFACTURES IN NEW JERSEY,  
1899-1927

YEAR	BROAD SILKS, THOUSAND LINEAR YARDS			BROAD SILKS 1919=100			Organic Traw and Crepe Twist For Sale (Thous. Pounds)	Value of Ribbon (Thous. Dollars)
	Total	All Silk	Silk Mixed	Total	All Silk	Silk Mixed		
1899	40,593	36,415	4,178	37.4	36.6	46.1	317	8,342
1904	46,701	42,328	4,373	43.0	42.5	48.2	171	10,036
1909	64,788	52,403	12,385	59.7	52.7	136.6	266	14,971
1914	69,163	52,049	17,114	63.7	52.7	188.8	874	17,924
1919	108,548	99,483	9,064	100.0	100.0	100.0	1,813	30,342
1921	78,388	71,304	7,083	72.2	71.7	78.1	1,097	21,149
1923	96,506	77,545	18,960	88.9	77.9	209.1	624	20,526
1925	117,000*	101,000*	16,000*	107.8	101.5	176.5	681	23,006
1927	120,000*	94,000*	26,000*	.....	.....	.....	.....	13,246
Value 1927 \$000	121,337	95,577	25,760	.....	.....	.....	.....	13,246

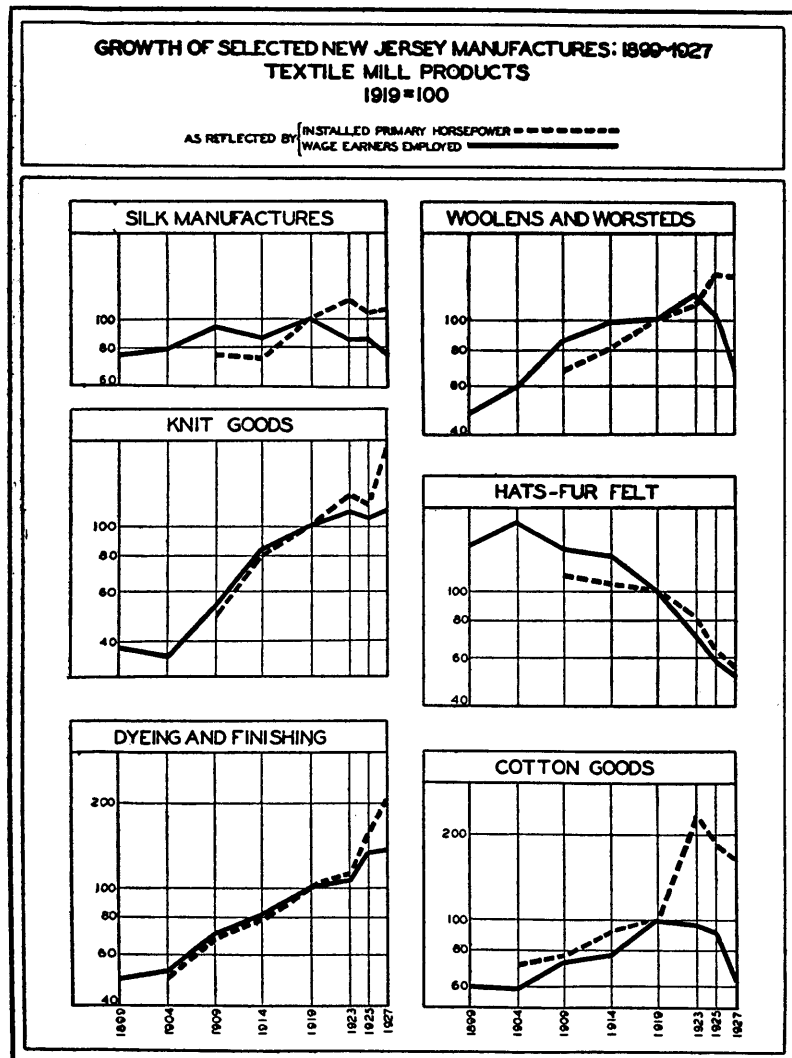
\*Estimated from reports of square yards for 1925 on the basis of linear yard equivalents to square yards as reported for 1921 and 1923.

reported, but no production figures are available for thrown silk. The amount of "thrown silk for sale" discloses little for it does not include the amount of silk thrown for consumption within the weaving mills nor the amount thrown under contract, and the amount of "silk thrown under contract" reveals the operations of only those establishments throwing silk for others. The amount of "raw silk consumed" in New Jersey manufactures is worthless as a criterion, since it represents, not the amount of raw silk converted by New Jersey manufactures, but the amount purchased by manufacturers of this state either for conversion within their own plants or for assignment by them to contracting throwsters, who may operate in other states. In 1927, less than thirty per cent of the raw silk so reported as consumed by New Jersey manufactures, was thrown by contract within the state. How much was thrown within the weaving establishments it is impossible to say, but it seems likely that considerable quantities were thrown in other states.

Pennsylvania mills, in 1927, converted into yarn some 21,000,000 pounds of raw silk although only 14,000,000 pounds were reported as consumed by that state's silk manufactures, and some of this may

have been thrown within the fabric mills. This would suggest that much of the silk thrown under contract for New Jersey weaving establishments is so converted in Pennsylvania. This is to be expected, for the throwing of silk, a highly mechanized industry requiring only the cheapest unskilled labor, tends to settle in regions affording an ample supply of such labor. Paterson, because of the availability of the wives and children of the men employed in the then prosperous locomotive works, early attracted this industry. But

CHART 6



with the dwindling in the supply of cheap labor and with the newly discovered source of labor in the families of the Pennsylvania miners, silk throwing has tended more and more to migrate to that state; favorable legislation and absence of labor organization have offered additional inducements.

That the conversion of raw silks into yarns has been less prosperous than silk weaving in New Jersey, is evidenced by the decline in the employment of spinners and winders from 12,463 in 1914 to 8,814 in 1919, during a period when the employment of broad silk weavers increased by 6,000 and when there was a slight decline in the employment of ribbon weavers. The drop in the employment of spinners was compensated to a certain extent by an increase in active producing spindles during this period from 213,000 to 284,000. At the same time, weaving equipment increased from 23,000 looms in 1914 to 30,600 looms in 1919. Figures of occupational employment are not available for later dates, but, from examination of this one period, it is evident that the seeming discrepancy between the growth reflected in Chart 6 and that in Table 1 may be explained by the unusual growth of broad silk manufacture in relation to the other silk industries of New Jersey.

TABLE 2

**PRINCIPAL MATERIALS CONSUMED IN NEW JERSEY SILK MANUFACTURES 1904-1927**

(Thousands of Pounds)

YEAR	RAW SILK	ORGANZINE, TRAM, AND CREPE TWIST	ARTIFICIAL SILK	COTTON AND MERCERIZED YARNS	WOOLEN AND MOHAIR SPUN SILK AND OTHERS
1904	3,553	1,343	8	1,317	195
1909	6,113	1,144	103	2,379	436
1914	6,892	1,472	488	3,327	1,068
1919	7,966	3,505	556	2,638	907
1925	7,477	5,453	3,854	2,632	723
1927	7,413	5,481	3,747	2,636	359

It will be noticed from Table 1 that the greater part of broad silk production has been in the field of all-silk fabrics. Production of mixed-silk fabrics dropped in 1919 but since that date this branch of the industry has grown more rapidly than the "all silk" branch. From 1914 to 1927 the consumption of cotton, woollen, and other yarns has dropped along with an increase, marked after 1919, in the consumption of artificial silk (Table 2).

Since 1909 when New Jersey created 35.9 per cent of the total value added by American silk manufactures, her contribution to the national product steadily fell to 30.5 per cent in 1919 and to 24.7 per cent in 1927. But if New Jersey has been declining in importance as a silk manufacturing state, it has been gaining in promi-



nence as a dyer and finisher of textiles. In 1909, 19.6 per cent of the total value added by the dyeing and finishing establishments of the United States was created in New Jersey and this percentage rose to 23.5 in 1919 and to 27.4 in 1927.

*Dyeing and Finishing.* The dyeing and finishing industry has displayed a marked growth over the whole period and will be observed in Chart 6 to be one of the few New Jersey textile industries, and in fact one of the few New Jersey manufactures, to have continued adding to its employment after 1919. This manufacture which includes the dyeing of yarns and the dyeing and finishing of woven fabrics has settled in New Jersey and, more especially, in Passaic County because of the availability of water of a quality necessary to its processes, and because much of its product requires speedy delivery to New York City.

It is not reported how much of the dyeing and finishing is performed upon silks and how much upon the other textiles. Furthermore, a certain amount of it is concealed in the other textile-industry totals since some dyeing and finishing is done within the yarn and fabric mills. And since the Census Bureau, whenever possible, reports dyeing and finishing as a separate industry, even when it is performed within a textile-producing plant, a certain amount of its rapid growth and of silk's mild growth may possibly reflect merely the more thorough isolation of this process in recent census reports.

*Woolen and Worsted Goods.* The "woolen and worsted goods" industry, it will be seen from Chart 6 and Table 3, experienced its rapid growth during the first fifteen years of the century. Production peaks for the census years covered were reached in 1914 in the manufacture of "all-wool worsteds" and of "worsted yarns for sale." Although there was little change in employment and an increase in the installation of power between 1914 and 1919, the production of woven goods was considerably curtailed during this period. This decline in the production of woven goods by the combined woolen and worsted industry, however, was characteristic of only the worsted goods, there having been an increase in the production of woolens.

However, the production of woolens, which had been steadily increasing, declined from 1919 to 1925 to below the 1899 output; and the increased production in 1927 was below the 1904 output. Production of worsteds increased in 1923 to almost the high production of 1914, only again to decline through 1925 and 1927 to a figure lower than any year since 1904. While the American woolen and worsted manufactures have been none too prosperous in recent years, the New Jersey industry seems to have suffered even more than the total American industry. Although this state accounted for 17.1 per cent of the "value added" reported by the worsted goods industry in 1919, it accounted for only 10.3 per cent of the total in 1927.

*Other Textile-Mill Products.* Like the woolen and worsted goods industry, the manufacture of knit goods experienced an early rapid expansion, though this slackened somewhat after 1914, but, unlike

this other industry, it shows an increase even in its employment, after 1919 (Chart 6). It is most difficult to learn from the available figures how this growth has been distributed within the industry. Hosiery, and more especially silk hosiery, is the major product. Some

TABLE 3  
PRINCIPAL PRODUCTS OF NEW JERSEY WOOLEN AND WORSTED  
GOODS MANUFACTURES, 1899-1927

YEAR	SUITINGS, DRESS GOODS, OVERCOATINGS, CLOAKINGS (Thousand Square Yards)			COTTON WARP WOVEN GOODS (Thous. Sq. Yds.)	WOR- STED YARNS FOR SALE (Thous. Pounds)	NOILS AND WOOL WASTE (Thous. Pounds)
	Total <sup>1</sup>	All Wool Worsteds	All Wool Woolens			
1899	8,177	5,237	2,243	5,223	4,756	1,411
1904	16,805	13,065	3,623	7,617	5,776	2,015
1909	26,793	21,887	4,842	2,978	11,205	3,740
1914	36,464	29,361	7,079	3,627	12,719	6,282
1919	29,576	19,592	9,984	2,173	8,991	6,561
1921	27,300	21,695	5,605	..... <sup>1</sup>	10,807	6,592
1923	31,229	29,006	1,888	..... <sup>1</sup>	11,392	6,183
1925	27,943	26,266	1,676	..... <sup>1</sup>	8,576	4,234
1927	23,416	19,141	3,056	..... <sup>1</sup>	8,868	5,643
Value 1927 \$000	33,268	26,414	5,919	..... <sup>1</sup>	12,787	3,040

<sup>1</sup> Not reported separately for New Jersey.

<sup>2</sup> Includes for some years fabrics other than "all wool."

two million dozen pairs of silk hose were produced in 1927 over against a half million dozen in 1914. Cotton hosiery was important in 1919 when 1,175,000 dozen pairs were produced, but, in view of the tremendous decline in the consumption of cotton yarn and changes in hosiery fashion, it is not thought to have persisted in its importance. A certain amount of the production of cotton underwear, woolen and worsted outerwear, and knitted fabrics are included in the knit goods industry.

Cotton manufacturing, which is the leading branch of the textile industry in the United States, is one of the less important branches of this industry in New Jersey. Prior to 1919, it grew at a steady rate (Chart 6); some twenty-eight million square yards of fabric were woven in 1899, but over fifty-five million square yards in 1919. This growth was largely in the weaving of tire duck, the output of which increased from six million square yards in 1909 to twenty-two million square yards ten years later. Comparative figures of the physical production of fabrics for the years since 1919 are not available.

The consumption of raw cotton varied little before 1919, but after that date it shot up from seventeen million pounds to twenty-nine million pounds in 1925, while the consumption of purchased yarns,



which increased rapidly from two million pounds in 1899 to twenty-nine million pounds in 1919, fell off to only thirteen million pounds in 1925. This suggests that, unlike the situation in the silk industry, rather more of the yarns are being produced by the cotton industry in New Jersey.

In 1904, there were 5,700 wage earners employed in making fur felt hats in New Jersey, almost as many as in the dyeing and finishing industry, and the worsted goods industry. Since that time, employment has steadily dropped to only 1,700 in 1927, and production has fallen off from 677,000 dozen finished hats in 1904 to 276,000 dozen in 1927. This decline, however, has not been peculiar to the New Jersey industry, but has been country-wide, although to a less degree.

#### THE CLOTHING INDUSTRIES

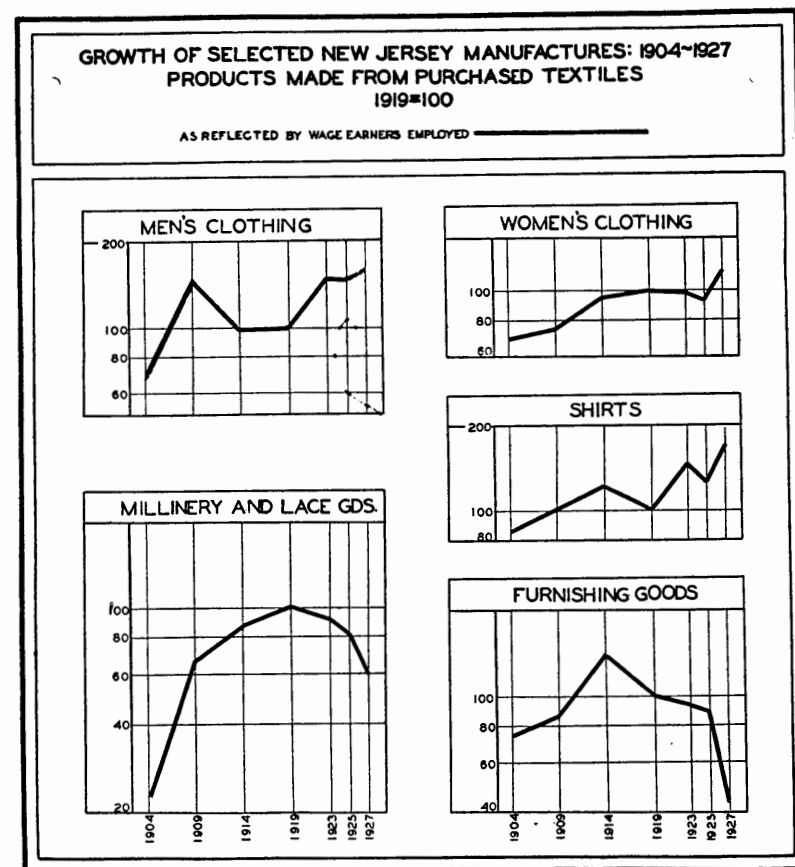
The more important of the industries which work up the fabrics into finished products, and especially into clothing, have been plotted in Chart 7, with the horsepower curves eliminated since these industries depend for the most part upon labor. The men's clothing industry, which was characterized by wide fluctuations prior to 1919, has grown steadily since that date; and there has been a marked growth in the shirt industry. More wage earners were employed in the women's clothing industry in 1927 than in 1919; but this growth occurred wholly during the period from 1925 to 1927. It is significant that in these three clothing industries, which increased their employment since 1919, New York City has curtailed its employment. Between 1919 and 1927, employment in the men's clothing industry of that city, dropped from 47,311 to 30,687, in the women's clothing industry from 95,842 to 84,379, and in the shirt industry from 6,474 to 4,490. The charts of the clothing industries of New Jersey would suggest that there has been a certain shift of the clothing industry from New York City to New Jersey.

Other of the clothing industries have not prospered in recent years. The production of millinery and lace goods which had increased through every period prior to 1919 has declined since that year. The peak for furnishing goods was reached in 1914. Employment in this industry has been curtailed in every subsequent period, the most marked decline having been from 1925 to 1927.

The history of textile manufactures in New Jersey during this quarter century, then, is not a simple story but there has been mild growth, a rapid increase, and an actual decline in the constituent branches of the industry. National leadership has been relinquished

in certain of the component industries and achieved in others, although the losses in this respect have been greater than the gains. Other industries in which New Jersey has never led have tended more and more to leave the state, while, in recent years, the clothing indus-

CHART 7



tries of a neighboring state have found New Jersey increasingly attractive. The significance of the marked growth of the dyeing and finishing industry, which is so closely allied to the chemical industry, will be apparent when the chemical industry is discussed in the following chapter.

## THE CHEMICAL INDUSTRY

Unlike the textile industry, the "chemical and allied products" industry of New Jersey has grown rapidly and has persistently increased in importance. An important industry in New Jersey, even at the beginning of the century, its progress has been marked by the introduction of innumerable new products, a development which is obscured by the rather elastic classification of the census.

### CHEMICALS

The most phenomenal growth in this group has been in the "chemicals not elsewhere classified" industry, which, rather than being the category of miscellaneous negligible products suggested by its name, includes the greater part of those products, which in the customary sense of the word are termed chemicals. The extensiveness of this class arises from the common practice of chemical plants to manufacture a multiplicity of products, all of which means that their major product has little significance for purposes of classification. The difficulties of interpretation may be illustrated by taking the "sulphuric, nitric, and mixed acids" industry as an example. The products in question are reported separately for the establishments engaged primarily in their manufacture. However, great quantities of these acids are produced as by-products of other chemical industries and sold by them, and even greater amounts are produced for consumption within the plants of manufacture. In New Jersey, in 1919, forty per cent of the sulphuric acid, eighty-five per cent of the nitric acid, and sixty per cent of the mixed acids produced, were consumed within the plants of manufacture. Such production of acids is not reported in the "sulphuric, nitric and mixed acids" group. Another difficulty in correctly interpreting the "chemicals not elsewhere classified" group arises from the failure to include in 1919 coal tar products, reported separately, in this year.

From Chart 8 it will be observed that the greatest growth of the "chemicals, not elsewhere classified" industry occurred prior to 1919. This was especially true during the war period when American chemists were called upon to produce many of the chemicals formerly supplied by Europe. Not only was it necessary to meet the customary needs of industry, but it was also imperative to meet the enormous governmental demands for chemicals. Subsequent to 1919, it is difficult to determine the trend of this industry for it shows a sharp curtailment in employment and only a slight increase in installed power;

but, in the face of falling prices, only an imperceptible decline in "value added" by manufacture. It should be noted that figures for 1925 and 1927 are not strictly comparable with figures for previous years, because of the exclusion from this class of compressed and liquified gases in 1927 and of rayon in 1925 and 1927. New Jersey's share in the total value added by this industry, which had increased from 16.6 per cent in 1909 to 20.2 per cent in 1919, fell to 19.2 per cent in 1925. This decline may mean that the chemical industry is beginning to decentralize or it may merely mean that New Jersey manufactures were called upon to carry rather more of the additional war-time output.

In Table 4 are presented the values for different kinds of chemicals produced for sale in New Jersey and in certain selected states. Total

TABLE 4

**CHEMICAL PRODUCTS, FOR SALE, PRODUCED IN NEW JERSEY: 1909, 1914, 1919, AND IN NEW YORK AND PENNSYLVANIA: 1919**  
(Thousands of Dollars)

PRODUCT	NEW JERSEY			NEW YORK	PENN- SYLVA- NIA
	1909	1914	1919	1919	1919
<i>Products: Total Value..</i>	26,516	37,689	142,395	152,399	94,696
<i>Chemicals, n.e.c. ....</i>	22,824	31,687	84,034	88,102	73,333
<i>Coal Tar Products.....</i>			44,740	45,792	9,492
<i>Sulphuric, Nitric and Mixed Acids.....</i>	2,127	5,071	2,804	2,670	11,871
<i>By Products from other Industries.....</i>	1,564	931	10,816	15,835	
Plastics and Py- roxylin Solutions..	4,634	7,622	25,281	..... <sup>1</sup>	..... <sup>1</sup>
Acids.....	5,256	7,645	14,314	11,085	12,925
Sodas, Sodium Compounds.....	1,473	4,924	12,125	19,617	2,600
Compressed and Liquified Gases..	425	527	2,471	2,065	3,460
Bleaching Com- pounds.....	76	317	1,542	5,685	148
Other Chemicals.....	13,122	14,670	74,345 <sup>2</sup>	107,816 <sup>23</sup>	65,750 <sup>2</sup>
All other Products ..	1,531	1,983	12,317	6,130	9,806

<sup>1</sup> Not reported.

<sup>2</sup> Includes Coal Tar Products reported above.

<sup>3</sup> Includes Alums, Aluminum, and Compounds, 16,838 thousand.

value is the sum of the "chemicals, not elsewhere classified," "coal tar products," "sulphuric, nitric, and mixed acids" classes and the chemical by-products from other industries. The value of "coal tar products" reported in the italics part of the table is not strictly comparable with the separate products reported in the lower part of the table, because it represents not the value of coal tar products manufactured but the value of the total product of those establishments engaged primarily in the manufacture of coal tar products. However the "coal

tar products" figure is so high relative to the other figures that this industry may safely be classed along with plastics and pyroxylin solutions as one of the leading chemical industries of the state. Acids and sodas and sodium compounds, follow respectively in importance.

Conclusions as to growth in the production of these separate products must not be drawn from Table 4 because of the wide price fluctuations of the period. It is believed that the prominence of plastic and pyroxylin products and of coal tar products in 1919 has persisted since then. The development of the plastic and pyroxylin solution industry is interesting since it utilizes nitrocellulose—the basic material for the production of explosives. Extensive research to discover new uses for this material which had been produced in great quantities during the war did much to prevent a decline in this industry to be expected in the post-war period.

The detailed statistics of Table 4 are not available for recent years. However, in 1927, New York still led in the manufacture of chemicals with New Jersey an unquestioned second. Pennsylvania, on the other hand, had lost its high rank, probably due to the isolation of rayon, and compressed and liquefied gases into separate classes. In 1919, New York and New Jersey, both producing about the same amount of coal tar products, accounted for about two-thirds of the country's total. In the same year New Jersey produced about one-third of all the pyroxylin solutions and plastics, and led in the production of sulfuric, nitric, and mixed acids including the acids consumed within the plant of manufacture.

However, when an industry's scope is so broad, state-rankings lose much of their significance. The difference in composition of this industry within the states as reflected in Table 4 is further suggested by the 1927 returns when New Jersey spent more for materials than New York but added only \$50,000,000 value, while New York added \$73,000,000.

#### ALLIED PRODUCTS

*Petroleum Refining.* Petroleum refining can hardly be termed a new industry, but it has developed many new products in recent years and has undergone such marked changes that gasoline, a former by-product, is now its major product. If it does not represent a new industry, it is one the growth of which has been effected by a new industry, namely the manufacture of automobiles.

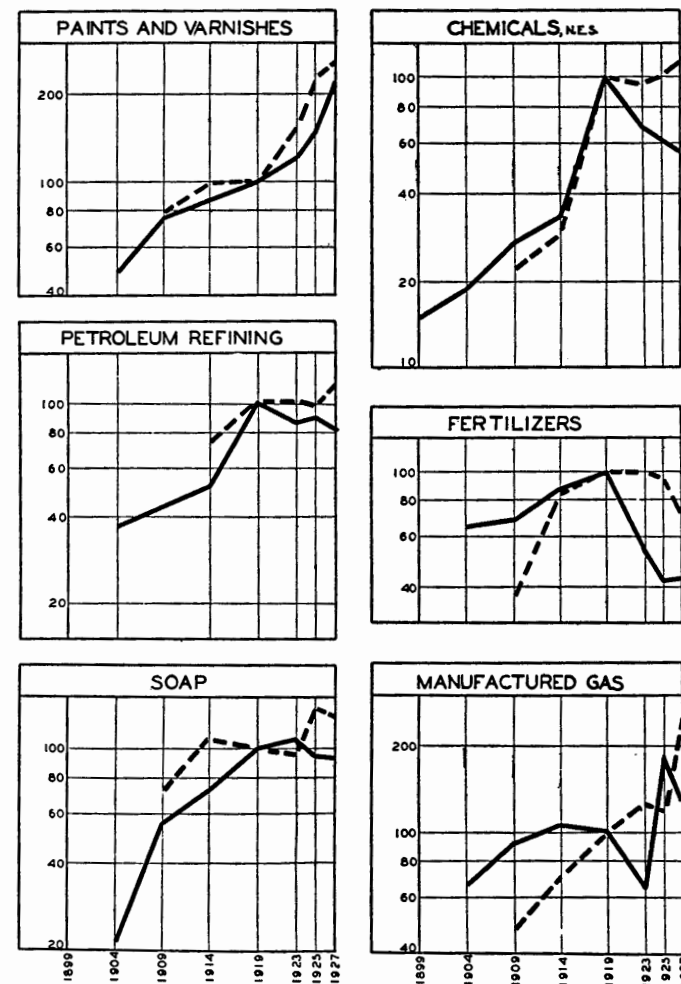
The rapid growth of this industry up to 1919 is reflected in Chart 8. In 1919 more wage earners were employed in this industry in New Jersey than in any other state; as for "value added" by manufacture, New Jersey was surpassed by California only. But, in 1927 New Jersey ranked only third in "value added" by manufacture, and third in number of wage earners employed.

Here again conclusions as to post-war changes are apt to be misleading. While employment has declined and installed power has in-

CHART 8

#### GROWTH OF SELECTED NEW JERSEY MANUFACTURES: 1899-1927 CHEMICALS AND ALLIED PRODUCTS 1919=100

AS REFLECTED BY  $\left\{ \begin{array}{l} \text{INSTALLED PRIMARY HORSEPOWER} \text{-----} \\ \text{WAGE EARNERS EMPLOYED} \text{-----} \end{array} \right.$



creased only slightly in New Jersey, both have experienced marked increases for the country as a whole. On the other hand, recent technological changes have been such that the productivity of labor for the petroleum refining industry of the United States doubled between 1919 and 1925,<sup>1</sup> and it may be assumed that this change has been widespread. Even though only slight additions have been made to installed primary power, statistics suggest that there has been a significant increase in the resort to power: expenditure for fuel and power increased from \$8,000,000 in 1919 to \$14,000,000 in 1927 along with a decline in an outlay for wages from \$18,000,000 in 1919 to \$14,000,000 in 1927. It seems that the abrupt slackening of increase after 1919 reflected in Chart 8 does not represent adequately production since that date.

That this industry has grown so rapidly in New Jersey is not surprising. Petroleum refineries tend to locate near the markets for the finished products, the crude oil being pumped across the country through pipe lines or shipped by tankers. As was mentioned before, this industry in its growth, has followed the automobile industry and has introduced processes which have extracted more and more gasoline from the crude oil. Furthermore, it is in this state that recent successful experiments have been conducted perfecting the hydrogenization of petroleum by which nearly one hundred per cent of the petroleum can be converted into gasoline or other of the more valuable products.<sup>2</sup>

*Paints and Varnishes.* Unlike the two industries just observed,—“chemicals not elsewhere classified” and “petroleum refining”—the paint and varnish industry of New Jersey has experienced its greatest growth since 1919, and more particularly since 1923, both within the state and in relation to the rest of the country (Chart 8). In 1919 only 8.9 per cent of the total “value added” by manufacture was created in New Jersey, a contribution which increased to 14.3 per cent in 1927.

Apparently this change has occurred for the most part in the production of varnishes (Table 5). Unfortunately, however, colors and pigments have not been reported since 1919 and pyroxylin lacquers, enamels, etc., are reported only for 1927. Since less than one-half of the total value of this industry is represented by the products recorded in Table 5, it is to be assumed that either colors and pigments or pyroxylin lacquers, or both, has largely contributed to this growth. Moreover, of these two, this would seem more likely for the production of pyroxylin lacquers, since in 1927 these products represented over one-third of the value for the paint and varnish industry. The manufacture of pyroxylin lacquers is a comparatively new industry supplying the automobile manufactures with a durable finish for their products.

<sup>1</sup> Handbook of Labor Statistics, 1924-1926, Bulletin of U. S. Bureau of Labor Statistics, No. 439.

<sup>2</sup> Chemical and Metallurgical Engineering, June, 1929, p. 332.

**TABLE 5**  
**PRODUCTION OF PAINTS AND VARNISHES IN NEW JERSEY**  
**1909-1925**

PRODUCT	Unit (000's)	1909	1914	1919	1923	1925	Value 1925 (Thous. Dollars)
TOTAL							50,577 <sup>2</sup>
Colors, Pigments	Pounds	65,004	60,273	103,447	..... <sup>1</sup>	..... <sup>1</sup>	..... <sup>1</sup>
Paints, Paste Form							
White Lead	"	..... <sup>1</sup>	12,211 <sup>1</sup>	7,138	1,884	22,546	2,243
Zinc Oxide	"	..... <sup>1</sup>	..... <sup>1</sup>	4,483	729	301	30
Other	"	..... <sup>1</sup>	..... <sup>1</sup>	15,296	11,801	11,678	1,756
Paints, Mixed	Gallons	2,806	2,968	5,072	5,106	6,809	10,762
Varnishes and Lacquers							
Oleoresinous Varnish	"	..... <sup>1</sup>	..... <sup>1</sup>	3,402	5,910	7,778	8,837
Spirit Varnish	"	..... <sup>1</sup>	..... <sup>1</sup>	422	605	578	1,301
Damar Varnish	"	..... <sup>1</sup>	..... <sup>1</sup>	318	161	193	171
Drying Japans	"	..... <sup>1</sup>	593	748	923	624	697
Baking Japans	"	..... <sup>1</sup>	459	1,613	1,346	271	262

<sup>1</sup> Not reported for New Jersey.

<sup>2</sup> Includes all paints and varnishes not reported separately.

*Other Allied Products.* Other manufactures, closely allied to the chemical industry, which have experienced a marked growth over this period are the manufactures of soap and of illuminating and heating gas. The output of hard soap, which increased from 200,000,000 pounds in 1909 to 307,000,000 pounds in 1919, fell to 271,000,000 pounds in 1925. This decline must have been accompanied by increases in production of other soap products, more especially since hard soap represented about eighty per cent of the total value for soaps in 1919 and only about fifty per cent in 1925. There has been an increase in installed horsepower in the manufactured gas industry, an increase which was particularly marked from 1925 to 1927. This increase in power has been accompanied by wide fluctuations in employment since 1919.

The fertilizer industry has been plotted since it is one of the few New Jersey chemical industries to decline appreciably in recent years. This rate of growth of this industry was curbed as early as 1914. Since 1919 employment has rapidly declined; at no time since that year has employment been as great as in the lowest pre-war year.

It is clear from our observations, that the growth of the “chemicals and allied products” industry, which is rapidly becoming New Jersey’s leading manufacture, has resulted in large part from the introduction into the manufactures of New Jersey of products new to American manufactures, of products new to world manufactures, and because of the increased demands for the established chemical products created by certain of the new industries.

steadily since 1919, physical production in 1927 showed an increase over 1919 of 24 per cent.<sup>1</sup>

It will be remembered from the graph of the non-ferrous "metals and metal products" industries (Chart 4-b) that a most unusual spread occurred here between installed power and employment after

## THE METAL AND MACHINERY INDUSTRIES

Three related industrial groups will be discussed in this chapter. They are: non-ferrous "metals and metal products," "machinery," and "iron and steel and their products." Since the limits of these groups are not clearly defined, it is advisable to treat them jointly.

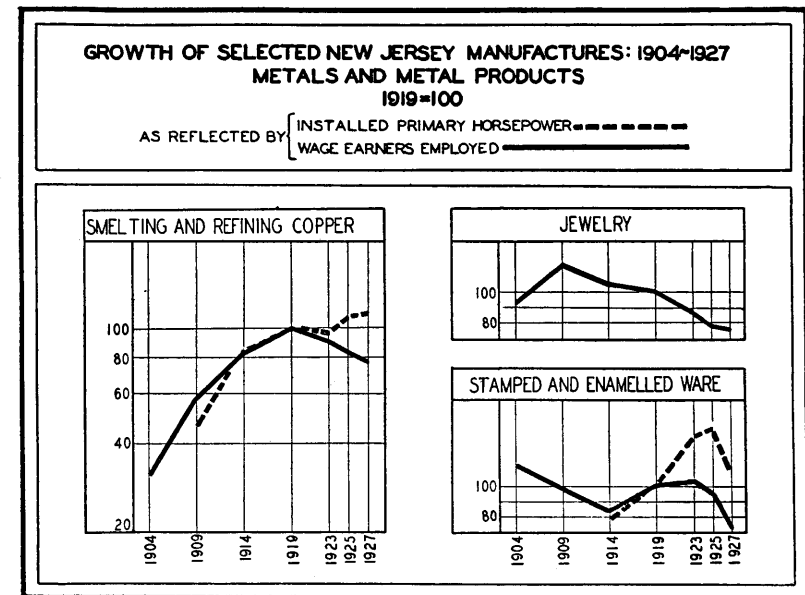
### NON-FERROUS METALS AND THEIR PRODUCTS

Situated in an advantageous position to receive the smelted copper which is shipped by ocean vessels and to re-export it, as well as to supply the copper consuming manufactures of the East, New Jersey refines more copper than any of the other states. The growth of this industry has followed much the same course as the growth of the electrical equipment industry, its major consumer (Charts 9 and 10).

The smelting and refining of copper are reported jointly by the Census Bureau. Although it is generally more economical to smelt the ores near their sources and to refine the product near its market, a certain amount of Cuban and other foreign ores are shipped to New Jersey for smelting. Nevertheless, relatively little of the ore is smelted in this state. The joint treatment of smelting and refining in the census reports may lead to some confusion in the interpretation of the figures. Thus Arizona leads in the combined industry of smelting and refining, but it derives that position as a result of its great activity in smelting, and, as a matter of fact, is relatively unimportant as a refining state. Copper from these Arizona smelters is shipped to New Jersey for refining. Other sources of the copper refined in New Jersey are Utah, Nevada, and Peru. The refining industry in New Jersey is confined to only three plants; the annual capacity of their electrolytic refineries increased from 480,000 tons in 1923 to 594,000 tons in 1927, this being nearly forty per cent of the capacity of the country.<sup>1</sup> Washington, Montana and Maryland are the other important refining states.

New Jersey's recent increase in refining capacity is presented in Chart 9 which shows an increase in installed horsepower. Not only has the capacity been increased but labor has been rendered increasingly efficient with the result that, although employment has dropped

CHART 9



1909. That this is not characteristic of the separate industries is evident from Chart 9 where it may be seen that the smelting and refining of copper, which is the most important industry of the group, follows much the same pattern after 1919 as many of the other industries. The early decline in employment in the group as a whole is, then, the resultant of the growth in copper refining and the decline in jewelry and other industries in this group (Chart 9). The installed power of the copper refining industry has been so relatively great within the group as to determine the course of that factor for the group as a whole.

<sup>1</sup> The value of the product of this industry, which is preponderantly refined copper, decreased from \$244,269,000 in 1919 to \$210,202,000 in 1927, while the price in New York City of refined copper dropped from 18.7 cents a pound to 12.9 cents a pound. Correcting this change in value for price change we find production to have increased 24%.

One must be cautioned not to draw rash conclusions as to the size of this industry from the value figure quoted, for although the value of this industry in New Jersey was \$210,200,000, materials cost \$198,700,000 and only a value of \$11,500,000 was added by manufacture.

<sup>1</sup> Yearbook of the Bureau of Metal Statistics, 1928.

The installation of power has not been plotted for the jewelry industry because of the relative unimportance of power in this industry and it has been necessary to omit the 1909 figures for stamped and enameled ware which was not reported for that year. Employment has declined in the jewelry industry. Apparently, then, New Jersey has curtailed production of jewelry since 1909, at the same time retaining a certain prominence in this field; it created 16 per cent of the "value added" for that industry in the country as a whole in 1904 and 12.2 per cent in 1927. Although manufacture of most of the products of non-ferrous metals seems to have suffered declines, the processing of the metals has increased. Another of the manufactures of non-ferrous metals which has grown appreciably since 1919 is the production of "brass, bronze, and other non-ferrous alloys." While this industry has displayed little change in employment of labor or installation of power since 1919, it increased its "value added" by manufacture from \$5,943,000 to \$7,056,000 in 1927.

#### MACHINERY

Electrical machinery, apparatus, and supplies can hardly be classified as products of copper, yet large quantities of this metal are employed in their manufacture. The group to which this industry is assigned—the machinery group—is misleading in its emphasis as far as New Jersey is concerned, because comparatively little of the heavy electrical machinery is produced in this state. A considerable number of the lighter motors are manufactured in New Jersey, but the major products of New Jersey in this field are batteries, incandescent lamps, vacuum radio tubes, radio apparatus, insulated wires and cables, telephone equipment, and electrical measuring instruments.

The "electrical machinery, apparatus, and supplies" industry grew rapidly in the earlier period when electrification was expanding swiftly and new appliances were being introduced and popularized. Doubtless this growth has been curbed in recent years but not to the extent that would be suggested by Chart 10, for "value added" by manufacture increased from \$61,000,000 in 1919 to \$105,000,000 in 1927. The introduction of new products has persisted, a notable example being radio apparatus. Over this whole period, the number of establishments has grown from 42 to 137.

The greater part of the remaining machinery industries are classified under "foundry and machine shop products" which includes a vast miscellany of products. However, due to the practice of the shops concerned to produce different kinds of machinery, they cannot be classified in more detail. The scope of this industry has so changed for different census years that no significant comparisons can be made. Chief among the products are printing presses, elevators, conveying machinery, incandescent lamp machinery, along with a host of other machines, and a certain amount of gray iron casting. Of those machinery industries separately classified, "pumps and pumping equipment" have increased in output since 1919 and exhibit

the characteristic decline in employment accompanying an increased installation of power.<sup>1</sup> The manufacture of textile machinery has done little more than hold its own.

#### IRON AND STEEL AND THEIR PRODUCTS

The "iron and steel and their products" industry in New Jersey embraces largely the products of iron and steel, rather than the processing of the metals themselves. In 1919 there were reported for New Jersey only three blast furnaces which employed some 500 wage earners. Steel works and rolling mills showed an increase in output between 1914 and 1919, but have experienced declines since that date; in 1927, 129,000 tons of steel were produced, which is less than the output in 1914.

The manufacture of cast-iron pipe, experiencing a wartime curtailment characteristic of several of the building material industries, has grown steadily and rapidly since 1919, having added greatly to its employment in spite of a newly established process, centrifugal casting, which greatly increases the productivity of labor (Chart 10). However, this unusual increase in employment must be interpreted primarily as a recovery from wartime depression rather than as a positive growth of the industry. The principal pipe produced in New Jersey is the cast-iron gas and water pipe of which there were produced 215,000 tons in 1914. This fell to 81,000 tons in 1919 and increased again to 273,000 tons in 1927. Other manufactures of iron and steel products which have registered increases in employment since 1919, along with marked increases in installation of power and value added by manufacture, are "wire, drawn from purchased rods," "structural and ornamental work," "hardware," "plumbers' supplies," "steam fittings and heating apparatus," "tinware," and "stoves and furnaces." The decline in employment for the iron and steel group is largely traceable to the decline in employment in "steel works and rolling mills" and the manufacture of "cutlery and edge tools."

<sup>1</sup> The number of wage earners employed in the "pumps and pumping equipment" industry decreased from 2,408 in 1919 to 1,769 in 1927 and installed horsepower increased from 4,510 in 1919 to 8,948 in 1927.



## OTHER MANUFACTURES

In the three preceding chapters, the growth of the constituent industries of the textile, chemical, machinery, non-ferrous metals and iron and steel groups has been traced. This chapter will treat of the growth of the more important component industries of the remaining group.

## STONE, CLAY, AND GLASS PRODUCTS

The war-time depression which was observed to have affected the "cast-iron pipe" industry was also experienced by the "brick and other clay products" industry. Chart 11 shows that 1919 was the low year for this industry and that pre-war employment has, in fact, never since been equalled. Installed power has increased since 1919. Obviously, the trough in 1919 reflects the only partial recovery of construction activity from the wartime lull. If figures were available

**TABLE 6**  
**PRODUCTION OF CLAY PRODUCTS AND NON-CLAY REFRAC-**  
**TORIES IN NEW JERSEY: 1919-1925**

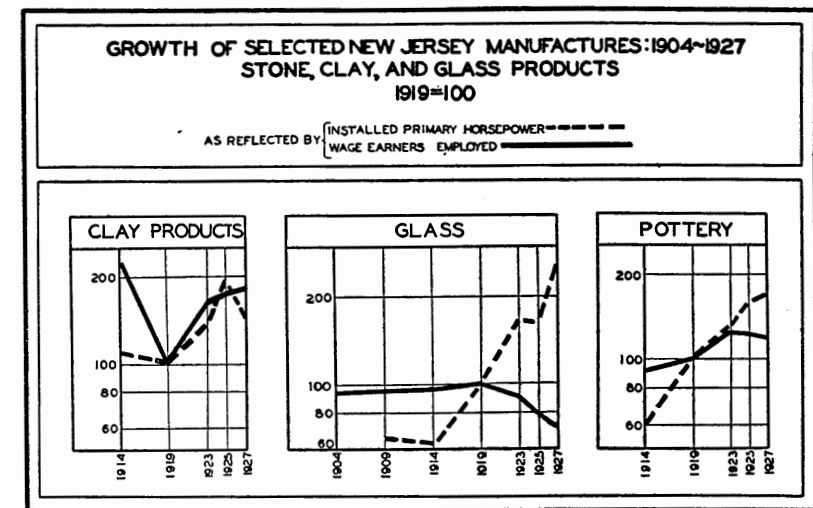
(No Reports for Years Prior to 1919)

PRODUCT	Unit	1919	1921	1923	1925
<b>Brick:</b>					
Common or Building	1000's	204,550	191,208	322,556	309,101
Enamelled and Fancy	"	8,630	6,405	7,362	.....
Face	"	24,611	15,101	23,304	26,537
Fire	"	28,716	18,101	27,728	.....
<b>Tile:</b>					
Building, hollow	Net Tons	173,933	176,231	307,470	373,211
Ceramic	1000 sq. ft.	2,225	3,533	6,442	7,061
Faience	"	321	.....	328	443
Flooring	"	1,458	1,916	3,200	2,719
Wall	"	1,988	2,544	6,654	7,427
<b>Architectural Terra Cotta</b>	Tons	.....	17,052	36,278	39,876
<b>Clay Sold</b>	"	.....	.....	22,349	45,680

for the years immediately preceding 1919, they would probably be even lower, since in 1919 building was already again getting under way. Statistics of the physical volume of production are not available prior to 1919, but Table 6 bears out Chart 11 for the post-war period. The greatest growth has been in the manufacture of tiles and terra cotta.

More important in New Jersey manufactures than the production of these building materials is the production of pottery. A change in

**CHART 11**



classification renders comparison with the years prior to 1914 impossible, but it will be seen that the pottery industry has grown appreciably since 1914 (Chart 11). Most significant is the great increase in the installed power over this period which has accompanied increased casting at the expense of hand pressing. The major product of this industry in New Jersey being china sanitaryware, it would be expected to follow pretty much the activity of construction. That the pottery industry did not experience the 1919 depression characteristic of other clay products, may have been caused by the relative prosperity of the pottery products other than sanitary ware, and particularly of porcelain electrical supplies. New Jersey ranks second only to Ohio in the pottery industry. This industry has shown a tendency to decentralize, as evidenced by declines in relative production of the leading states, Ohio, New Jersey, and West Virginia.<sup>1</sup> Increases in relative production have taken place in Pennsylvania and Illinois.<sup>1</sup> New Jersey is the center of manufacture of vitreous and semi-vitreous china plumbing fixtures, the largest of her pottery industries,

<sup>1</sup> See page 40, note 2.

which represented in 1927 a value of product of over \$13,000,000; the value of all pottery produced in New Jersey was \$22,090,000. Other products of the pottery industry which are of importance in New Jersey are hotel china, and porcelain electrical supplies. The latter had a value of \$3,800,000 in 1927. It will be observed that the greater part of New Jersey pottery industry is not the finer china suggested by the industry's title.

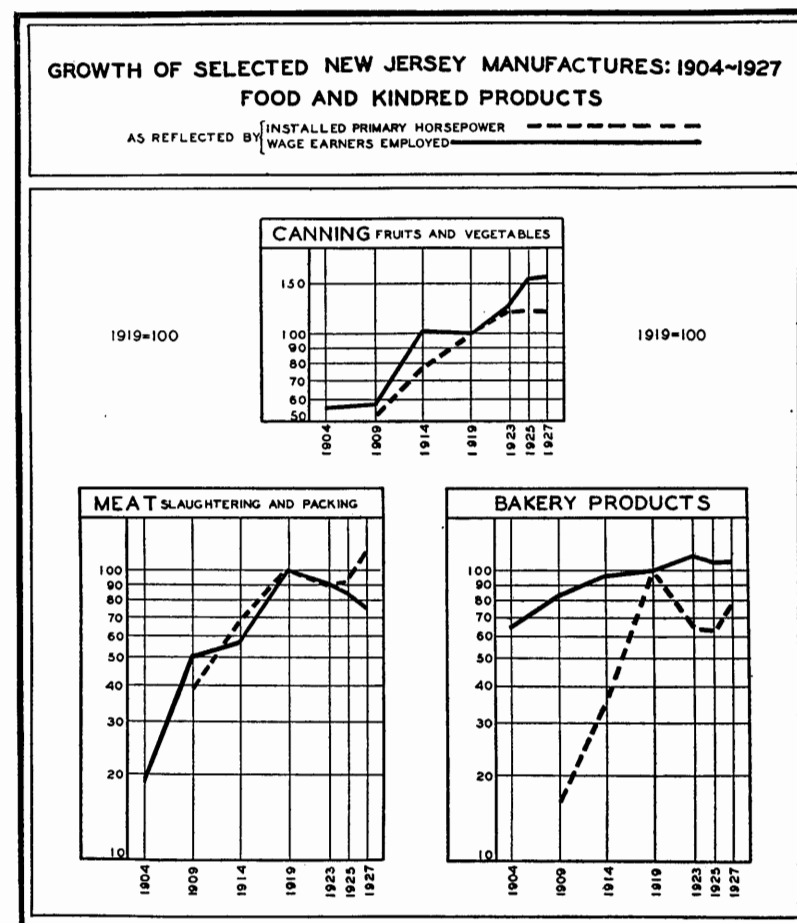
One of the most conspicuous spreads between employment and installed power in New Jersey manufactures is to be found in the glass industry. Here we find only slight increases in employment up to 1919, a marked falling off in employment after that date, and sharp increases in installed power since 1914 (Chart 11). The chief products of this industry are glass bottles and jars—either patent and proprietary or druggists' wares—and bulbs for electrical lamps. Manufacture of these products has been revolutionized in recent years. The year 1898 witnessed the introduction of the semi-automatic machinery for the making of wide mouth ware. This was followed in 1905 by the Owens automatic machine which, in spite of its superiority, was slow in being adopted because of the restrictive policies of the machinery producers. It did however afford an impetus for the widespread adoption of semi-automatic machinery. Devices were introduced which converted this semi-automatic machinery into automatic machinery with the result that practically all bottle making machinery is now of the automatic type. One man, with the aid of this machinery, can now produce in some cases from twenty-five to forty times as many bottles as he can by hand. The introduction of automatic machinery for the manufacture of electric bulbs came later; here one man's output with the machine is now over thirty times as great as it was by hand.<sup>1</sup> Of course, these great increases in output per man have occurred only in those plants manufacturing products which lend themselves to standardization and large scale manufacture.

#### FOOD AND KINDRED PRODUCTS

Most of New Jersey's food manufactures serve a local market; the most marked exception being the canning and preserving of fruits and vegetables, which, serving as an outlet for New Jersey agricultural products, has grown at a steady rate over the whole period (Chart 12). The rapid growth of the New Jersey slaughtering and meat packing industry prior to 1919 is probably accounted for to a large extent by the shift of slaughter yards from New York City to the

west shore of the Hudson (Chart 12). The "bread and other bakery products" industry steadily but slowly added to its employment up to 1923; employment has contracted slightly since that date. Installed power had increased rapidly up to 1923, but has been sharply cur-

CHART 12



<sup>1</sup> Bulletin of the U. S. Bureau of Labor Statistics, No. 441.

<sup>2</sup> These states reported the following value added by manufacture for the pottery industry:

	Value Added by Manufacture		Per Cent of Total	
	1919	1927	1919	1927
	(000's)	(000's)		
United States .....	\$54,125	\$77,017	100.0%	100.0%
New Jersey .....	12,645	17,467	23.4	22.6
Ohio .....	19,663	26,276	36.3	32.9
West Virginia .....	7,074	7,515	13.1	9.8
Pennsylvania .....	3,212	5,766	5.9	7.5
Illinois .....	1,463	3,230	2.7	4.2

tailed since then (Chart 12). However, the drop in the installed power is traceable to Jersey City where a large branch bakery for a chain store suspended operations.

Other important industries of the food group are the manufacture of ice cream, ice, and confectionery. From 1919 to 1927, power equipment, which is the significant factor in ice and in ice cream

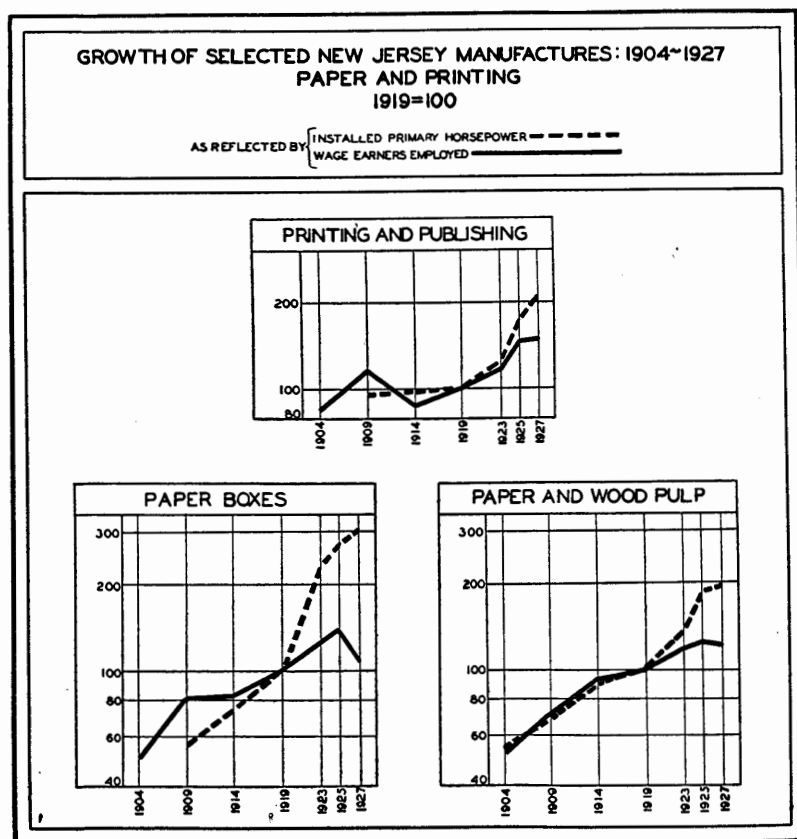


manufacture, was more than doubled in the ice industry, and tripled in the ice cream industry.

#### PAPER AND PRINTING

With the exception of the wall paper industry, every industry in New Jersey producing paper or paper products, or engaged in printing and publishing, increased its employment between 1919 and 1925 (Chart 13). This growth has been reflected in all of the branches of

CHART 13



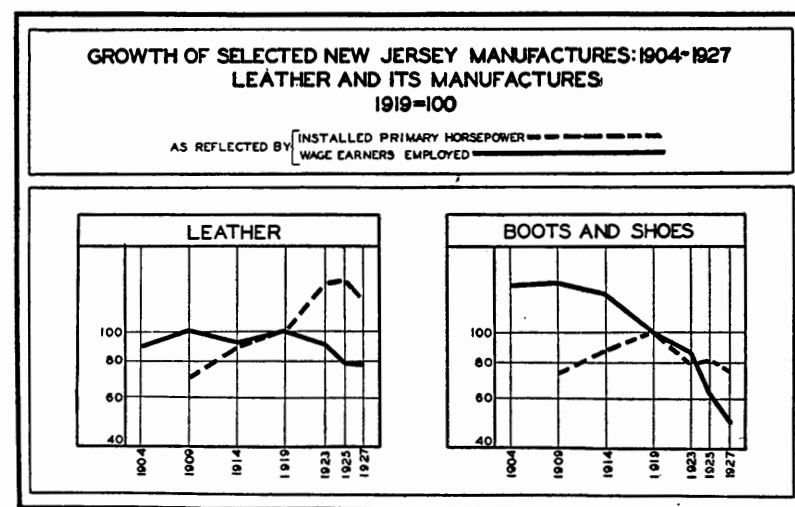
the printing industry from the printing of newspapers and periodicals to job printing. Of a total value of \$51,000,000 produced by the printing and publishing industry in 1927, newspapers contributed \$26,000,000, job printing \$18,000,000, and books and pamphlets \$3,200,000.

Complete statistics for paper produced in New Jersey are not available. The production of paper board, which represented \$13,600,000 of the \$34,800,000 value reported by the paper and wood pulp industry in 1925, has grown rapidly since 1919, although that year's production was considerably below production in 1914. One hundred and twenty thousand tons of paper board were produced in 1919, and 229,000 tons in 1925. Comparable figures for 1927 are not published; but paper boards produced for sale and for consumption within the plant of manufacture increased from 290,000 tons in 1925 to 361,000 tons in 1927. This board—news board, chip board, and others—is used in the manufacture of paper boxes, an industry which has kept pace in New Jersey with the production of paper. In addition to these box materials considerable quantities of high grade tissue, parchment, and various specialty papers are produced.

#### LEATHER AND ITS PRODUCTS

The "tanning, currying, and finishing of leather" industry which is designated "leather" in Chart 14 has displayed little change over the

CHART 14



whole period and, if anything, has declined in New Jersey since 1919. During the post-war period horsepower has been increased at least as rapidly as employment has been curtailed. It is believed, however, that physical production has declined in New Jersey as it has in the United States, since this state's percentage of the "value added" by this industry for the country has shown little change.

Although the recent trend of the basic leather industry is somewhat uncertain, the production of shoes, its major product, has definitely

declined. Not only did employment fall off from 4,192 in 1904 to 1,389 wage earners in 1927, but installed power declined after 1919. While a decline in the number of establishments often reflects little more than a consolidation of plants, it would seem that the drop in number of establishments from fifty-three in 1909 to seventeen in 1927 represents for the most part actual shutdowns of plants. Two leather industries which have grown since 1919 are the production of "pocketbooks" and "trunks and suitcases and bags," neither of which, however, has reached a significant size.

#### OTHER PRODUCTS

Other important New Jersey manufactures, which have not been plotted because of want of comparable figures, are the production of cigars, rubber tires and inner tubes, and phonographs. The "value added" by manufacture increased for the cigar and cigarette industry from \$18,000,000 in 1919 to \$35,000,000 in 1927, and there have been only slight changes in employment. The production of tire casings increased from 807,000 in 1914 to 2,081,000 in 1919 and 2,378,000 in 1925. Inner tubes followed a similar course from 1,618,000 in 1914 to 4,112,000 in 1925. The production of phonographs which, following the introduction of the product in New Jersey, increased at a remarkably rapid rate up to 1923, suffered a decline. Employment increased from 2,000 in 1914 to 10,400 in 1923 and fell to 4,800 in 1925.

### THE INCREASING MECHANIZATION OF MANUFACTURES

There was observed in Chart 1 a marked spread after 1919 between the curve of installed power and the curve of employment: while the former has continued to increase, the latter has registered a decline. This is true for the country as a whole as well as for the state of New Jersey.

According to the computations of Day and Thomas the expansion of the physical volume of production in the United States since 1919 has been greater than the increase in installed power. While no production index is available for New Jersey, "value added" by manufacture in this state increased 4.7 per cent from 1919 to 1927. The price level in 1927 was considerably lower than the price level in 1919, and the actual increase of physical production was, therefore, in all probability, very much greater.

The increasing amount of installed power in New Jersey manufactures portrayed in Chart 1 suggests that, all other things remaining equal, rather more was being spent for machinery, equipment, and power in 1927 than in 1919, and rather less for wages. And, if wage rates over the period have remained stable in relation to prices of manufactures, it would be expected that wage earners have been receiving a decreasing share of the "value added" by manufacture. During this period, 1919-1927, wages rose relative to prices; but in spite of this fact, a decreasing share of the "value added" by manufacture has gone to the wage earners (Chart 15).

Before investigating the individual industries for evidences of this change in degree of mechanization, it will be well to ask what the horsepower-wage earner charts can reflect. Increased mechanization may be brought about in several ways. Processes may be so refined and improved that given amounts of labor will result in an increased production without the utilization of additional power. This could be discovered only when there were available production data from which to compute variations in the output per unit of human labor. Or an increased mechanization may be brought about by the outright substitution of machinery for human labor, involving an additional installation of horsepower for its operation. Obviously this would be reflected in the charts by an increase in the installation of power accompanied by either a less marked increase, or a decrease, in the employment of wage earners.

When it is said that the manufactures of a given region are becoming increasingly mechanized, "manufactures" may connote the several

individual manufacturing industries or the collective manufactures of the area. That is, one may mean that the separate manufactures of the region are so altering their processes that each is consuming more power per wage-earner or that those industries which rely for the most part upon power are growing rather more rapidly than those industries in which labor is the important factor.

It is difficult to determine to what extent the one or the other has been taking place in New Jersey, but it may be recalled that among the rapidly growing industries, there are petroleum refining, copper refining, and paper production. However, the charts for industrial groups and specific industries suggest that increased mechanization of the total manufacture of New Jersey can not be wholly explained by the growth of the heavy industries. In Charts 4a and 4b the spread between horsepower and employment was noticed to have been characteristic of every group except the non-ferrous "metals and metal products" and the "leather and its products" groups and, perhaps the "paper and printing" group.

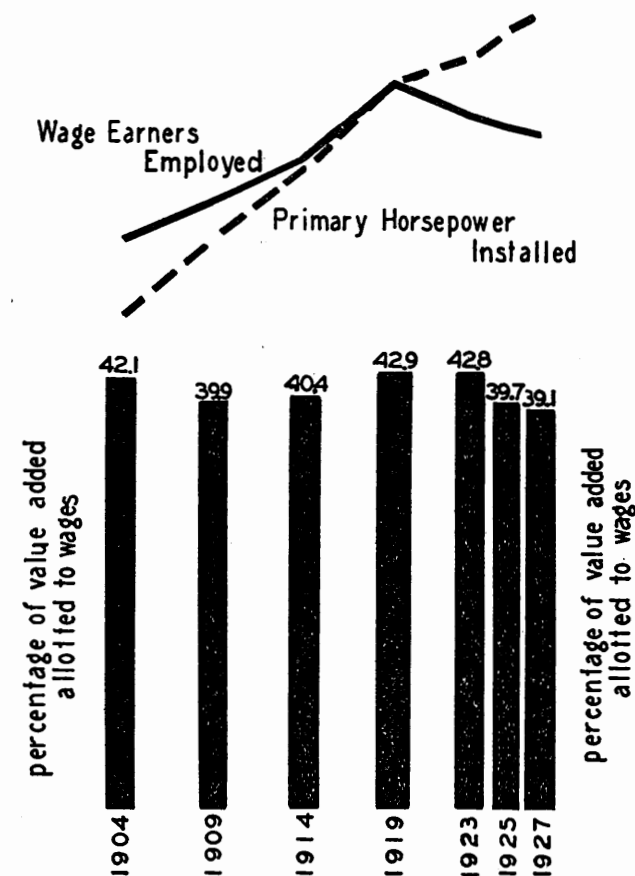
The movement has been found to be characteristic of not only the broader groups, but of most of the individual industries as well. In fact, the expanding constituent industries of the two groups which showed an earlier spread—non-ferrous "metals and their products" and "leather and its products"—were found to have followed the typical post-war spread. Two of the industries, which at first glance seem not to have undergone this change are the "cast-iron pipe" and "clay products, other than pottery" industries, both of which have increased employment and horsepower, since 1919, at pretty much the same rate. However, when it is remembered that 1919 employment was at a low point in these industries which had about the same horsepower as in 1914, and that their increases represented a return to normal, while the increases in horsepower represented an installation of new equipment, it will be evident that these two industries also have experienced the increased mechanization characteristic of the other industries.

The caveat may be repeated that any conclusions of variation in degree of mechanization will necessarily be conditioned by the limitations of the data, *i.e.*, that the horsepower figures represent installed primary horsepower, and not consumed power, and that the employment figures represent wage earners on the payrolls, and not man-hours worked.

Labor has not received a decreasing share since 1919 of the total product for every industry studied (Table 7). To be sure there is a concentration of maximum post-war shares in the years 1919 and 1923. There were eleven industries that had maximum shares in 1919, eight industries in 1923, and six and four industries in 1925 and 1927 respectively. Upon examination of the four industries of the latter group—those having maximum shares in 1927—one finds that there was no appreciable spread between horsepower and employment in the dyeing and finishing industry until 1925, that if the depression in the clay products industry in 1919 be taken into account, the spread in this industry would be found to have taken place in 1919, that horse-

CHART 15

COMPARISON OF SPREAD BETWEEN INSTALLED PRIMARY HORSEPOWER AND WAGE EARNERS EMPLOYED WITH CHANGES IN PERCENTAGE OF VALUE ADDED BY MANUFACTURE ALLOTTED TO WAGES IN NEW JERSEY MANUFACTURES: 1904-1927



power for the jewelry industry has not been plotted, and that there was a marked spread in the leather industry as early as 1919. Turning next to those industries in which labor received a maximum share in 1925, one discovers that the spread between horsepower and employ-

TABLE 7

PER CENT OF "VALUE ADDED BY MANUFACTURE" ASSIGNED TO  
WAGES IN NEW JERSEY MANUFACTURES BY INDUSTRIES:  
1904-1927\*

INDUSTRY	1904	1909	1914	1919	1923	1925	1927
<b>TEXTILES AND THEIR PRODUCTS:</b>							
Silk Manufactures	48.2	41.0	42.5	35.9	47.9	47.4	44.5
Dyeing and Finishing	50.0	53.1	41.5	42.5	45.5	42.1	50.3
Woolen and Worsted Goods	51.9	38.5	48.2	30.9	59.2	62.0	56.3
Knit Goods	46.3	45.5	49.7	59.1	46.4	44.8	45.6
Cotton Goods	58.8	49.9	49.5	44.9	62.6	64.7	59.1
Men's Clothing	56.7	61.3	54.8	57.0	54.8	56.8	52.6
<b>CHEMICALS &amp; ALLIED PRODUCTS:</b>							
Chemicals not elsewhere classified	29.0	27.4	28.2	38.3	34.3	31.8	31.1
Petroleum Refining	31.1		34.9	31.0	39.0	33.3	34.0
Paints and Varnishes	17.8	18.6	17.4	20.9	21.6	23.6	22.0
Gas: Illuminating and Heating	13.7	12.2	7.7	18.4	9.2	25.5	16.2
Soap	16.2	12.0	20.3	30.7	17.8	19.1	22.3
<b>MACHINERY &amp; IRON &amp; STEEL:</b>							
Electrical Machinery, Apparatus, Supplies	41.7	40.2	39.0	44.5	42.9	33.0	28.9
Steel Works and Rolling Mills	53.3	52.5	56.7	42.6	63.3	46.1	59.0
Cast Iron Pipe		72.9	77.5	61.8	64.3	59.7	63.6
<b>FOOD AND KINDRED PRODUCTS:</b>							
Bread and Bakery Products	43.7	41.9	42.3	44.8	45.8	41.0	35.7
Canning, Fruits and Vegetables	39.3	37.5	21.7	22.8	19.3	18.8	19.1
Slaughtering and Meat Packing	28.6	33.5	42.1	47.3	46.5	41.5	46.0
<b>PAPER AND PRINTING:</b>							
Printing and Publishing	38.7	40.9	38.3	39.2	33.6	35.8	35.2
Paper and Wood Pulp	39.0	42.4	43.5	44.5	41.2	39.5	36.4
Paper Boxes	52.0	47.3	54.8	46.3	51.6	46.3	41.1
<b>STONE, CLAY, &amp; GLASS PRODUCTS:</b>							
Pottery			62.7	53.2	60.0	61.7	55.5
Glass	68.5	67.4	74.5	64.9	58.9	47.3	50.7
Clay Products and Non-Clay Refractories			62.2	52.5	52.2	51.9	56.8
<b>METALS AND METAL PRODUCTS:</b>							
Smelting and Refining of Copper	16.2	19.9	41.8	41.6	66.4	47.9	44.1
Jewelry	39.5	36.4	38.1	31.4	35.8	36.4	39.6
<b>TRANSPORTATION EQUIPMENT:</b>							
Shipbuilding	71.0	71.9	74.5	71.1	71.8	79.6	70.2
Motor Vehicle Bodies and Parts			41.8	47.7	57.4	54.6	53.4
Motor Vehicles	53.4	55.2	38.2	39.5	37.5	26.6	34.8
<b>OTHERS:</b>							
Leather: Tanned, Curried, Finished	24.9	42.2	34.1	28.7	40.1	38.4	40.7
Cigars and Cigarettes	35.5			35.4	23.9	19.1	

\* The high percentage for 1904-1914 and 1919-1927 has been printed in bold type.

ment in the woolen and worsted goods industry and in the pottery industry occurred in the previous census year, 1923, and in the cotton goods industry as early as 1919. The early spread in the paint and varnish industry is difficult to interpret because of the rapid growth of both horsepower and employment since 1919. Nor can the spread in the shipbuilding industry be considered significant. Employment in the manufactured gas industry has fluctuated widely, but there were spreads between employment and power after 1919 and 1925 and the maximum share of labor was reached in 1925 and the second

greatest share in 1919. From the examinations of these industries for which the maximum share was reached in either 1925 or 1927, it would seem that in some cases there is no relation between the maximum share of labor and the spread between horsepower and employment and that in others this maximum share lags one census interval behind the year of spread.

However, expectation of labor's declining share in the total product of an increasingly mechanized industry is predicated upon an assumption of stability of wage rates of that industry relative to the prices of that industry's products. It was considered significant that labor, in the collective manufactures of New Jersey, has received less of the total net product in wages during a period when there was no such stability, but rather when there was an instability which would tend toward a constant share.<sup>1</sup> But, since a comparison of the relative movements of wages and prices in each individual industry would constitute a study separate in itself, it is impossible to say to what extent these fluctuations in the shares of labor have resulted from such relations. And, finally, the percentages in Table 7 do not reflect the substitution of fuel and power for labor, figures of the cost of fuel and power not being available for the years between 1919 and 1927. That the figures might be appreciably altered by the inclusion of fuel and power in the "value added" by manufacture is suggested by the petroleum refining industry for which Table 7 shows labor's share to have been greater in 1927 than in 1919, a relation which is reversed when the cost of fuel and power is added to the "value added" by manufacture rendering labor's share 27.1 per cent in 1919 and 25.5 per cent in 1927.

<sup>1</sup> The increase in wage rates relative to prices of manufactures would give the individual wage earner a greater share in the total product. This in turn would tend to counteract the decreasing share for the collective wage earners resulting from the decrease in workers employed per unit of product.

## A CROSS SECTION OF MANUFACTURES IN 1927

Some idea of the relative importance of industrial groups in New Jersey's manufactures was obtained in the chapter, "Growth of Manufactures by Industrial Groups." A more accurate comparison can be drawn for 1927, for which year it has been possible to make certain refinements in the figures not possible for preceding years; and the reaching of such comparisons is the purpose of this chapter. The use of a "refined value added by manufacture," the criterion to be used in this chapter, is discussed in the chapter, "Nature and Scope of Statistics." In the present discussion, the New Jersey industries assigned in the census reports to the "all other industries" group have been distributed among their respective groups. The "all other industries" group which includes all of those census classes which may not be separately reported for New Jersey because of the participation of so few establishments that their individual operations would be disclosed, is not to be confused with the "miscellaneous industries" group which includes all of those census divisions which do not lend themselves to distribution among the other fifteen groups and which are of so heterogeneous a nature as not to warrant the setting up of other groups.

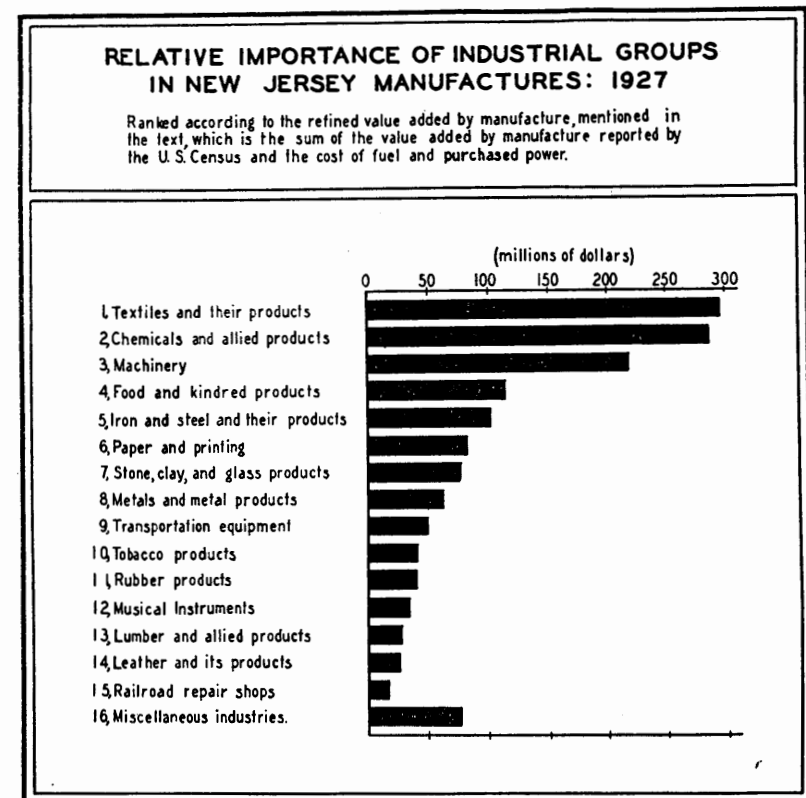
The relative importance of industrial groups is presented graphically in Chart 16 and numerically in Table 8. This refinement indicates

**TABLE 8**  
**REFINED VALUE ADDED BY MANUFACTURE IN NEW JERSEY**  
**MANUFACTURES BY INDUSTRIAL GROUPS: 1927**

All Manufactures	100.00%
Textiles and Their Products	19.15
Chemicals and Allied Products	18.47
Machinery	14.09
Food and Kindred Products	7.39
Iron and Steel and Their Products	6.50
Paper and Printing	5.22
Stone, Clay and Glass Products	4.92
Metals and Metal Products	4.01
Transportation Equipment	3.21
Tobacco Products	2.64
Rubber Products	2.61
Musical Instruments and Phonographs	2.19
Lumber and Allied Products	1.78
Leather and Its Products	1.67
Railroad Repair Shops	1.22
Miscellaneous Manufactures	4.93

that "chemicals and their products" more nearly approaches in importance "textiles and their products" than was suggested in Chart 5. Most striking is the concentration of New Jersey manufactures in these two groups along with the "machinery" group. These three groups accounted for over one-half of the total "refined value added

**CHART 16**



by manufacture" in New Jersey. They cover, however, a wider diversity of products than may be supposed. In previous chapters we discovered that the textiles group included the spinning and weaving processes, the dyeing and finishing of textiles, and their manufacture into clothing; that the chemicals group embraced the manufacture of such diverse products as acids, dyestuffs, pyroxylin products, gasoline, soaps, and paints, and varnishes; and that the machinery groups included products ranging from incandescent lamps and radios to heavy machinery. However, if the textile group is almost equalled by the chemical group in "refined value added by manufacture," it is still

the state's leading employer, having 108,000 wage earners on its payroll in 1927 in comparison with the 54,000 for the machinery industry group and 40,000 for the chemical industry group.<sup>1</sup> Also the amount of horsepower installed in the textile industry is slightly higher than in the chemical industry.

The relative importance of the particular industries which are reported by the Census Bureau bears less significance because of the variations in scope of the industry classes. For example, if the broad "electrical, machinery, apparatus and supplies" category which is statistically New Jersey's greatest single industry were to be split up into its components, the manufacture of incandescent lamps—a distinct product—would be far outstripped by "silk manufactures" which represents for the most part broad silks. For this reason the relative importance of the various individual industries has been indicated graphically with particular emphasis upon their intragroup relationships, preserving to a certain extent their ranking by placing the groups according to the "refined value added by manufacture" of their most important industry (Chart 17). Only those industries for which there was a "refined value added by manufacture" of \$10,000,000 or more have been included.

It will be noticed that "silk manufactures" and "dyeing and finishing of textiles" predominate in the textiles group in spite of the growth of other textiles, and that silk manufactures is still the most important. "Worsted goods," "knit goods," and "men's clothing" come next in importance. "Shirts," "cotton goods," "women's clothing," and "millinery and lace goods" follow; and while they are of some significance in New Jersey's manufactures they are far out-ranked by the previously mentioned textile industries.

There is less concentration in the "chemicals and allied products" group. "Chemicals, not elsewhere classified" and "petroleum refining" are of about equal importance but since the first is so broad in scope, petroleum refining, which represents a single industry, must be accepted as the most important individual industry of the chemicals group. "Paints and varnishes" and "manufactured gas" both about equal in "refined value added by manufacture" follow next in importance; and "soap," "patent medicines," and "oil, not elsewhere classified" graduate down in importance.

The only two industries of any significance whatsoever in the "machinery" group are "electrical machinery, apparatus, and supplies" and "foundry and machine shop products." Since these two categories are so inclusive, comparison with other industries would be meaningless but their comparative size suggests that within the machinery group, those industries manufacturing products which are intimately associated with electricity are collectively of greater importance than those producing non-electrical machinery and parts.

Certain other industries warrant mention. The "printing and publishing" industry ranks seventh among the individual industry divi-

<sup>1</sup> These totals include figures for those industries in which so few plants are engaged that operations of industrial plants would be revealed if the industries were reported separately. Therefore, these totals will not agree with those presented in the Appendix.

### NEW JERSEY'S LEADING MANUFACTURES RANKED ACCORDING TO THE SUM OF THEIR VALUE ADDED BY MANUFACTURE AND COST OF FUEL AND POWER: 1927



sions (Chart 17) and has a "refined value added by manufacture" twice as great as that for the paper and woodpulp industry which is next in importance within the paper and printing group. The "bread and other bakery products" industry, and canning of fruits and vegetables are of about equal importance and dominate the food group.

TABLE 9

PER CENT OF UNITED STATES "VALUE ADDED BY MANUFACTURE" CREATED BY SELECTED NEW JERSEY MANUFACTURES  
1925

	% of U. S. value added by manu- facture		% of U. S. value added by manu- facture
<b>Over 40%</b>		19. Buttons .....	18.6
1. Gold and silved reducing and refining.....	54.2	20. Wire drawn from rods....	17.9
2. Phonographs .....	48.1	21. Cast iron pipe .....	17.0
<b>Between 30% and 40%</b>		22. Roofing material .....	16.4
3. Linen goods .....	35.3	23. Silversmithing and sil- verware .....	15.4
4. Blacking, stains, polishes	34.0	24. Ship and boat building..	14.4
5. Oil n.e.s. not made in petroleum refineries .....	32.4	25. Jewelry .....	13.8
6. Dyeing, finishing textiles	30.7	26. Worsted goods .....	12.9
7. Artificial leather .....	30.5	27. Copper smelting, refining	12.3
<b>Between 20% and 30%</b>		28. Window shades, fixtures	12.0
8. Furs, dressed .....	29.6	29. Corsets .....	11.9
9. Cork products .....	28.6	30. Ammunition and related products .....	11.6
10. Tanning materials .....	24.5	31. Paper goods n.e.s. ....	11.2
11. Silk manufactures .....	24.1	32. Canning fruits, vegetables	11.2
12. Pottery, including porce- lain ware .....	23.0	33. Hats: fur felt .....	10.7
13. Rubber goods n.e.s. ....	22.5	34. Pocketbooks, purses, card cases .....	10.5
14. Explosives .....	22.3	35. Paints and varnish.....	10.2
15. Soap .....	20.8	36. Trunks, suitcases, bags..	10.1
16. Babbitt, type, and white metal .....	20.3	37. Electrical machinery, apparatus and supplies	10.0
<b>Between 10% and 20%</b>		38. Sulfuric, nitric, and mixed acids .....	10.0
17. Chemicals, n.e.s. ....	19.8	39. Leather: tanned, cur- ried, and finished .....	10.0
18. Printing ink .....	18.6		

The "steel works and rolling mills" industry, in spite of its recent sluggish growth and of New Jersey's relative unimportance in this industry, outranks the copper refining industry. Although shipbuilding has suffered marked declines in New Jersey, it is still seen to be of significance among this state's manufactures and outranks the production of motor vehicles and parts, as also their assembly. The "pottery" and "clay products" industries, popularly considered to be among the leading industries of the state, while of considerable importance, produce much less than many of the other industries. Nevertheless, each of these two industries is responsible for a greater "refined value added by manufacture" than the glass industry. Two of

the remaining industries which created a "refined value added by manufacture" of at least \$10,000,000—"leather, tanning, currying, and finishing" and "jewelry"—are industries which have not prospered in recent years.

It must be remembered that several of the manufactures of New Jersey can not be reported separately, since operations of individual plants would be revealed. The "value added" by manufacture of the more important industries reported in 1925, but not in 1927, were: cigars and cigarettes—\$40,468,000, phonographs—\$17,422,000, and rubber tires and inner tubes—\$16,339,000. These figures acquire more meaning when it is realized that in 1925 the "value added" by manufacture for the petroleum refining industry was \$46,976,000 and for the clay products industry was \$17,489,000.

There are certain of the manufactures which, although they may be unimportant relative to other manufactures of New Jersey, still represent an appreciable percentage of the output of the respective industries of the United States. Of the thirty-nine industries in Table 9 which represent ten per cent or more of the "value added" by manufacture in the United States, ten are in the chemical group, seven in the textile group, and five in the non-ferrous metals group. Particular attention should be called to the concentration of the American gold and silver reducing and refining industry, and the phonograph industry in New Jersey, and to the prominence of New Jersey as a producer of linen goods, blacking, stains, and polishes, oil other than that made in petroleum refineries, dyed and finished textiles, and artificial leather. Other industries which have not been previously discussed but which are of marked significance in relation to national output are those producing dressed furs, cork products, tanning materials, explosives, and "Babbitt, type, and white metal."



## APPENDIX

NOTE: The statistics for 1927 which are recorded in the following pages were obtained by special communication with the Census Bureau prior to the final publication of the returns for that year. It is possible that the Census Bureau has made certain revisions in these figures before publishing them in final form. To the extent that this has happened, there will be discrepancies between the statistics presented here and those published by the Census Bureau.

TABLE 1

### AVERAGE NUMBER OF WAGE EARNERS EMPLOYED IN MANUFACTURES OF SELECTED STATES BY CENSUS YEARS: 1899-1927

SECTION AND STATE	1899	1904	1909	1914	1919	1921	1923	1925	1927
<b>Middle Atlantic States:</b>									
New Jersey.....	213,975	266,301	326,223	372,522	506,857	381,773	447,765	425,377	408,010
Pennsylvania.....	663,960	763,282	877,543	924,478	1,135,837	863,917	1,095,057	999,460	987,414
New York.....	726,909	856,947	1,003,981	1,057,857	1,228,130	1,000,414	1,150,901	1,066,202	1,072,284
<b>New England States:</b>									
Massachusetts.....	438,234	488,399	584,559	606,698	713,836	579,071	667,172	591,438	578,068
Connecticut.....	159,733	181,605	210,792	226,264	292,672	210,990	263,232	242,362	240,806
Rhode Island.....	88,197	97,318	113,538	113,425	139,665	112,745	134,667	120,346	120,009
<b>East North Central States:</b>									
Ohio.....	308,109	364,298	446,924	510,435	730,733	494,288	699,132	676,742	669,097
Illinois.....	332,871	379,436	465,764	506,943	653,114	513,876	645,627	622,368	623,468
Michigan.....	155,800	175,229	231,499	271,090	471,242	304,471	503,308	515,494	488,856
Indiana.....	139,017	154,174	186,984	197,503	277,580	206,534	291,131	280,854	280,633
<b>Miscellaneous States:</b>									
California.....	77,224	100,355	115,296	139,481	243,692	198,334	246,154	249,552	262,936
North Carolina.....	72,322	85,339	121,473	136,844	157,659	135,833	173,687	182,234	204,590
Georgia.....	83,336	92,749	104,588	104,461	98,264	98,264	137,476	141,173	154,168
Alabama.....	52,711	62,173	72,148	78,717	107,159	82,748	109,620	116,599	119,093

TABLE 2

### PRIMARY HORSEPOWER INSTALLED IN MANUFACTURES OF SELECTED STATES BY CENSUS YEARS: 1899-1927

SECTION AND STATE	1899	1904	1909	1914	1919	1923	1925	1927
<b>Middle Atlantic States:</b>								
New Jersey.....	322,503	436,274	612,293	792,011	1,138,622	1,256,890	1,384,234	1,500,388
Pennsylvania.....	1,716,694	2,302,398	2,921,547	3,549,858	4,454,386	5,107,593	5,373,972	5,800,634
New York.....	1,099,531	1,516,592	1,997,662	2,356,655	2,936,530	3,263,325	3,348,184	3,671,185
<b>New England States:</b>								
Massachusetts.....	796,061	938,007	1,175,071	1,396,722	1,729,878	1,931,787	2,013,017	2,149,164
Connecticut.....	256,331	304,204	400,275	453,812	664,691	727,021	790,087	847,397
Rhode Island.....	153,619	181,017	226,740	269,854	321,016	391,928	395,754	410,181
<b>East North Central States:</b>								
Ohio.....	783,665	1,116,932	1,583,155	1,993,080	2,897,497	3,307,726	3,482,618	3,730,761
Illinois.....	559,347	741,555	1,013,071	1,305,930	1,660,918	1,980,508	2,247,408	2,457,339
Michigan.....	368,497	440,890	598,288	730,383	1,202,128	1,471,550	1,887,750	2,259,747
Indiana.....	325,919	380,758	633,377	709,703	1,095,912	1,372,007	1,420,989	1,602,113
<b>Miscellaneous States:</b>								
California.....	126,953	210,359	329,100	491,025	766,016	971,315	1,133,890	1,339,695
North Carolina.....	154,467	216,622	378,556	508,085	549,878	702,832	800,051	986,057
Georgia.....	136,499	220,419	298,241	357,403	436,608	449,888	523,334	565,899
Alabama.....	173,208	293,185	357,837	445,762	628,376	640,892	697,998	279,156

TABLE 3  
AVERAGE NUMBER OF WAGE EARNERS EMPLOYED IN NEW JERSEY MANUFACTURES BY INDUSTRIAL GROUPS FOR CENSUS YEARS: 1904-1927

INDUSTRIAL GROUP	1904	1909	1914	1919	1923	1925	1927	1904	1909	1914	1919	1923	1925	1927
<b>All Manufactures</b> <sup>7</sup>	266,301	326,223	372,522	506,857	447,765	425,377	408,010	82	100	114	155	137	130	125
1. Textiles and their Products.....	75,945	92,809	100,621	114,337	111,889	111,802	103,253	82	100	108	123	121	121	111
2. Chemicals and Allied Products <sup>1</sup> .....	13,958	13,643	21,970	45,010	38,166	38,627	36,178	72	100	161	330	280	283	265
3. Machinery.....	28,593	39,580	34,448	60,634	49,097	49,574	47,630	102	100	87	153	124	125	120
4. Food and Kindred Products.....	11,061	13,231	18,642	21,656	19,584	20,068	19,503	84	100	141	164	148	152	147
5. Iron and Steel and their Products <sup>2</sup> .....	16,496	16,496	36,262	37,432	31,957	30,228	31,957	100	100	100	220	221	194	183
6. Paper and Printing.....	8,564	11,220	11,870	13,045	15,329	17,690	16,979	76	100	106	116	137	159	151
7. Stone, Clay and Glass Products <sup>3</sup> .....	19,014	21,577	17,571	17,556	27,218	22,930	22,930	78	100	92	181	108	106	106
8. Metals and Metal Products <sup>4</sup> .....	13,052	17,751	16,322	18,156	24,729	16,871	15,156	84	100	102	102	99	95	85
9a. Equipment for Land Transportation.....	2,805	2,625	6,324	5,953	12,660	10,722	8,655	99	100	146	107	483	385	263
9b. Shipbuilding.....	4,863	4,869	6,324	52,397	8,979	7,652	8,655	99	100	130	107	184	157	178
10. Tobacco Products <sup>5</sup> .....	6,508	9,466	18,530	10,161	12,764	12,395	11,129	69	100	167	107	101	114	114
11. Rubber Products.....	3,920	6,550	8,555	14,014	12,764	12,395	11,129	69	100	131	214	195	188	170
12. Musical Instruments and Phonographs <sup>6</sup> .....	3,542	8,603	9,377	14,028	11,621	5,648	7,902	71	100	109	96	106	106	92
13. Lumber and Allied Products.....	6,116	11,813	10,668	10,156	9,149	8,690	8,008	99	100	90	86	88	74	68
14. Leather and its Products.....	11,735	11,813	8,063	11,654	10,477	8,690	10,050	80	100	109	157	171	140	135
15. Railroad Repair Shops.....	5,912	7,430	8,063	11,654	12,713	10,371	10,050	80	100	109	157	171	140	135

<sup>1</sup>, <sup>2</sup>, <sup>3</sup>, <sup>4</sup>, <sup>5</sup>, <sup>6</sup>, <sup>7</sup>. See notes, Table 4.

TABLE 4  
PRIMARY HORSEPOWER INSTALLED IN NEW JERSEY MANUFACTURES BY INDUSTRIAL GROUPS FOR CENSUS YEARS: 1904-1927  
(Horsepower not Reported by Industries for 1904)

INDUSTRIAL GROUP	1909	1914	1919	1923	1925	1927	1909	1914	1919	1923	1925	1927
<b>All Manufactures</b> <sup>7</sup>	612,293	792,011	1,138,622	1,256,890	1,384,234	1,500,388	100	129	186	205	226	245
1. Textiles and their Products.....	106,891	118,364	151,056	182,862	196,158	209,560	100	111	141	172	184	196
2. Chemicals and Allied Products <sup>1</sup> .....	37,938	85,938	148,710	162,432	170,367	203,885	100	227	392	429	450	537
3. Machinery.....	53,897	65,540	124,160	101,501	140,263	140,263	100	122	230	188	269	260
4. Food and Kindred Products.....	46,070	64,109	72,569	81,559	82,843	86,822	100	139	158	177	180	189
5. Iron and Steel and their Products <sup>2</sup> .....	54,856	145,047	160,952	150,380	171,177	171,177	100	100	266	293	275	312
6. Paper and Printing.....	33,489	41,516	45,515	61,910	78,772	90,223	100	124	136	185	235	269
7. Stone, Clay and Glass Products <sup>3</sup> .....	32,819	34,119	36,751	53,247	72,232	69,823	100	104	112	169	233	232
8. Metals and Metal Products <sup>4</sup> .....	40,897	57,695	78,167	78,347	81,375	81,375	100	142	192	192	209	202
9a. Equipment for Land Transportation.....	2,956	4,765	5,876	38,542	26,835	27,342	100	161	334	1,301	908	928
9b. Shipbuilding.....	9,904	11,944	52,712	39,523	40,721	42,321	100	121	532	399	411	427
10. Tobacco Products <sup>5</sup> .....	3,302	4,479	4,479	5,795	6,721	7,795	100	121	136	136	136	115
11. Rubber Products.....	21,654	31,893	49,776	61,657	67,462	78,952	100	147	230	285	312	365
12. Musical Instruments and Phonographs <sup>6</sup> .....	21,677	25,947	22,722	26,539	29,105	29,690	100	120	116	122	137	137
13. Lumber and Allied Products.....	11,809	16,345	15,222	22,588	22,905	19,923	100	132	139	191	194	169
14. Leather and its Products.....	11,735	11,813	8,063	10,477	8,690	10,050	100	132	139	191	194	169
15. Railroad Repair Shops.....	9,916	15,050	22,943	17,279	23,270	24,016	100	152	231	174	235	242

1. Petroleum Refining not reported in 1909.  
2. Figures prior to 1919 not comparable. The 1909 total does not represent as complete a sample as the following years, hence the relatives are exaggerated.  
3. Excluding cement which has not been reported since 1914 because of the predominance of a single company.  
4. Excluding Watches, Watch Cases and Materials.



TABLE 5

**AVERAGE NUMBER OF WAGE EARNERS EMPLOYED IN SELECTED NEW JERSEY MANUFACTURES  
BY CENSUS YEARS: 1899-1927**

PRODUCT	AVERAGE NUMBER OF WAGE EARNERS								RELATIVE TO 1919							
	1899	1904	1909	1914	1919	1923	1925	1927	1899	1904	1909	1914	1919	1923	1925	1927
TEXTILES AND THEIR PRODUCTS:																
Silk Manufactures	24,157	25,481	30,285	28,263	32,326	27,951	28,196	24,482	75	79	94	87	100	86	87	76
Dyeing and Finishing Textiles	7,074	7,597	10,129	11,683	14,492	15,319	19,270	19,470	49	52	70	81	100	106	133	134
Woolens and Worsteds	5,618	8,700	12,632	14,280	14,490	17,838	15,157	9,953	48	60	87	99	100	123	105	69
Knit Goods	1,841	1,742	2,506	4,025	4,853	5,447	5,146	5,975	38	36	52	83	100	112	106	123
Cotton Goods	5,618	5,362	6,638	7,144	9,261	8,957	8,396	5,718	61	58	72	77	100	97	91	62
Hats, Fur Felt	4,745	5,705	4,657	4,401	3,303	2,316	1,892	1,687	144	173	140	133	100	70	57	51
Men's Clothing	—	3,193	6,994	4,715	4,801	7,006	6,967	7,578	—	67	145	98	100	146	145	158
Women's Clothing	—	3,900	4,216	5,423	5,696	5,622	5,319	6,608	—	68	74	95	100	99	93	116
Furnishings	—	2,115	2,458	3,920	2,841	2,692	2,553	1,186	—	74	87	138	100	94	90	42
Shirts	—	2,471	—	3,502	2,884	4,115	3,595	4,815	—	86	—	122	100	143	125	167
Millinery and Lace Goods	—	1,345	4,120	5,373	6,254	5,709	5,078	3,610	—	22	66	86	100	91	81	58
CHEMICALS AND ALLIED PRODUCTS:																
Petroleum Refining	2,951	3,721	—	5,178	10,178	8,824	9,198	8,360	29	37	—	51	100	87	90	82
Chemicals, n. e. s.	3,048	3,597	5,046	6,276	18,967	12,989	11,732	10,651	16	19	27	33	100	69	62	56
Paints and Varnishes	—	960	1,493	1,737	1,994	2,383	2,899	4,403	—	48	75	87	100	120	145	220
Soap	—	619	1,599	2,057	2,889	3,018	2,706	2,700	—	21	55	71	100	105	94	93
Manufactured Gas	1,320	1,367	1,917	2,205	2,083	1,368	3,866	2,661	63	67	92	106	100	66	186	128
Fertilizers	—	1,139	1,208	1,530	1,740	917	703	732	—	65	69	88	100	52	41	42
IRON AND STEEL AND MACHINERY:																
Electrical Machinery, Apparatus, Supplies	—	6,268	11,099	14,405	26,135	21,443	23,800	22,734	—	24	42	55	100	82	91	87
Steel Works and Rolling Mills	—	—	4,671	4,639	13,811	10,378	8,189	7,557	—	—	34	34	100	75	59	55
Cast Iron Pipe	—	—	3,275	3,421	2,035	3,212	3,624	3,781	—	—	161	168	100	158	178	185
FOOD AND KINDRED PRODUCTS:																
Bread and Other Bakery Products	—	3,848	4,936	5,712	5,911	6,547	6,260	6,357	—	65	84	97	100	111	106	108
Canning: Fruits and Vegetables	—	1,700	1,818	3,133	3,119	3,918	4,814	4,826	—	55	58	101	100	126	154	155
Slaughtering and Meat Packing	—	678	1,817	2,033	3,566	3,260	3,040	2,673	—	19	51	57	100	91	85	75
PAPER AND PRINTING:																
Printing and Publishing	—	3,972	5,451	4,168	4,691	5,515	6,743	6,854	—	85	116	89	100	118	144	146
Paper and Wood Pulp	—	1,629	2,223	2,927	3,108	3,679	3,841	3,773	—	52	72	94	100	119	124	121
Paper Boxes	—	1,334	2,142	2,176	2,655	3,307	3,651	2,996	—	50	81	82	100	124	137	109
STONE, CLAY, AND GLASS PRODUCTS:																
Clay Products other than Pottery	—	—	—	7,786	3,544	5,999	6,135	6,457	—	—	—	220	100	169	173	182
Pottery, including Porcelain Ware	—	11,434	13,220	15,225	5,717	7,128	7,037	6,811	—	—	—	91	100	125	123	119
Glass	—	5,507	5,651	5,784	5,942	5,144	4,660	4,324	—	93	95	97	100	87	79	73
METALS AND METAL PRODUCTS:																
Smelting and Refining Copper	—	1,243	2,322	3,344	4,066	3,683	3,362	3,145	—	31	57	82	100	91	83	77
Jewelry	—	2,988	4,008	3,408	3,234	2,804	2,568	2,454	—	92	124	105	100	87	79	76
Stamped and Enamelled Ware	—	2,886	—	2,263	2,446	2,460	2,350	2,349	—	118	—	93	100	101	96	71
LEATHER AND ITS MANUFACTURES:																
Leather: Tanned, Curried, and Finished	—	4,953	5,560	5,108	5,499	5,001	4,319	4,282	—	90	101	93	100	91	79	78
Boots and Shoes	—	4,192	4,232	3,834	2,835	2,457	1,724	1,389	—	148	149	135	100	87	61	49

TABLE 6

**PRIMARY HORSEPOWER INSTALLED IN SELECTED NEW JERSEY MANUFACTURES  
BY CENSUS YEARS: 1904-1927**

PRODUCT	INSTALLED PRIMARY HORSEPOWER							RELATIVE TO 1919						
	1904	1909	1914	1919	1923	1925	1927	1904	1909	1914	1919	1923	1925	1927
TEXTILES AND THEIR PRODUCTS:														
Silk Manufactures	—	22,376	21,218	29,095	33,460	30,886	31,796	—	76	73	100	115	106	109
Dyeing and Finishing Textiles	14,426	19,989	22,876	28,703	31,854	43,727	58,833	50	70	80	100	111	152	205
Woolens and Worsteds	—	20,254	24,499	29,856	34,447	42,740	42,436	—	68	82	100	116	143	142
Knit Goods	—	1,477	2,506	3,016	3,817	3,557	5,514	—	49	83	100	127	118	183
Cotton Goods	15,698	17,288	20,617	22,373	20,691	41,562	35,709	70	77	92	100	227	-186	160
Hats, Fur Felt	—	5,046	4,722	4,447	3,742	2,819	2,503	—	114	106	100	84	63	56
Men's Clothing	—	1,351	786	946	1,491	1,390	1,585	—	143	83	100	158	147	168
Women's Clothing	—	959	1,300	1,393	1,181	1,094	1,115	—	69	93	100	85	79	80
Furnishings	—	973	1,229	1,038	775	544	395	—	94	118	100	75	52	38
Shirts	—	—	751	671	698	853	860	—	—	112	100	104	127	128
Millinery and Lace Goods	—	1,380	1,709	2,371	2,394	2,015	1,454	—	58	72	100	101	85	61
CHEMICALS AND ALLIED PRODUCTS:														
Petroleum Refining	—	—	26,498	36,040	36,307	35,161	41,165	—	—	74	100	101	97	114
Chemicals, n. e. s.	—	13,880	18,563	63,784	61,143	64,216	70,526	—	22	29	100	96	101	111
Paints and Varnishes	—	5,924	7,505	7,521	11,415	16,902	19,505	—	79	99	100	152	225	259
Soap	—	2,761	4,276	3,942	3,774	5,486	5,111	—	71	108	100	96	139	130
Manufactured Gas	—	6,717	10,397	14,757	18,834	17,348	36,369	—	46	70	100	128	118	246
Fertilizers	—	2,459	5,829	6,635	6,639	6,393	4,788	—	37	88	100	100	96	72
IRON AND STEEL MACHINERY:														
Electrical Machinery, Apparatus, Supplies	—	11,326	22,860	51,664	30,100	59,965	58,343	—	22	44	100	58	116	113
Steel Works and Rolling Mills	—	29,699	36,971	81,600	87,867	78,940	84,647	—	36	45	100	107	96	104
Cast Iron Pipe	—	4,035	4,785	3,714	5,499	5,818	12,329	—	109	129	100	148	157	332
FOOD AND KINDRED PRODUCTS:														
Bread and Other Bakery Products	—	2,184	4,599	13,307	8,520	8,345	10,310	—	16	35	100	64	63	77
Canning: Fruits and Vegetables	—	2,698	3,781	5,117	6,357	6,182	6,183	—	53	78	100	124	121	121
Slaughtering and Meat Packing	—	3,610	6,597	9,560	8,573	8,758	11,044	—	38	69	100	90	92	116
PAPER AND PRINTING:														
Printing and Publishing	—	5,636	5,655	5,836	7,202	10,647	12,210	—	96	97	100	123	182	209
Paper and Wood Pulp	17,626	22,995	29,695	32,948	43,977	61,429	64,365	54	70	90	100	134	186	195
Paper Boxes	—	1,224	1,635	2,198	5,058	6,012	6,728	—	56	74	100	230	274	306
STONE, CLAY, AND GLASS PRODUCTS:														
Clay Products Other than Pottery	—	—	19,103	17,523	23,063	34,733	24,333	—	—	109	100	132	198	139
Pottery, including Porcelain Ware	—	23,236	3,724	6,116	7,880	9,662	10,195	—	—	61	100	129	158	167
Glass	—	3,081	2,897	4,684	7,762	7,702	12,276	—	66	62	100	166	164	262
METALS AND METAL PRODUCTS:														
Smelting and Refining Copper	—	22,320	42,735	49,683	48,185	53,462	55,496	—	45	85	100	97	108	112
Jewelry	—	1,231	1,915	1,648	1,759	1,776	1,592	—	75	116	100	107	108	97
Stamped and Enamelled Ware	—	—	1,681	2,126	3,121	3,373	2,349	—	—	79	100	147	159	111
LEATHER AND ITS MANUFACTURES:														
Leather: Tanned, Curried, and Finished	—	9,243	12,306	13,239	19,585	19,960	16,455	—	70	93	100	148	151	124
Boots and Shoes	—	1,500	1,814	2,057	1,621	1,655	1,525	—	73	88	100	79	81	74

TABLE 7

PERCENTAGE OF VALUE ADDED BY MANUFACTURE BY NEW JERSEY INDUSTRIAL GROUPS TO TOTAL VALUE ADDED BY MANUFACTURE BY ALL NEW JERSEY MANUFACTURES FOR CENSUS YEARS: 1904-1927, AND VALUE ADDED BY MANUFACTURE AND COST OF FUEL AND POWER BY INDUSTRIAL GROUPS: 1927

INDUSTRIAL GROUP	PER CENT OF TOTAL VALUE ADDED BY MANUFACTURE <sup>1</sup>							1927 <sup>2</sup> Thousands of Dollars		
	1904	1909	1914	1919	1923	1925	1927	Value Added by Manufacture	Cost of Fuel and Power	Total
All Manufactures .....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	1,460,855	90,224	1,551,109
1. Textiles and their Products .....	19.2	20.6	20.4	20.4	18.7	18.7	18.5	285,860	11,136	296,996
2. Chemicals and Allied Products .....	10.2	— <sup>a</sup>	12.3	13.1	15.5	15.0	15.9	249,962	36,584	286,546
3. Machinery .....	10.7	11.9	9.4	11.6	10.9	12.9	13.3	213,968	4,607	218,575
4. Food and Kindred Products .....	8.8	7.7	8.1	6.0	5.7	6.4	6.9	108,744	5,860	114,604
5. Iron and Steel and their Products .....	6.4	— <sup>a</sup>	— <sup>a</sup>	6.7	7.2	6.9	6.2	94,374	6,361	100,735
6. Paper and Printing .....	3.5	3.7	3.5	2.5	4.3	4.6	5.1	76,791	4,236	81,027
7. Stone, Clay, and Glass Products .....	5.7 <sup>b</sup>	5.1 <sup>b</sup>	4.1 <sup>b</sup>	2.5 <sup>b</sup>	4.4 <sup>b</sup>	4.3 <sup>b</sup>	4.3 <sup>b</sup>	68,302	7,939	76,241
8. Metals and Metal Products .....	7.7	7.2	4.3	3.7	3.8	3.8	3.5	58,409	3,792	62,201
9a. Equipment for Land Transportation .....	0.7	0.7	1.2	1.3	3.4	3.4	1.8	48,459	1,301	49,760
9b. Shipbuilding .....	1.4	1.1	1.2	8.1	1.4	1.1	1.4			
10. Tobacco Products .....	2.4	3.1	4.3	2.2	2.7	2.8	2.8	40,762	222	40,984
11. Rubber Products .....	1.9	2.4	2.9	3.1	2.8	2.6	2.6	38,338	2,118	40,456
12. Musical Instruments and Phonographs .....	1.6	— <sup>c</sup>	— <sup>c</sup>	2.7	2.8	2.6	— <sup>c</sup>	32,795	1,181	33,976
13. Lumber and Allied Products .....	1.9	2.2	2.0	1.3	1.7	1.8	1.7	26,519	1,112	27,631
14. Leather and its Products .....	3.9	3.2	2.9	2.5	2.1	1.8	1.7	25,143	797	25,940
15. Railroad Repair Shops .....	1.3	1.3	1.3	1.4	1.7	1.3	1.3	18,184	699	18,883
16. Miscellaneous Manufactures .....	—	—	—	—	—	—	—	74,245	2,279	76,524

<sup>1</sup> Computed from totals of industries reported separately for New Jersey by the Census Bureau.

<sup>2</sup> Totals for the groups include industries assigned to "All Other Industries" to avoid disclosures.

<sup>a</sup> Petroleum Refining not reported in 1909.

<sup>b</sup> Figures for 1909 and 1914 not comparable with other years.

<sup>c</sup> Excludes Cement which was not reported for New Jersey after 1914.

<sup>d</sup> Figures for 1909, 1914, and 1927 not comparable with other years.

TABLE 8

VALUE ADDED BY MANUFACTURE AND COST OF FUEL AND POWER FOR NEW JERSEY'S LEADING MANUFACTURES: 1927

PRODUCT	VALUE ADDED BY MANUFACTURE	COST OF FUEL AND POWER	TOTAL	PRODUCT	VALUE ADDED BY MANUFACTURE	COST OF FUEL AND POWER	TOTAL
<b>MACHINERY:</b>	(000's)	(000's)	(000's)	<b>FOOD AND KINDRED PRODUCTS:</b>	(000's)	(000's)	(000's)
Electrical Machinery, Apparatus, Supplies.....	\$105,487	\$1,863	\$107,350	Bread and other Bakery Products.....	\$30,026	\$1,461	\$31,487
Foundry and Machine Shop Products.....	70,364	2,009	72,373	Canning: Fruits and Vegetables .....	24,951	338	25,289
<b>TEXTILES AND THEIR PRODUCTS:</b>				Slaughtering and Meat Packing .....	9,333	672	10,005
Silk Manufactures .....	75,289	1,622	76,911	<b>IRON AND STEEL AND THEIR PRODUCTS:</b>			
Dyeing and Finishing Textiles .....	53,497	5,239	58,736	Steel Works and Rolling Mills .....	18,394	3,161	21,555
Woolens and Worsteds .....	21,743	823	22,566	Wire drawn from purchased Rods.....	9,800	810	10,610
Knit Goods .....	19,324	223	19,547	<b>TRANSPORTATION EQUIPMENT:</b>			
Men's Clothing .....	16,937	222	17,159	Shipbuilding .....	20,068	604	20,672
Shirts .....	11,719	73	11,792	Motor Vehicles: Bodies and Parts.....	13,414	343	13,757
Cotton Goods .....	10,643	400	11,043	Motor Vehicles .....	12,181	302	12,483
Women's Clothing .....	10,831	163	10,994	<b>STONE, CLAY AND GLASS PRODUCTS:</b>			
Millinery and Lace Goods .....	9,923	189	10,112	Pottery, including Porcelain Ware .....	17,465	1,619	19,084
<b>CHEMICALS AND THEIR PRODUCTS:</b>				Clay Products, except Pottery .....	15,868	2,459	18,327
Chemicals, n.e.s. ....	52,673	4,540	57,213	Glass .....	9,844	1,721	11,565
Petroleum Refining .....	41,512	14,476	55,988	<b>MISCELLANEOUS MANUFACTURES:</b>			
Paints and Varnishes .....	30,244	1,297	31,541	Steam Railroad Repair Shops .....	16,002	679	16,681
Gas, Illuminating and Heating.....	24,661	6,009	30,670	Leather: Tanned, Curried and Finished.....	15,196	657	15,853
Soap .....	18,940	457	19,397	<b>METALS AND METAL PRODUCTS:</b>			
Patent Medicines .....	15,062	229	15,291	Copper: Smelting and Refining .....	11,500	2,276	13,776
Oil, n.e.s. ....	10,493	293	10,786	Jewelry .....	10,734	96	10,830
<b>PAPER AND PRINTING:</b>							
Printing and Publishing .....	38,376	596	38,972				
Paper and Wood Pulp .....	14,669	3,111	17,780				