

Wm. Dawson
FIRST ANNUAL REPORT

Feb 8/98
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OF THE

COMMISSIONER

OF

PUBLIC ROADS

For the Year Ending December 31st,

1894.

TRENTON, N. J.:

MACCRELLISH & QUIGLEY, BOOK AND JOB PRINTERS.

1895.

OFFICE COMMISSIONER OF PUBLIC ROADS,

TRENTON, N. J., January 1st, 1895. }

To the Governor and Legislature of New Jersey :

In accordance with the act of the Legislature creating the office of *State Commissioner of Public Roads*, I have the honor to submit the following report of what roads were constructed with State aid for the year ending December thirty-first, eighteen hundred and ninety-four, and such items and reports respecting their construction as may be of public interest.

EDWARD BURROUGH,

Commissioner of Public Roads.

REPORT.

The Beginnings of Public Roads.

The movement for bettering the condition of public roads has not been of spasmodic or mushroom growth so far as the State of New Jersey is concerned. It has been said, and said truly, that the railroads of the country are the great arteries of trade and internal commerce. They are penetrating nearly every section of the country, and in New Jersey there is not a spot distant seven miles from a railroad. If these iron highways are the arteries, the great system of country roads is the veins through which flow, without ceasing, the productions of the soil which constitute the life-blood of trade and commerce throughout the world.

When the first settlers located here, they found a dense wilderness, and the only highways were the rivers and creeks. Consequently, they were of necessity compelled to locate on the banks of these streams, and communication with each other and with the old countries was by boat and sailing vessel. Soon there was an eagerness to penetrate the interior and to communicate with settlers in other sections by a shorter route than that afforded by the crooked and winding streams, and the trails and paths of the Indians were soon utilized for this purpose. These trails soon widened into bridle paths, thence into wagon roads, without any attempt at improvement. This may be designated the first era in road building in New Jersey.

Gradual Improvement of Wagon Roads.

As the country filled up and the land was cleared and tilled, there came a demand for more direct routes of access to the landings, which soon became distributing centers, and a public road system was inaugurated, which, with some alterations, has been handed down to the present day. This system caused the laying out of wider and straighter highways, with some attempts to improve the worst places, which naturally extended until there was a regular system of caring for and maintaining the highways, which system

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was improved upon as the demands for better facilities for transportation increased, and may be termed the second era in road making in our State

The country developed rapidly, the abundance of the crops increased, and travel over the roads became heavier and heavier. The necessity for better roads became more and more apparent. The care and expense of the roads were chargeable to the people of the townships in which or through which the roads were located (a system that still exists), and in some cases these were unable to meet the expensive demands for the improvements of certain highways. Not unfrequently farmers from adjoining townships and neighboring centers, voluntarily came with their teams and assisted in claying and graveling portions of the highways over which they were compelled to pass on their way to and from market.

Turnpikes Established.

But this method soon became unsatisfactory. Something more was wanted, and companies were formed for road improvement, and toll roads were established, which inaugurated the turnpike system. This may be termed the third era in road-making. This commenced in the forties and lasted for a period of ten or twelve years, during which time the principal thoroughfares from cities and distributing points were converted into turnpikes by special charters, and became toll roads under the theory that those who used the roads should be charged with the building and repairing of the same. These roads served a good purpose in improving and developing the country, and especially the land fronting on the roads, the value of which increased rapidly, and it continues to be of greater value to-day than lands lying a few miles distant from these thoroughfares.

The General Road Law and its Abuses.

The advent of the turnpike created a desire for better cross-country roads, and about 1846 a general road law was passed creating overseers of the highways and road districts, and for a time some progress was made in opening, widening and ditching the highways. Soon charges of partiality in repairing certain roads created a demand for amendments to the road law, and then followed amendments, supplements, special enactments, repealers and repealers, which have so encumbered our statute books that it is difficult to find out just what

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road laws are now in force. The abuse of this general road law by incompetent and dishonest men led to its destruction.

According to the annual report of the State Comptroller for the year 1893, there are two hundred and twenty-eight townships, and seventy-one incorporated towns, boroughs and villages, outside the city limits, in the twenty-one counties of the State, in which there were raised and expended in the townships reporting, the sum of \$610,550.19 for road purposes, and in the several towns and boroughs reported \$136,920.63 were spent. As near as can be ascertained there are six boroughs and twenty-five townships that are not included, and allowing them only \$1,000 each for roads, we have \$25,000 for the townships and \$6,000 for the boroughs, making a total of \$635,550.19 expended by the townships, and \$142,920.63 expended by the boroughs, which amount to the sum of about \$778,470.82 annually raised and expended for repairing these country roads. This sum of \$778,500 is practically thrown away on roads that have existed for nearly a century, notwithstanding the vast amount of money that has been spent upon them. Under our present methods of maintaining our highways the greater proportion of the money expended is paid by farmers, who have seen this money squandered in spite of their protests.

Operations of the Old Laws.

According to the Geological reports and maps, which I believe to be very accurate, and recent surveys have confirmed, there are about eight thousand miles of public roads in the State, and notwithstanding the efforts of the counties and municipal authorities, and the aid given by the State, it will be many years before the majority of this mileage will be permanently improved. And it is to benefit this great mileage that the utility of the township laws becomes apparent; the greatest drawback is the lack of any practical, contiguous system of building and maintaining different portions of the same road where it runs into or across two or three townships. Prior to the abolition of the Overseer system, and particularly while the district-election method prevailed, it was practically impossible to have a road of any considerable length kept in good condition. Each overseer had a plan of his own, or no plan at all, and no two, even of contiguous districts, were alike; they generally did the work whenever and wherever it suited them best, and there was no one to call them to account. If the Township Committee objected and withheld their pay, they would go to the courts and prove that it was neces-

sary that the work should be done, and the court would order their bills paid ; they were thus masters of the situation and the people in general.

Overseers Abolished.

Under the law depends the construction, care and maintaining of our common earth roads, and it becomes the duty of the Township Committee to take charge of the road work ; by this it is not meant that they must individually go on the road and do the work (although not prevented from so doing), but, rather, that they must have the supervision of the work. They should annually inspect the roads of their townships, and adopt a systematic plan for improving the highways ; they have power to employ an engineer or any competent person for advice, plans and estimates ; they can select and appoint one or more persons to do certain kinds of work, and others for another kind ; they can let the work by contract or have it done by the job or day ; they can give a taxpayer an opportunity to work the amount of his tax out, or any portion of it, by paying him the cash for his work or accepting his bill, but in all cases they should say when, where and how the work must be done, and make it conform to their system of improving the roads. Under this law the Township Committees of adjoining townships can effect arrangements for the maintaining and improving of any road or section of a road passing through their respective townships ; they can purchase stone, shells, slag, cinders, gravel, sand or any other material needed for particular sections of a road ; they can lay macadam or telford road-beds over particular bad spots, and underdrain the same. Probably the most essential feature is the grading, draining and ditching ; this should never be undertaken unless done in a thorough manner and carried to the outlets. It is estimated that at least 27,000 tons of water fall annually on one mile of road, and the necessity of a well-rounded road-bed, with open side ditches from outlet to outlet, is an important feature.

Township Committees should thoroughly study their duties under the law, and when they refuse to do so, and attempt or persist in plodding along in the old methods, they should be held accountable at the town meeting and their places filled by other and more progressive men.

The road system of New Jersey is now confined to the operations of four general statute laws, to wit:

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1. "An act relating to streets and roads in townships, and authorizing the inhabitants of townships to place all roads and streets within the township under the management of the township committee, and to raise money by *bonds* for grading, macadamizing and improving the same." Approved March 23d, 1888. P. L. 1888, page 240.

2. "An act placing all township roads under the township committee, entitled 'A further supplement to an act entitled "An act concerning roads" (Revision), approved March twenty-seventh, one thousand eight hundred and seventy-four.'" Approved March 12th, 1891. P. L. 1891, page 137.

3. "An act to enable boards of chosen freeholders to acquire, improve and maintain public roads," approved March 19th, 1889, and the amendments and supplements thereto, approved March 18th, 1890, April 6th, 1891. See P. L. 1889, page 46 ; P. L. 1890, page 89 ; P. L. 1891, page 333.

4. "An act to provide for the more permanent improvement of the public roads of this state," approved April 14th, 1891, and the supplement thereto, approved March 29th, 1892. See P. L. 1891, page ---, and P. L. 1892, page ----.

Under these beneficent laws eleven of the twenty-one counties of the State have inaugurated a system of building and maintaining permanently-improved roads, either of macadam or telford pavements, that are a credit to the State and the several localities where located ; and the economy in transportation, pleasure and comfort of travel, has perceptibly enhanced the value of the real estate of sections through which they pass.

The Township Bonding Act.

The success of the road movement, under the County Bonding act, induced the passage of an act authorizing townships to issue bonds and construct roads under similar provisions. The privileges of this act were embraced by Neptune township, Monmouth county, and Chester township, Burlington county, and the operations under it are very satisfactory. About twelve miles of roads, radiating from the village of Moorestown, in Chester township, of varying widths, from nine to fourteen feet, and from six to eight inches deep, have been put down under the provisions of this law at an expense of \$40,000, and were paid for by issuing five per cent. township bonds.

These roads, although subjected to very heavy travel for three years, are in good order, and the repairs have been surprisingly small.

They connect with those of Cinnaminson township, where roads were built under the law abolishing the overseers of highways, and have been again extended under the law granting State aid to public roads, thus completing a system of macadamized highways that cover the main leading roads of the wealthiest and heaviest tax paying

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section of the county. A more detailed statement of the operations under this law will be found in the paper contributed by E. G. Harrison, C.E., appended and included in the reports of engineers.

County Bonding Law.

By virtue of the provisions of this law, Union and Passaic counties have covered their highways with a complete system of macadam and telford roads, and Morris county has taken advantage of the act and will, the ensuing year, cover the main thoroughfares of the county with improved highways. The enterprise and progressive spirit manifested by these counties has given a strong impetus to public road improvement and largely aided in subsequent road legislation of great value to the State and nation. The history of the work done and results obtained therefrom will be found in the reports from these counties.

First Improved Stone Roadways in New Jersey.

The first practical operations for improved stone roadways in New Jersey began in Essex county more than twenty years ago under a special law, and that county, though only twelve miles square, has built more than two hundred miles of fine telford and macadam roads, many of them boulevards.

Inspired by the example of Essex county and the many advantages thereby secured to it, and impatient at the delay in obtaining direct State aid for the construction of improved roadways, the adjoining county of Union procured the passage of a general law allowing counties to issue bonds for road purposes, which is familiarly known as "the Union County law," under the provisions of which the county borrowed \$350,000 ten-twenty four per cent. bonds, and covered the county with a complete system of telford and macadam roads, and with the interest of this sum added to the annual tax levy, the rate of taxation is lower than before the building of the roads. The opposition at first encountered has been superseded by an almost unanimous sentiment in favor of road improvement. Under this law Passaic county, adjoining Essex and Union, has built, during the past four years, about sixty-five miles of macadam roads.

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State Aid Law.

This is the last and greatest advance in road legislation in the country. It is original in New Jersey, and its unique feature is the granting of direct aid by the State to the permanent improvement of its highways, a feature not only possible but practicable and profitable. Its workings and utility have been closely watched and studied by the great majority of the States of the Union, delegations appointed by State Legislatures, county and other municipal authorities and committees of road improvement associations have visited our State and personally inspected our work, and their reports to their respective bodies have been flattering to our State and complimentary of a people whose energy and progressive spirit has done so much to solve the problem of State and National aid to permanently improve the highways of the country. This law was passed in 1891, but was inoperative until amended in 1892, by which amendment the work of inaugurating and enforcing the law was imposed upon the President of the State Board of Agriculture, who performed all the duties necessary to a proper enforcement of the same, without fee or reward, for over two years and a half. The demand became so great and advice and consultations so numerous, that in connection with the regular duties of the Board of Agriculture, the entire time of the President of the Board was occupied with his official duties, and the Legislature was asked to separate the road work from the Board of Agriculture so far as the enforcement of the law was concerned. Accordingly, on May 17th, 1894, an act creating the office of State Commissioner of Public Roads was approved. His Excellency, Governor Werts, immediately nominated me for the position, a prompt confirmation followed, and on May 25th I received my commission and immediately entered upon the duties of the office.

At that time specifications had been approved for a sufficient number of miles of telford and macadam roads in the counties of Mercer, Middlesex and Burlington to use all the State appropriation for the year 1894, and further approvals were suspended for a few months. In the meantime the movement under the State Aid law in Gloucester county had progressed to such a stage that specifications were subsequently approved for two roads in that county, and Camden county's claim for recognition received due attention; bids for the building of their newly applied-for roads were opened in the early Fall months, which effectually set at rest the claim that macadam and telford roads could not be built in the lower counties of the State in consequence of the distance from the stone quarries. Roads in Camden county that

in 1893 cost one dollar and fifteen cents a square yard, were contracted for by the same parties for same kind and quality of road at seventy-nine cents per square yard for telford twelve inches thick, and forty-two cents per square yard for macadam six inches thick ; another road—the extension of a road twelve inches thick built in 1893—that cost one dollar and fifteen cents per square yard, was contracted for by the same parties at seventy-three cents per square yard, ten inches thick, for identically the same kind of road, with macadam wings six inches thick, at thirty-nine cents per square yard ; this depth of macadam pavement in Burlington county in 1893 cost eighty-nine cents, showing a decrease of more than fifty per cent. *These contract prices have demonstrated that a macadam road can be constructed almost anywhere in the State as cheaply as a properly built and consolidated gravel turnpike, even where the gravel is easily accessible.* All road authorities should carefully investigate these practical operations before deciding how to employ the funds at their command for road improvement.

Much depends upon the proper construction of these improved highways. The most elaborate and carefully prepared specifications amount to nothing if the engineer in charge of the work fails to properly construe the details of the specifications, and instruct the supervisors how to carry them out.

But it is upon the supervisor of construction that the practical responsibility rests, and he should be selected for his fitness for the work he has to perform rather than to satisfy his importunities as a place-hunter. The same amendment to the law that changed the duties of the president of the State Board of Agriculture to that of the Commissioner of Public Roads, also changed the selection of the supervisor from the Governor to the property-owners along the line of the road to be improved, upon the ground that as they have to pay ten per cent of the cost, and were directly interested in the road, that they should have some recognition and voice in its construction, and that in selecting a person who had a personal interest in the road they would get as good service for three dollars per day as a place-hunter would be likely to render for five dollars per day. Under this method of appointing supervisors a greater degree of efficiency is expected, and fewer complaints from property-owners of lax methods in the construction of the roads.

Salient Features of the State Aid Law.

The essential points of this law are set out in the title. The preamble and the seventh and fourth sections of this are as follows :

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AN ACT to provide for the more permanent improvement of the public roads of this State.

Whereas public roads in this State have heretofore been built and maintained solely at the expense of the respective townships in which they are located ; and

Whereas such roads are for the convenience of the citizens of the counties in which they are located, and of the entire State as well as of said townships ; and

Whereas the expense of constructing permanently-improved roads may be reasonably imposed in due proportions, upon the State and upon the counties in which they are located ; therefore, etc.

7. *And be it enacted*, That whenever there shall be presented to the board of chosen freeholders of any county a petition signed by the owners of at least two-thirds of the lands and real estate fronting or bordering on any public road or section of road in such county, not being less than one mile in length, praying the board to cause such road or section to be improved under this act, and setting forth that they are willing that the peculiar benefits conferred on the lands fronting or bordering on said road or section shall be assessed thereon, in proportion to the benefits conferred, to an amount not exceeding ten per centum of the entire cost of the improvement, it shall be the duty of the board to cause such improvements to be made ; *provided*, that the estimated cost of all improvements made under this act in any county in any one year shall not exceed one-half of one per centum of the ratables of such county for the last preceding year. It shall not be necessary for the board in such case to declare by resolution their intention to cause such improvement to be made, but they shall forthwith cause all necessary surveys of such road or section to be made, and specifications for a macadam, telford, or other equally good stone road, to be prepared, and shall then proceed in the same manner as is hereinbefore required in cases where such intention has been declared. If the specifications shall not be approved by the board, or by the president of the State board of agriculture, or if all the bids for the work shall be rejected, it shall be the duty of the board to cause other specifications to be prepared, or re-advertisements for bids to be made, as often as may be necessary, and until a contract shall be awarded, to the end that the improvement prayed for may be completed with reasonable speed ; *provided, however*, that no re-advertisement need be made where the lowest bid submitted shows the improvement prayed for cannot be made within the limit of expenditure hereinafter mentioned. In every case where a contract shall be awarded after the presentation of such petition as aforesaid, the board of chosen freeholders, instead of certifying to the county board of assessors two-thirds of the estimated cost of the work, as prescribed by the fifth section of this act, shall certify two-thirds of said estimated cost, less than one-tenth of said estimated cost, which sum the county board of assessors shall include in their assessment of county taxes.

4. *And be it enacted*, That one-third of the cost of all roads constructed in this State under this act shall be paid for out of the State treasury ; *provided*, that the amount so paid shall not in any one year exceed the sum of seventy-five thousand dollars. If one-third of such cost shall exceed said sum, the said seventy-five thousand dollars shall be apportioned by the governor and the State commissioner of agriculture amongst the counties of the State in proportion to the cost of roads constructed therein for such year, as shown by the

statements of costs filed in the office of the State commissioner of agriculture. The governor and said commissioner shall, between December fifteenth and thirty-first in each year, certify to the State comptroller the amount to be paid to each county for such year, and the State comptroller shall thereupon draw his warrants in favor of the respective county. * * *

Where the Cost Rests Under the State Aid Law.

It will be observed that under this act the property owners pay one-tenth and the State one-third of the costs. These payments are virtually a free gift to the county, which pays the remainder and thereafter must keep the road in repair. It differs from the Union county road law (county bonding law) in this respect—the latter compels the townships where the road is located to pay one-third the cost, and then to be taxed in common besides, thus making a double tax upon all the inhabitants of the township. The State aid law relieves them from this and imposes an assessment only on those whose property is benefited, without relieving the owners from local or county taxation; or, in other words, they are taxed in all respects the same as other citizens of the township are taxed, the extra assessment being a free will offering for the benefits received.

The First Roads Built Under the New Law.

The passage of this law created a demand by the friends of the road movement for its enforcement, and an equally determined opposition, which resulted in an appeal to the courts, and the mandatory features were sustained. During this opposition elsewhere the county of Middlesex, seeing an opportunity to get several roads built immediately, borrowed \$50,000 or \$60,000 for road purposes for their share of the expense, and extended the proposed roads to be improved five miles more or thereabouts, making about ten miles to be improved under the new law, and the State paid them on the 27th of December, 1892, \$20,661.85, being the first money paid by the State of New Jersey for improved roadways. (It is also the first money ever paid in the United States under a law granting State aid for the construction of public roads)

Since that time there has been an increasing desire for roads to be improved under this act, and a much larger sum will be required annually to meet the demands

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Maintaining and Repairs.

The maintaining and repairing of the roads well deserves attention. Generally the first winter's frosts and the first summer droughts are the hardest on a newly-constructed road, and all contracts have thus far required the contractor to keep the roads in repair for one year from the completion of the work and acceptance by the Board of Chosen Freeholders, and at least five per centum of the last twenty per cent. of the cost should remain in the County Collector's hands, to insure prompt attention to necessary repairs by the contractors, until the expiration of the final limits of the contract. When the work finally passes out of the hands of the contractor the road is expected to be and should be in good condition. And it will be found economical to keep them so; for this purpose a good two-and-a-half or three-ton roller is indispensable, and the County Supervisor should select some suitable person living along the line of each road to inspect the road at least once in each week and attend to any settlings or ravelings at once and to have the rolling promptly attended to after each rain. No such person should have more than three miles under his care. At first this idea may seem extravagant and expensive, but if properly carried out it will be found the most satisfactory and will prevent re-surfacing for several years. More detailed recommendations for the repairing of these roads will be found in the papers of engineers and others that are printed in the report for general information.

Laws Need But Little Amending.

There is but little need of alterations in the general road laws and none whatever that will change the essential characteristics of any of them. What is most imperatively needed is to educate the people and those who are placed in charge of the roads how to proceed under the laws, and that road making and repairing is an art and a trade that needs careful study and care to successfully carry out; and the sooner the idea and practice that any one who can haul a load of mud or sods from where the ditch ought to be and dump it into the road, is a fit person for road repairing is abandoned, the better. Competent and skilled men are needed to do this work just as much as other branches of business. The State Aid Road act needs to be re-written, in order to abolish some crudities and conflicting amendments that will shortly interfere in its successful operation, but all the fundamental principles of the law should be retained.

Increased Appropriations Desired.

The continued demand for permanently improved roads calls for an increase in the State appropriation, which I feel justified in asking for, believing in common with our State Comptrollers and Treasurers that the money expended on our public roads by the State brings the best return to the people direct, of any money appropriated from the State treasury, and the enjoyment and benefits arising therefrom are accessible to all citizens; we are buying the greatest amount of comfort and permanent good with the money thus expended. The advantages to be derived from our system of permanently improved roads is so fittingly set forth by Prof. Pendergast, in an address before the Minnesota Good Roads Convention, that I quote his closing sentence: "Would not model roads be of greater benefit than our tobacco, liquor, tea, circus and other show moneys bring? Would they not more than balance the good times we have hauling our produce through miles of mud, at such fearful cost, in extra labor, repairs, horses, oats; in wear and tear of conscience and damages to character?"

"It is certain that bad roads make weak, struggling churches and poor, ill-attended, lifeless schools. They necessitate a life of seclusion which walls the path of social progress.

"To sum up, a perfect highway is a thing of beauty and a joy forever. It blesses every home by which it passes. It brings into pleasant communion people who otherwise would have remained at a perpetual distance. It awakens emulation, cements friendships, and adds new charm to social life. It makes the region it traverses more attractive, the residences more delightful; it stimulates a spirit of general improvement. Fields begin to look tidier, shabby fences disappear, gardens show fewer weeds, lawns are better kept, the houses seem cosier, trees are planted along its borders, birds fill the air with music, the world seems brighter, the atmosphere purer. The country is awake, patriotism revives, philanthropy blossoms as selfishness fades and slinks from view. The school-house and the church feel the magic influence—the wand of progress has touched even them; the old are young again, the young see something new to live for, and to all life seems worth the living. The daily mail reaches each home. The rural cosmopolitan 'feels the daily pulse of the world.' Wheelmen are no longer confined to the cities. Bicycles, now within the reach of all, are no strangers among farmers. The golden days of which the poets long have sung are upon us. The dreams of the past are coming true. Nothing can thwart the will of fate. Put your ear to the ground even now and you will hear the footfalls of the 'good time coming.'"

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Summary of the Work Under the State Aid Act for the Year Ending December 31st, 1894.

Total number of miles built, 39.
Total State expenditure, \$74,696.03.

TO MIDDLESEX COUNTY.

Completion of Old Bridge road to Monmouth county line, 2½ miles.

Total Cost of Road,	\$21,549 30
Paid by State,	7,183 10
Total Paid the County,	7,183 10

MERCER COUNTY.

Scotch Road, Total Cost,	\$41,650 50
Ingham Street, " "	9,433 06
Lawrenceville, " "	31,275 61
Total Cost,	\$82,359 17
* Paid by State,	27,453 05
Total Paid the County,	27,453 05

BURLINGTON COUNTY.

Number of miles built, 23¾.

Colestown and Evesboro,	\$15,704 06
Beverly and Delanco,	6,932 24
Riverside and Bridgeboro,	27,066 11
High Street and Woodlane,	10,199 44
Mount Holly and Masonville,	20,792 55
Marlton and Medford,	28,398 89
Five Points and Riverton,	11,300 09
Total Cost,	\$120,875 92
Paid by State,	40,059 88
Total Paid the County,	40,059 88

General Summary of Expenditures by the State.

Year.	Appropriation.	Expended.
1891,	\$20,000 00
1892,	75,000 00	\$20,661 85
1893,	75,000 00	71,237 22
1894,	75,000 00	74,696 03
Total,	\$245,000 00	\$166,595 10

* Ewingville Road, completed since the allotment of State money, is not included in this year's statement.

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Of the money expended by the State there has been paid to

Middlesex County,	\$34,554 29
Mercer "	27,453 05
Camden "	40,747 11
Burlington "	63,840 65
	<hr/>
	\$166,595 10

There has been built, by virtue of this expenditure by the State, seventy-four and three-fourths miles of macadam and telford roads, viz.:

In Middlesex county,	16.09 miles.
In Mercer "	12.78 "
In Camden "	14.50 "
In Burlington "	31.47 "
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	74.76 miles.

The following roads have been improved in

CAMDEN COUNTY.

Merchantville to Colestown, known as Church road.
Camden to Kirkwood, known as White Horse turnpike.
Mount Ephraim to Gloucester City.

Now Under Construction.

Collingswood road,	1¼ miles.
Heading or Browning Lane road,	1½ "
Kirkwood and Berlin road,	5½ "
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Total under construction,	8¼ miles.

BURLINGTON COUNTY.

Moorestown and Mount Laurel.
Stanwick and Bridgeboro.
Beverly and Coopertown.
Coopertown and Charleston.
Colestown and Evesboro.
Beverly and Delanco.
Riverside and Bridgeboro.
Riverton and Westfield.
Marlton and Medford.
Mount Holly and Masonville.
High Street and Woodlane.
Five Points and Riverton.

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Under Construction.

Evesboro and Cross Roads,	5¼ miles.
Cross Roads and Vincentown,	4½ "
Total under construction,	9¾ miles.

MERCER COUNTY.

Trenton to Lawrenceville.
Trenton to Ewingville.
Scotch Road.
Ingham Street Extension.

Under Construction.

Greenwood Avenue,	1½ miles.
Milford or Etra Road,	1½ "
Total under construction,	3 miles.

MIDDLESEX COUNTY.

Plainfield to Metuchen.
Metuchen to Holly's Corner.
Metuchen to New Brunswick.
Park Avenue.
Old Bridge to Matawan.
Old Bridge to Matawan Extension.

Under Construction.

Perth Amboy and Woodbridge,	5¾ miles.
Pumpstown and Holly's Corner and Oak Tree,	1¾ "
Total under construction,	7¾ miles.

The Extent of the County Demands under the Law.

The provisions of the law as it stands, and the manner in which it has been enforced, have proved satisfactory to the people of the localities where the improvements are located, and to others who have witnessed the practical benefits arising therefrom. The rapidity with which this sentiment has increased is apparent in the demands from more than half the counties in the State, from which specifications now on file represent enough miles of roads seeking recognition under the law to absorb the present annual State allowance for two years in advance of the present. The demand still continues, and will continue as it becomes practically demonstrated that all parts of the State are accessible to the operations of the law.

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Saving Effectuated by Good Roads.

That farmers should be relieved of a portion of the burden of maintaining the public roads is a reasonable demand, and is heartily concurred in by the best citizens of our cities and towns

The depression in the price of farm products and farm lands necessitates a lessening of the cost of production, and the saving in time and labor in drawing a load to or from market is an important item to farmers, lumber, brick, coal, ice dealers, merchants and business men in general, whose delivery wagons permeate the nearby towns, villages and rural districts.

The views of some of them are herewith presented, together with the papers of engineers and a few others worthy of consideration; also a summary of the work done under the act for the year 1894, and a general summary, with the amount of appropriations and expenditures, and the statements of supervisors of construction and county officials as filed in this office. The constant increase in the work incident to the enforcement of this law, and the demand for information touching the various phases of the law and its operations, will, in the near future, require an office clerk, in order that the business and duties of the Commissioner may be promptly and efficiently transacted.

It would be manifestly unjust to close this report without acknowledging the valuable assistance of the League of American Wheelmen, who from the date of their organization began an agitation for better roads throughout the State. Their persistent demand and numerous publications, distributed with a liberality seldom equaled, have done much to bring about the movement for "good roads," a movement that they are sustaining by all the means at their command. They are not only interested in good roads and the rights of the riders of the bicycle, but they denounce and expel the careless and unthoughtful rider. Although frequently condemned for the acts of wheelmen who usurp the sidewalks with impunity, it is only simple justice to ascertain whether the violators of the law are members of the League before condemning the organization

The annual increase in the number of those who now ride the wheel is astonishing, and it is no longer regarded as the sportsman's hobby, but rather the poor man's horse. Hundreds of mechanics, clerks and laboring men now go to and from their daily labor on the bicycle over our new roads, and their number is constantly increasing.

All of which is respectfully submitted

EDWARD BURROUGH,
State Commissioner of Public Roads.

Good Roads Conference.

An explanation of the manner in which the law was inaugurated and carried out will be found in the following remarks made at the Good Roads Conference, at Asbury Park, July 5th, which are introduced here for general information :

MR. CHAIRMAN AND GENTLEMEN OF THE CONVENTION : The improvement of our public roads has long been a subject of great interest in New Jersey, and our State Board of Agriculture commenced the investigation of the subject ten or fifteen years ago, and kept continually at work upon it until it became evident that some action must be taken. Committees were appointed to investigate the road system, or rather lack of system, and to examine the great mass of laws of all conceivable forms upon the statute books. It was soon found that new legislation was necessary if any reform in the highway expenditures and the deplorable condition of the roads was to be accomplished, and a series of new laws was secured (after the usual delays) that have done much to better the road system of this State. The condition of the agricultural population of this State, upon whom the maintenance of the roads heretofore largely depended, was such that it became apparent that relief must be had from some source, either State or national. The sentiment in favor of the permanent improvement of our roads grew so rapidly that it became evident that we could not afford to await for the general government to act, and that if relief was to be had it must come through the State aid principle ; and the law whereby the State pays $33\frac{1}{3}$ per cent. of the total cost of construction, the adjoining property owners 10 per cent. and the county the balance and maintains the road, was passed and has done good work. The operation of the law is simple and easy, its mandatory features being a valuable provision and the one that insured its enforcement.

A person desiring to have a road improved must first determine that the road is not less than one mile in length, and that it does not approach a county or municipal line so as to prevent the continuance of the road to their limit by leaving a distance (less than one mile) too short to be constructed under the law. This is necessary, in order that an adjoining county can connect with it and thus continue the system. Having looked after these points, next ascertain the exact length of the road wanted to be improved and the number of property owners whose land fronts or borders on the road. Having obtained this information, then prepare a petition in the usual form, setting forth that the signers are owners of property fronting or bordering on said public road and that they are willing to be assessed for the peculiar benefits to be derived under the law "for the more permanent improvement of the public roads," etc., to an amount not exceeding 10 per cent. of the total cost of the improve-

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ment asked for, stating also the kind of roadbed wanted and width of the same. Offer this petition to every property owner on the line of the road and request his signature to it, and after so doing, if more than two-thirds of the linear feet fronting on the road has been signed for, present the same to the Board of Chosen Freeholders of your county, who must cause all necessary surveys to be made and specifications prepared. After these have been adopted by the Board, they must be presented to the State Commissioner of Public Roads for his approval. After the State officer has signed the specifications, they are returned to the Board of Freeholders, who must forthwith advertise for proposals to build the road. When the contracts are let, a copy of the contract must be filed with the State Commissioner, who shall, on recommendation of the property owners who have signed the petition for the road, appoint a supervisor of construction, who is to be paid \$3 per day, and who must give his whole time to the work and see that the conditions of the specifications and contract are carried out under the direction of the engineer.

Such are the principal details of the road-building section of the law. Under this law the feasibility and practicability of State aid to road improvement has been thoroughly demonstrated by the building of about forty miles of road, already completed; thirty-six miles are under construction, and specifications on file for at least fifty miles additional, with a constant inquiry tending to increase and extend the mileage. The adoption of so advanced a position on the road question has caused some friction, but almost exclusively in sections of the State that have not attempted to utilize the law, and where practical benefits have not been received, the great objection being that they fear the system will not nor can not be used in their localities, an anxiety that I feel is entirely without foundation.

I am honestly of the opinion that there is no section or soil in the State of New Jersey that a telford or macadam road cannot profitably be built upon, and at no very great increase of cost, the principal elements of cost being the railroad freight and the loading and unloading and hauling from station. There is no spot in the State distant seven miles from a railroad, besides the numerous water facilities. While there is relatively no difference in the cost of a macadam and telford road, yet there are many conditions that experience has taught us whereby the cost of construction is greatly lessened, and still ample accommodation for traffic is afforded.

A common mistake is that the road must be fourteen or sixteen feet wide, while practice has taught us that in most instances ten feet and even less is sufficient, and in nearly all cases twelve feet is ample. In the establishing of these improved roadways it is well to keep in mind a continuous or at least a connecting system. A short piece omitted between two roads is like a link left out of a chain. You have always to send additional teams to cover the unimproved portion, or lighten your load correspondingly. When an improved road is finished there is certain to be a greatly increased concentration of travel upon it, hence a few parallel roads converging to a commercial center are not objectionable, as they divide the travel and lessen the wear and tear upon the roads.

From the progress we are now making another year will most likely find two of our leading roads extended half way across the State, and, as it so happens, they are leading directly toward two very popular seaside resorts.

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In Atlantic county the agitation has started looking toward building to the main land and out into the country. Camden county is making strong efforts to extend her roads to the lower end of the county, and when these roads are finished it will only be a few years, and perhaps before the advent of the twentieth century, that a macadamized road will extend from Camden to Atlantic City, a distance of about sixty miles.

I have listened with a great deal of interest to many suggestions and arguments concerning the law, and after giving them a careful consideration with a view of practical effect in the operations under the suggestions made, I find that for general use, taking the State as a whole, the law is about as near equitable, as it now stands, as we are likely to get it, the greatest necessity being an increased State appropriation.

The increasing petitions for roads, even with an additional appropriation, will necessarily render the amount allowable to each county applying for it much less than in some recent cases. There being no direct tax on the people of our State for State purposes other than for the support of the public schools, our legislators are careful as to the amount of money appropriated for improvements, but it is evident that there is nothing for which this State will receive a greater return for the outlay than for the money spent upon its public roads. In addition to above law, we also have a township and county law, under each of which we are building these improved highways.

In conclusion, I beg you to remember that our public roads are the primary routes of the commerce of the nation; that they are as justly entitled to State and national aid in their improvement as are the waterways; that the tonnage transported over them is greater and more valuable than that of the water highways of the country.

The State and nation are both gainers by having the highways open to full transportation during the year; property is advanced in value, homes are made happy, farmers are encouraged to make their business self-sustaining, if not largely more profitable. The saving in time and labor are very important items in lessening the cost of production. The merchants of our cities are also directly benefited. Their delivery-wagons now penetrate the country in the districts where the roads have been improved for a distance of ten and twelve miles. Icemen, butchers, laundrymen and others have regular business routes and deliveries, while livery-stable men are lessening their rates in some instances, and merchants, when stores are located on the streets through which the traffic from these highways enter the city, receive increased patronage.

The commercial organizations already recognize the force of this argument, and the utterances of boards of trade, chambers of commerce, banking and financial institutions, railroad and other transportation companies can be quoted to prove the truth of this assertion. The National Board of Trade and Transportation, in 1892, passed the following resolution:

"We recognize the exceeding poverty of the country, even among its riches, in the universally deplorable condition of its public highways, and favor a system which will provide for their immediate improvement, under control of the State government."

These are the principal points of information touching road law. * * * *

OPINIONS

Of Farmers, Merchants and Others Regarding Road Improvements.

On May 5th, 1894, a circular letter was sent to various prominent farmers, inviting them to express their opinions regarding the permanent improvement of public roads. Some of the expressions elicited by that letter are given in the extracts which follow:

From H. Darnell, Mount Laurel, N. J.:

In reply to your letter asking the views or opinions of farmers as to the efforts now being made regarding the permanent improvement of public roads, I would say that since having some of them so improved among us, it is the universal opinion among farmers that they are of more benefit to the agricultural community than anything that has ever been done for them, and that they will derive more benefit therefrom, considering amount of cost, than from anything that has been heretofore accomplished.

From Samuel L. Allen, Cinnaminson, N. J.:

The assistance of the State in building permanent stone roads in the vicinity of my farm and home, in Cinnaminson township, Burlington county, N. J., has been very beneficial and thoroughly appreciated by myself and many other farmers. At first the farmers of the neighborhood were largely opposed to the movement, but within the past year they have become almost unanimous in favor of the extension of the system. I am hoping that the State appropriation may be largely increased.

From H. H. Brown, Old Bridge N. J.:

We have four miles of macadam road through our township. Property has almost doubled in value and travel has more than doubled. Farmers carting over our road speak in the highest terms of it. It is a rest for their horses to cart over it. Our citizens are greatly in favor of having it extended, and I think the present law is working very nicely all over our county, and I would be very sorry to see it changed.

From Clayton Conrow, Cinnaminson, N. J.:

While I believe that good roads are of great benefit to all the mercantile, manufacturing and agricultural industries of our State, they have enabled the farming class of our citizens especially to conduct their business at a profit by

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reducing the cost of fertilizers brought on to the farm and the expenses of conveying products to the market. In fact, this apparently small item of expense, daily saved, constitutes the difference between success and failure. Good roads enable the farmer to place his products on the market when at the highest point; bad roads often forbid this. Good roads enable him to deliver perishable vegetables and tender fruit in so much better condition that they invite the better class of customers and command a higher price. Thus, every consideration of the subject, if carried to its legitimate conclusion, is in favor of good roads. We can't afford bad roads. Their effect is enervating, while that of good roads is inspiring.

From Dennis Long, Union, N. J.:

I think the law granting State aid in the building of stone roads is one of the best that can be put on our statute books, and that the sooner our public roads are all in the hands of the freeholders of the different counties, with some competent men to supervise and construct the same in a permanent way, with stone for a solid foundation, well pounded and wedged, and with broken stone on top, solidly rolled, the better off the people of New Jersey will be.

We have a county road in my own neighborhood of which we are very proud, and near which property has advanced 50 per cent. of its value before the road was laid. A case in point is that of a piece of property along this county road which could have been bought for \$20,000 before the road was built, and only a few days ago the owner was offered \$30,000 for the same farm, and it is two miles away from any railroad station. And there are many more cases of the same sort.

From William H. Nicholson, Haddonfield, N. J.:

I am of opinion that stone roads, if well made, will be of great advantage to the people of the State of New Jersey. The rubble road, however, is the execration of all travelers, and should be outlawed. The telford or macadam is what we want. As such roads are costly, my judgment would be to first construct the main arteries of travel, then the more important branches as funds can be raised, without too onerous taxation. To make haste slowly will be our best policy, and we will learn as we go along. But it will be a matter of prime necessity to have all wagons and other vehicles shod with wide tires. Wagons hauling one ton should have tires four inches wide; over two tons, five inches wide, and over three tons, six inches wide. A law should be passed at once fining (six months after its enactment) all owners of vehicles used on such roads not fulfilling these requirements. Without such a measure good roads can not be maintained without great cost. Wide tires, irrespective of their use on stone roads, are really a great economy on common roads and on the farm, so that such a law would work no hardship but would be a positive benefit to all concerned.

From John F. Starr, Camden, N. J.:

In reply to your letter asking my views as a farmer, I must say that I ought to reply only as a farm owner, but I suppose the one, to some extent, includes the other. At all events I can give my views as confirmed by my observations.

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In the first place I was favorably inclined toward the construction of stone roads by observing and experiencing the inconvenience and insufficiency of the gravel turnpikes and ordinary roads, and the evident loss in depending upon them for traffic and pleasure travel, and I gladly embraced the opportunity to aid in getting the Church roads made into a telford road.

From Charles R Vansciver, Beverly, N J. :

To your request that I give my views, from a farmer's standpoint, regarding the efforts now being made in New Jersey to permanently improve the public roads of the State, under the law granting State aid in building stone roads, I will say that I consider the law most beneficial to farmers, as it is the farmer that uses the roads and his labors are more or less burdensome in proportion to the condition of the roads.

The farmers' land is made more valuable when the roads are in such a condition that the hauling to and from the farm becomes less expensive. And what little I have observed leads me to believe that property owners along the line of the road so improved are inclined to add improvements in the way of sidewalks and fences; and furthermore I have never seen anyone that has had a good stone road built along their property that would exchange it for one of sand or mud.

From Howard G Taylor, Riverton, N. J. :

The farmers in this section are very much in favor of State aid for improved stone roads, as a large portion of our crops is hauled to market. A good stone road enables us to haul larger loads at less expense for teams. Gravel as a road material has been found inadequate to stand the wear which we now place upon our roads, making it necessary for us to use stone, which is too expensive for township use, on leading roads used by neighboring townships or counties as much as by its own residents. Our gravel and dirt roads are no better than they were years ago, some not so good. But we think this is a matter that needs care that we do not go too fast. We are bitterly opposed to heavy taxes and to contracting debts for others to pay. Our leading roads that can be joined by others in other counties ought to be looked after first. If we can learn how to take right care of them, they are most satisfactory.

From Jacob C. Lippincott, Kirkwood, N. J. :

I have interviewed several farmers and very seldom have found one who is not in favor of better roads. In one instance I found a farmer who claimed the drovers were making the farmers poor and taking their money out of the State buying so many horses. He cited one drover in a small town who had sold \$14,000 worth of horses that Spring. I have seen farmers buy nice teams which were worn out in a very short time by bad roads. I have not seen one petition that has not received the 60 per cent. of signers for a stone road.

From John P. Lippincott, Vincentown, N. J. :

I am the owner of three farms and live twenty miles from the city and at present eight miles from the stone-road system, which, it is expected, will reach our town next year. We have to take one or two horses on the lead of our teams

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till we reach the stone road below, taking a good part of the day or night before the man returns home with the leading team. Farmers say when they reach the stone road their horses cool off and they can sleep much of the way to the city. When we receive the advantage of a continuous permanent road all the way to the city the extra teams and labor will be saved, besides the care and anxiety incident to bad roads.

From Samuel C. DeCou, West Moorestown, N. J. :

From about two years' observation and experience on a good stone road, I think they are very hard to overestimate, either from a business standpoint or pleasure standpoint. Teams can not only draw double the loads formerly drawn on ordinary gravel roads, but on level or descending grade they actually rest.

Besides the economy of increased loads, we are no longer compelled to make deductions for very wet weather, very dry weather or spring time, when the frost is coming out of the ground. The State has very wisely lent a helping hand in this important matter. But the care of the roads should, in my judgment, revert to local management.

From William R. Lippincott, Fellowship, N. J. :

In reference to the farmers' views on building stone roads in our State, it is safe to say that the general impression among farmers is that stone roads improve the country they pass through. Where they have been built one can already see greater energy being manifested among the farmers along their lines. One of the most important things for the farmer is easy access to a market where he can sell his product, and stone roads are to agriculture what rivers are to commerce. Again, good roads show the most direct benefit to the farmer for the taxes he pays, and in many instances save him in toll a heavy interest on their cost. Almost every intelligent farmer views stone roads as forerunners of other improvements that must follow, such as the electric railways, free mail delivery, and an increased demand for country residences, and the numerous applications presented to the boards of freeholders, speak in plain language the farmers' views on road improvement in New Jersey. I hope the Governor will not approve any bill that tends to stop this great onward movement for good roads.

From John M. Lippincott, Moorestown, N. J. :

My opinion is desired in regard to the operation of the New Jersey State road law. In the first place, I believe it to be the right principle for the State to assist in permanently improving our leading roads.

So far as my present knowledge goes, after having a half mile built under its provision directly through the center of my farm, I believe the present law, with a few slight alterations, to be a success, if carried out strictly in the spirit intended, independently of politics.

From Stockton Hough, Trenton, N. J. :

In answer to your inquiry concerning the benefits derived under the law granting State aid in building stone roads, I would say, from my experience, as the first promoter of these roads built in Mercer county, N. J., that in the

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beginning I met with opposition at every step, and now that the road is near completion, all opposition has been silenced, and all are anxious to extend the system wherever possible. This sentiment is growing daily with the experience of those who use these roads, many of whom never had any opportunity to know what a good road is. Travel has already doubled over our road, and property has greatly increased in value. Building sites are being laid out, and improvements are projected even before the road is completed. As the owner of two farms and a mill property on this road, I am confident that they will be greatly increased in value. At times in the winter we could not haul one-half a ton with a team from any of these properties. Now, with the road completed, two tons is less of a load than the empty wagon on the old road at times in the winter and spring. I am of the opinion that the improvement would be cheap at five times the cost.

From H. H. Bell, Mount Ephraim, N. J.:

Good stone roads—and stone seems to be the only way of making roads permanently good - are of great importance and benefit to us farmers. To make any profits, we must haul heavy loads. With the taxes I pay it is but just that I be able to go to and from town with as great a load as my team can haul through town, without having to use four horses extra to insure getting through the sand. We ought to be able to work our teams all the year round instead of having to keep them idle while the frost comes out of the ground.

From Dennis C. Crane, Westfield, N. J.:

The farmers of Union county think the county road law has been of great benefit to them, and while they have not taken advantage of the State road law think that it is also calculated to bring about the desired end, namely, good roads all over the State. I think the help of the State is an incentive to property owners and counties to take hold of the work, and when it is done according to specifications, and under intelligent supervision, there is reason to hope it will be well done. These good roads through the country districts are a help to the farmer, and we think he has a right to claim a part of the money received by the State from railroad and corporation taxation, if spent in this public way. We find that good roads shorten distances one-half. They make good sidewalks. They are likely to hasten free delivery of mail in the country, and they increase the value of real estate.

From Amos Ebert, Ashland, N. J.:

That I am in favor of good roads may be inferred from the fact that I kept the best road in the township—about a mile—at my own expense, for thirty years, at a cost of more than my proportion of stone roads would have been.

I think it was good policy to construct all the stone roads so far constructed, and I think some more of the leading roads should be constructed and other roads improved by such materials as good gravel or clay on sandy roads. In summer one side should be used, and the other side in winter or wet weather, as sandy roads never get bad in wet weather.

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From Clayton L. Andrews, Moorestown, N. J. :

In reply to your letter asking for my views on the subject of the stone roads, I hardly know what to say, for I think there is no comparison between them. The stone roads have every advantage over the dirt roads. They are much easier on the horses, as everybody must know. Two can pull a load that formerly needed four horses to pull it. Therefore they are a saving of horseflesh, saving of time, and, as "time is money," consequently a saving of money. Although they cost considerable at first, I think the great benefit derived from them will be a saving in the end.

From Charles S. Albertson, Magnolia, N. J. :

I am part owner and operate a farm of 200 acres near the line of the recently completed "White Horse" telford road. I consider this road one of the greatest public benefits ever conferred upon the people of this locality. At a distance of 8 miles it brings us nearly an hour nearer the market. It enables us to dispense with one team. Our teams are in better condition and require less feed and attention in doing the same amount of carting. We make a daily saving of 1 cent per horse per mile toll. The road is always in good condition in any weather. It has increased and will enhance the value of farms along and near it. It has awakened a spirit of progress and a demand for public advancement that must be beneficial. It has become a popular drive, attracting capitalists, who invest in and develop real estate. I trust that the wise policy under which this road was built may continue, as there is nothing that the State can do that will develop her resources and improve the condition of her farms and farmers more than this.

From Joseph A. Burrough, Merchantville, N. J. :

Farmers are greatly benefited in horseflesh, time and expense by the aid of the State in building stone roads. We can do with two horses what it required four to do. Some of our roads were impassable in the spring. It has taken six mules to get one hundred bushels of wheat to Merchantville, and then it was all that four could do to take it to Camden on the gravel turnpike, and it took five hours to go a distance of five and a half miles. I have known carriages to get set going down hill.

In carting manure from Philadelphia we bring from four to five tons, where two and a half to three tons was considered a large load, and we had then to throw off part of the load before we could get it home. The teams do the work easier now, and save nearly an hour in the trip, and there need be no anxiety about the return of the team. We haul ninety to one hundred and thirty baskets of truck where sixty to seventy were considered a large load, toll and ferriage being the same. I do not think it costs any more to keep a good road than it does a bad one. We are having more roads built every year, are perfectly satisfied with the law, and do not want to see it changed unless the change will give us more help.

From Charles Collins, Moorestown, N. J. :

Having lived for years near the intersection of a dirt road (now stoned) with a stone road that leads into Camden, I have become familiar with the practice

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of farmers in carting their produce to market to bring an extra team to help them out to the stone road, with an extra driver to take the team back. This was done at all times during day and night, and often in returning from the city with loads of manure and not knowing at just what time to meet at the intersection of these roads they would have to wait for hours. I have seen enough of this to thoroughly convince me that the heaviest tax we pay is dragging through dirt or mud roads.

From Edward S Harmer, Moorestown, N. J.:

Living as I do in a thriving agricultural district, I am enabled to appreciate the practical merits of a permanent stone road. Until within the past two years for a greater part of the season our carting was done over bad, sometimes almost impassable, roads. Now, at any time of the year, we are favored with a good drive. The law granting State aid is a good one, although some changes might be made to profit. It is a step in the right direction, and will be appreciated more fully in the future than it is now. It is necessary, however, in the construction of all permanent roads, that thorough work should be done. Where a road is poorly built it entails untold expense, and is always in bad shape, while, on the other hand, a well-constructed road scarcely needs repair and gives universal satisfaction.

From Manning Freeman, Metuchen, N. J.:

I have only to say that farmers are very enthusiastic for good roads; the only trouble is to get our freeholders to act. We have eight freeholders from the city in our board, and they object because the city is taxed for a portion.

I would not sell my house and accept another worth \$7,000 as a gift and be obliged to live in it if two miles from a macadam road. No farmer in this neighborhood would buy a farm not located on the macadam road. Now that they have a sample of the road, they all want it.

From Thomas J. Beans, Moorestown, N. J.:

My views in relation to stone roads are so different from the general view that perhaps I ought not to trouble you with reply to your courteous inquiry. I am not qualified by experience for consideration and decision of questions that affect wide and general interests, but as to the intrinsic value of the roads they themselves are their most eloquent vindicator. One has only to pass from our earth roads at many times in the year to our stone roads to have unequivocal testimony of their respective merits. As in many parts of our State no stone roads have been constructed, the citizens resident there have not had access to this testimony. Hence there would appear to be wisdom in the provision made by the Massachusetts Legislature that of the money appropriated for the construction of stone roads there should be a pro rata expenditure in every county in the State. Thus each county would be provided with an object lesson, and it would seem to be only equitable and judicious that of the money appropriated from the common treasury of our State a pro rata share should be subject to the call of every county of the State for a limited period.

There is no method of conversion to good-road policy so effective and thorough as the seeing and riding over them. One of our township officers who went up to the stone-breaking works above Trenton told me they said they

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could not furnish so much to outside parties this season, as there was such a craze for home stone roads that it would take much of their effort to supply them. You already know that I place a high value upon stone roads, because of the marketable value they add to adjacent property. Where they enter towns and provoke the building of homes on either side it will surprise anyone who will estimate how little the cost of the road would be to each property owner compared with the benefits received and pleasure its presence would give. When a farmer living alongside a stone road sends out his team with a load they do not seem to pull the load; it just rolls along and they accompany.

There are so many whose contributed taxes help pay for these roads who not only will never use but will never see them, that it seems only fair that favored farmers and localities should contribute to their construction as much as the roads' present usefulness and luxury will add to the market value of their property. This would be a mere change of equivalents, and there would remain in their favor the everyday perpetual use of a public good, with such accruing personal advantage and enjoyment as is permitted to only a part of their fellow-citizens who are fellow-contributors to the public treasury. Such discrimination would somewhat disarm opposition that is honest, and somewhat restrain the eager, me-first rivalry for the palpable and recognized value of the public improvement to the fortunate and successful property owners. I am aware that the amendment provides for the payment, according to benefit, by added township rate or proportion. I know that in many parts of our State the presence of such a convenience seems to be a far-off hope, and that their share of contribution to their construction in other localities is given with the taxation-without-representation feeling. The roads themselves are an undeniable benefit.

JOHN C. HOPKINS,
Merchant Miller,
P. O. Box 38.

MOORESTOWN, N. J., January 14th, 1895.

DEAR SIR—In regard to stone roads in our community, I think the amount of travel and continuous hauling of heavy loads warrants the expense of building them. I have generally four or five teams on the road and feel satisfied that I can haul double the loads on stone than I can on the average dirt roads, taking the year through.

Respectfully yours,

JOHN C. HOPKINS.

To Hon. E. Burrough.

F. S. SIMMONS,
No. 309 Market Street.

CAMDEN, N. J., January 19th, 1895.

Mr. Edward Burrough, Chairman State Board of Agriculture:

DEAR SIR—You ask me what I think of stone road, telford road or macadamized road. In my opinion the macadamized road is what we should have all over the State, if it can be done by proper taxation, without putting the taxes too heavy

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on any one community. I use the roads out of the city some considerable in my business, and find that good roads are a great convenience. I have, from time to time, noticed the great improvements in this direction. There is no road that comes more to my notice at this time than the Old Church road, from Merhantville to Colestown. I can well remember when I dreaded to travel that road in wintertime, but now it is more of a pleasure to drive over than a dread. I have never believed in toll roads, and think some system should be adopted that they might be done away with. Good free roads will make any section of our State just what it should be—a prosperous one. Trusting you may continue in your good work and have great success, I am

Yours, very truly.

F. S. SIMMONS.

F. C. ROSS,
Livery and Boarding Stable,
Front and Arch streets,
CAMDEN, N. J.

Hon. Edward Burrough, State Commissioner of Public Roads:

DEAR SIR—It is my opinion, based upon observation and experience, that the most substantial benefits are derived from stone roads, which I consider one of the greatest improvements as well as conveniences of modern times.

These roads very materially lessen the difficulties and annoyances of travel due to the old and often poorly-kept roads.

Stone roads are beneficial to horses and certainly add much to the enjoyment of pleasure driving. I should suppose that all classes who have occasion to use them would be as much benefited as those in my line of business are.

The old toll system is or ought to be a thing of the past. Toll-gates, with their attendant nuisances, should have no place in these days of advanced ideas and improvements. All who use the roads should justly join in denouncing them.

Very respectfully yours,

January 21st, 1895.

F. C. ROSS.

C. B. COLES & SONS Co.,
Lumber, Millwork, Stairwork,
Packing-Boxes.

CAMDEN, N. J., January 16th, 1895,

Edward Burrough, State Commissioner of Public Roads:

EST. FRIEND—I take it that this is the proper time to agitate building stone roads. If any additional legislation is required to carry out the laws they should be got at once.

The stone roads of Burlington and Camden counties have advanced their value of the county around and a great advantage to all business men that have carting of merchandise, by the wear and tear of their wagons and teams and carting without breakage. Then for pleasure driving one has a fine, smooth ride on the road without being compelled to use the side of the roads, as one has to do on our turnpikes of to-day.

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The State and county should make an amicable agreement with turnpikes and report owners along lines of roads to make them free roads. I take it the turnpike only have an easement over roads so long as they are kept according to law ; very few are so kept. The property owners abutting said roads should be consulted as to their views regarding their abolition.

Farmers should not pay tax for the part of the farm used as public roads and lose the control of their property besides.

Very respectfully,

CHAS. B. COLES.

SHIVERS & MOFFETT,
Lumber.

CAMDEN, N. J., January 15th, 1895.

*Hon. Edward Burrough, State Commissioner of Public Roads, Merchantville,
N. J.:*

DEAR SIR—In congratulating you upon the advance made of late in the science of rational road building we feel we can congratulate ourselves at the same time in the reduction of wear and tear upon wagons and animals, which in our case has been quite evident, inasmuch as for the past three years at least seventy-five per cent. of our business has been in the outlying townships, necessitating an average haul of at least two and a half miles ; in some instances a maximum haul of eight miles being done upon the "stone" roads with equal facility as a short haul upon either our city streets or the old time "toll" and "dirt" roads.

This experience has given us abundant opportunity to observe the advantages of the modern "stone" over the toll road, which has had its era, and like all other things antiquated should be relegated to the past. We trust, in the interests of the general community, as well as those who employ teams in their business, that your influence and efforts may be as zealously applied henceforward in the direction last indicated and onward with the same degree of success as your advocacy of "stone" roads has been, even if it be tardy.

Very truly,

SHIVERS & MOFFETT.

J. B. VAN SCIVER & Co.,
Fine Furniture Manufacturers,
Federal, Delaware and Arch Streets.

CAMDEN, N. J., January 28th, 1895.

Edward Burrough, Esq., Camden, N. J.:

DEAR SIR—In reply to your favor requesting my opinion as to the merits of stone roads would say, that some three years ago, while riding continually for days over the magnificent stone roads of Switzerland, roads which were constructed with the greatest difficulty over the mountain passes, I was filled with admiration for those smooth-riding thoroughfares, which have not only enhanced the pleasures of travel but conduced to the prosperity of the Swiss people.

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Our chief shipping clerk says, "that after a season of bad weather one horse will haul a load over the stone roads while two are required on the turnpike system, also that better time can be made on the stone roads."

Regarding the free toll system, both city and country would receive a nearer mutual benefit from free toll than would appear at first thought, though the toll plan very exactly places the cost on each one using the road—the city merchant and manufacturer delivering goods to the suburban towns and farms, and the produce of the country, of about equal value, being brought to the city.

The saving to the general community would be in salaries, expense of collecting tolls and the profits a private corporation might make.

Respectfully yours,

JOS. B. VAN SCIVER.

Injustice of the System of Toll-Bridges and Toll-Roads.

The opposition to the old system of toll-bridges caused their absorption by the counties, and they are now free bridges. The same objection is urged against toll-roads, and where the charters have not been abandoned they should be purchased by the State or county. The sentiment is growing rapidly that as the roads are free to all and used by all, it is just for the burdens of road taxes to be borne by all, and the counties, the State and the nation must come to the rescue. These roads are the property of all the people; they are a public necessity and one of the institutions of the government, and the burden of making and repairing these lines of travel, which reach from country to town, the prosperity of both town and country depends upon their condition in a most emphatic degree. Agriculture is everywhere the gauge of national thrift, and the permanent enrichment of the Republic must depend upon the fullest development of its resources. There is a good deal worth thinking about in this matter of national policy. No country ever yet attained greatness whose farmers were not great, and in these days of improvement and driving competition the farmer has the same right to demand means for saving time, space, power, materials and expense as is accorded by the government to other divisions of society.

Stone Roads Constructed Under the Township Bonding Act, March 23, 1888.

Neptune Township, Monmouth County.

BY E. G. HARRISON, ENGINEER IN CHARGE.

The inhabitants of this township voted to issue bonds to the amount of \$30,000 to construct stone roads in March, 1890. With this money the Township Committee constructed of telford and macadam the principal road, running from Deal Lake to Shark River, three miles in length. This road forms Main street of Asbury Park, passing along Ocean Grove and through Bradley Beach, Neptune City and Avon. It varies in width from fifty feet to fifteen feet, and in depth from ten to seven inches. So far comparatively very little has been done in way of repairs; yet this road has the greatest amount of travel of any road in the State during summer, when the wear and tear is very excessive. The act of 1891, abolishing the road overseers, enabled the Township Committee to have the entire oversight of the road, which would not have been the case if the law had not been passed.

Chester Township, Burlington County.

This township issued bonds to the amount of \$40,000 to construct about eleven (11) miles of macadam stone road, on ten (10) different roads or parts of roads, at a width of nine (9) feet. The roads heretofore constructed in parts of the State so remote from stone quarries were found to be quite costly. The problem to be solved by the engineer was to construct all of the roads designated in the petition of the inhabitants of the township which authorized the bonding.

The engineer was enabled to accomplish this, first, as the depth or thickness of the roadbed had not been specified in the petition, he constructed most of the roads six inches deep, some eight inches, and in some cases, where the earth foundation was soft and uncertain, ten

inches deep ; and secondly, the best New Jersey trap-rock was used for three inches of surface and the foundation was made of a less costly stone. The cost of drains and grading, in excess of one foot of cut, was done by property holders and the township outside of the amount raised by bonds. The cost of road construction, not including engineer's charges, was about \$38,800 for about eleven and one-fourth miles. These roads were only intended for wagons not exceeding two tons capacity, but are now used by teams carrying from four to five tons. The roads have now been used nearly three years and very little has been done in the way of repairs. The success of the roads in Chester township had the effect of encouraging the citizens of the county to apply for roads under the State Aid act.

REPAIRS.

In compliance with the request of the State Commissioner of Public Roads to submit my views as to the best mode of repairs, I offer the following article, which I prepared for the Burlington County Board of Agriculture, and which was read at the annual meeting in December last :

STONE ROAD REPAIRS.

If we expend money to construct good roads it is desirable to keep them good. It cannot be said the work is done when the stone construction has been completed and the road made ready for travel. The roads, to be good roads, must be kept in order. There is an idea prevailing that stone never wears out. Look at the doorsteps of public places and you will see that shoe leather wears away the hardest marble. How much more the steel toes and caulks of horse-shoes and the tires of heavily loaded teams, often narrow and worn almost round, bearing the weight of several tons on a few inches of space where the wheel comes in contact with the road surface. We must keep in mind that

"A little drop every day
Will wear the hardest rock away "

The roads most used, as a general thing, will be the roads constructed with stone. Made smooth and hard the travel will naturally increase, and the increase will be of heavily loaded teams, and the wear begins at once. It must be borne in mind that the first year of the road's existence is the hardest year. The road is what we call "green ;" the binding has not penetrated all the interstices, and the sides of the stones have not all come together in a compact form. The heaviest rollers will not do this—they only begin the work of compacting but do not complete it. The heavy, continued rains will, to a certain extent, percolate through the stones and soften the earth formation. There is nothing like the continued natural travel of the road to get it completely compacted together. This takes time. But while this is going on depressions appear sometimes, and, particularly on narrow roads, ruts are formed. After

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the first or second winter the road becomes thoroughly compacted and cemented together.

When a physician is called upon to prescribe for a case of disorder he is greatly aided, if he knows the cause that brought on the disorder, in determining what remedies to use.

We will now refer to some of the most common causes which make repairs to a stone road necessary, outside of the general or common wear and tear from ordinary travel. Roads suffer from two causes, viz.: first, for want of water; second, from too much water. The former is very common in New Jersey during the hot, dry summer months, and particularly when the roads are new and have not become thoroughly consolidated. The winds and hot sun take all the moisture out of the road surface, so that the binding does not bind but becomes dry dust. The stones which are generally kept in place by this binding become loose and soon scatter along the road to the great inconvenience and annoyance of travel. Now, it will be observed, that this only continues until a rain thoroughly soaks the road, then travel seems to put the stones back in their places and the dust becomes a binding again to hold them in place. If rains continue to come at not very long intervals the road is all right again. But if the dry weather sets in again the inconvenience—particularly to light travel—is so great that a remedy must be applied. The best remedy is to follow nature's supply—what she has deprived us of. Put on the water, and if you do not want to wait for the travel to place the loose stones, put on a roller and this will soon complete the work.

It sometimes happens that the road authorities do not own a sprinkler and none can be had. In this case the same results may, in a measure, be obtained by restoring some of the binding material by putting on a very thin coat of soft, fine loam. I never recommend this if it can be avoided, as the tendency is to get too much on the road.

When too much earth-binding is used, and there comes continued rains, the stones will become loose. This leads me to the second cause, viz.: "Too much water." This brings about the work of destruction: first, when the natural road-bed is soft and spongy; second, when the road-bed has not been sufficiently drained; third, when water is allowed to stand in ditches or form pools along the roadside; all these matters can be removed, and they should be at once; fourth, when the road-bed retains dirt brought on from other roads, dropping of leaves, or any other cause. The water falling on the road turns the dirt into soft mud. This, if allowed to remain, softens the road-bed and the stones become loose. The dirt should be removed and the sides of the road smoothed off, so the water will run off the road to the side ditches.

When depressions appear or ruts form so they hold water, and are allowed to remain, the wheels of loaded teams going into these ruts and depressions, while the water is softening the surface, will grind out the stones and thus deepen the depressions. In this way the work of destruction is accelerated. It is well to remember "A stitch in time saves nine." These depressions should be filled as soon as they appear with one and a half inch stone.

If a road is properly attended to, what is termed re-surfacing need not be resorted to. But if a road is allowed to wear down and become rough by reason of holes and ruts, a general re-surfacing will become necessary. This will be found to be expensive not only in restoring the road, but to those who use them, in wear and tear of wagons, teams, etc.

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A railroad corporation could not long stand the expense of repairs and renewal of rolling stock, which would be necessary if they allowed their steel and iron tracks to become depressed and out of line. The well-managed corporations do not do business in that way, but they keep their tracks in line and well "tamped up" to proper grade. So repairs to stone roads should begin at once, and if continued it will be found, in the long run, the least expensive. It is impossible to give the proper mode of treatment for all cases. The causes arise from the varied conditions of the earth upon which the road is placed. On the same road we have a great variety of soil, and a kind of treatment for one part of the road would not answer for another part of the same road. The expert in road construction and road repairing must look over the ground before he applies a remedy. So I have given only a few general causes which make road repairing necessary, and the cheapest and best way to have the roads kept in repair.

We have the experience of stone turnpike corporations in other States, which experience covers many years. I would recommend—get none but the best stone for repairing. It can be obtained in this State and furnished under contract, as well as the placing of it on the road as needed. The broken stone should be placed on the roadside at convenient points, so that it can be put on the road without loss of time or expense for hauling. A laborer with a barrow can do a considerable amount of repairing by filling up depressions, ruts, etc., which always show up after a rain, and while the road is moist is the time to put on the stone. All of this work can be done by contract, with a carefully-drawn agreement, the payment of the contract price depending upon the certificate of a competent person having charge of the road.

When a road has been neglected and permitted to become uneven and rough, or has by constant use worn down near the foundation stones, there should be a general repairing. This is called re-surfacing, and can best be done by use of a large steam roller having steel spikes in its rolling wheels. This, when passed over the road will puncture the surface so that an ordinary harrow will tear up all the surface stones. Then remove the spikes from the roller wheels and with sprinkling and rolling the road bed will be replaced and made like a new road, smooth and even on the surface.

If it is found necessary to increase the thickness of the new surface, a coat of one inch and a half broken stone can be put on at any required thickness in excess of two inches by the use of a distributing cart, recently patented and made for that purpose. This cart holds two cubic yards of broken stone and will spread stone at any required width of six feet or less, emptying itself in two or three minutes. When much new stone is used, it will be found necessary to put a thin coat of screenings on top for binding.

An exhibition of repairing of this kind was made at Asbury Park at the National Road Conference, on July 20th, 1894. A macadam road had been constructed about four years ago, and had been considerably worn and never repaired. A section of the road was treated as above described, and in a short time made "as good as new." It is now smooth and compact and the work has received the commendation of many expert engineers and road constructors.

NEW JERSEY STATE LIBRARY

Reports of County Engineers.

BERGEN COUNTY.

RUTHERFORD and PASSAIC, N. J., February 4th, 1895.

Mr. Edward Burrough, State Road Commissioner, Merchantville, N. J.:

DEAR SIR—We have been busy with our annual reports here since receiving your communication in reference to the construction of stone roads in Bergen county; therefore, please excuse the delay in answering.

While we have had charge of the construction of the more important road work in this county, we are not familiar with all the stone roads which have been built in the county. However, we are pleased to be able to give you the information we have in reference to the roads we have supervised, and which are acknowledged to be the best constructed roads here. The answers to your questions are herewith submitted in the order you have requested them.

QUESTIONS.

1. In what year was the first macadam or telford road built in Bergen county?

Do not know the exact year the first macadam pavement was laid, but believe Englewood laid the first in the early seventies. The first telford-macadam was laid in the borough of Rutherford in July, 1892.

2. How many miles have you completed?

Union township, under direction Township Committee, about . . .	13	miles
Borough of Rutherford, under direction Mayor and Council, about .	12	"
Paterson and N. Y. Plank Road (Union and Lodi Township), under direction Board Chosen Freeholders, about	5	"
East Rutherford Borough (Boiling Spring Township), under direction Township Committee and Mayor and Council, about . . .	2½	"
Borough of Carlstadt (formerly village of Carlstadt), under direction Village Trustees, about	1	"
Saddle River township, under direction Township Committee, about	27	"
Total,	60½	"

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3. How many miles have you under construction?

About one-half mile in borough of East Rutherford.

4. What is the average width of the roads?

Union township, between 20 and 40 feet roadways; average width of stone pavement, 14 feet.

Borough of Rutherford, between 20 and 40 feet roadways; average width of stone pavement, 15 feet.

Borough of East Rutherford, between 20 and 36 feet roadways; average width of stone pavement, 15 feet.

Paterson and N. Y. Plank Road, between 36 and 40 feet roadways; average width of stone pavement, 15 feet.

Borough of Carlstadt, between 20 and 40 feet roadways; average width of stone pavement, 15 feet.

Saddle River township, between 20 and 40 feet roadways; average width of stone pavement, 14 feet.

5. What is the average thickness of the stone construction?

For telford, 8 inches, } in bor. of Rutherford.

For macadam, 6 inches, } " " " and Paterson and N. Y. Pl. Rd.

The balance of above roads average 4 inches in thickness.

6. Cost of the roads per square yard?

For telford, \$1.00 per square yard.

For macadam, 43 cts to 50 cents.

7. Expenses for actual repairs, rendered necessary by general wear and tear, per mile, per year?

There has been no expense on account of wear and tear on any of the roads and streets in the borough of Rutherford to date. On rural roadways, where macadam is four inches in thickness, the cost of maintenance or repairs averages \$100.00 per mile per year.

On the roadways in the larger towns, the cost of maintenance, or repairs, averages \$200.00 per mile per year.

8. Under what laws were these roads built? Total cost?

Under township and borough laws. Total cost, \$235,000.

9. How paid for, &c.?

Borough of Rutherford, by 30-year bonds; issue, \$50,000; interest, $4\frac{1}{2}\%$.

Union township, by 30-year bonds; issue, \$50,000; interest, 4%.

Saddle River township, by 30-year bonds; issue, \$90,000. (?)

In the balance of the above townships, etc., the roads were paid for out of funds provided for by the different municipalities. We regret we cannot have time to go into this matter more in detail. This is all the information we have at present.

Yours, respectfully,

WISE & WATSON.

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Bergen County.

BY DENNIS C. CRANE.

Bergen county is the northeastern county of the State. It covers considerable territory but has in it no important towns or cities Hackensack is the largest town. It is cut up into quite a number of townships and boroughs. The surface of the land is more or less rolling and hilly. The Palisade range of hills, several of the main lines of railroads from New York to the west pass through it north and south. Bad roads, incompetent road overseers, little satisfaction for money spent, has been the experience of its inhabitants for years. Four or five years ago an effort was made by enterprising citizens to improve some of its main roads under the County Road law of 1889. The advocates for mud roads, from the sparsely settled townships, defeated the movement. The controversy, however, awakened a lively interest, and led to townships undertaking the work. They have accomplished a wonderful amount of work for a rural community, as appears in the list below. Englewood has in it quite a number of wealthy people; for years they have been stoning their roads, and teaching those living in the other townships the value of good roads. William Walter Phelps also, during his lifetime, did much for his neighborhood; owning a crusher himself, he macadamized all the roads passing through his large estate at Teaneck.

Theodore A. Havemeyer, the wealthy sugar refiner, who owns a large number of acres at Mahwah, has also stoned roads at his own expense. The macadam system of stoning has been practiced almost entirely as being cheaper, more simple and, for ordinary country roads, as satisfactory—four inches deep on sandy, well-drained soil, six inches deep where traffic was heavy and soil retentive of moisture. The width varied from ten feet to eighteen wide for stone and from twenty-five to thirty-six feet from ditch to ditch; from one foot to eighteen inches crown. The average price paid contractors was forty-three cents a square yard. The stone used was mostly trap-rock from Snake Hill, in Hudson county. The total amount of road money raised by direct tax and bonding from 1890 to 1893, inclusive, is shown by the table given below, with the total population and valuation of 1893:

Townships.	Population.	Valuation.	Road Money.
Bergen,	5,131	\$647,692	\$2,500
Lodi,		536,445	20,000
Boiling Springs,	1,438	413,091	12,000

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Townships.	Population.	Valuation.	Road Money.
Englewood,	4,785	\$2,778,350	\$80,000
Franklyn,	2,307	1,063,000	10,000
Harrington,	2,769	1,340,300	24,000
Hohokus,	2,373	876,280	12,000
Midland,	1,829	1,172,575	20,000
New Barbadoes,	6,004	2,347,145	83,035
Orville,	1,690	890,550	42,000
Palisades,	2,590	1,381,420	32,000
Ridgewood,	1,841	1,054,450	44,000
Ridgefield,	5,477	2,007,935	60,000
Rutherford Borough,	2,293	1,221,030	55,000
Saddle River,	2,197	1,062,000	95,000
Union,	1,560	475,618	50,000
Washington,	2,942	1,384,455	10,000
	47,226	\$20,650,336	\$651,335

In addition to the above, \$60,000 has been spent by private parties, \$10,500 by the town of Hackensack and \$25,000 by the Board of Freeholders for improving the Paterson and New York Plank road. The amount of bonded indebtedness directly for macadam, \$302,000.

DENNIS C. CRANE, Westfield, N. J.

BURLINGTON COUNTY.

BY CHAS. T. HARRISON, ENGINEER, MOORESTOWN.

Hon. Edw. Burrough, State Commissioner of Public Roads :

Burlington county was the first in the State to avail itself of the provisions of the State Aid law, entitled "An act to provide for the more permanent improvement of the public roads of this state;" the first application coming from the citizens of Cinnaaminson township residing along the road leading from Westfield to Riverton, who, under the provisions of Section 7 of said act, petitioned the Board of Freeholders to cause said road to be improved. The Freeholders appointed the necessary committee, who ordered surveys to be made and plans and specifications prepared. Upon the report of that committee bids were asked for, received and opened by the committee, who recommended the awarding of the contract to the lowest bidder. The Board of Freeholders refused to act further in the matter, but, under

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a writ of *mandamus*, issued by the Supreme Court, they were ordered to proceed with the work as petitioned for.

About thirty-three miles of stone roads have since been constructed in the county under the State Aid act, as follows :

Westfield and Riverton road, a distance of one and seven-eighths miles, of telford and macadam construction, at a cost of eighty cents per square yard. From Westfield to Riverton the road is twelve feet wide, eight inches thick ; the balance of the road, through Riverton to the Delaware river, being twenty feet wide, ten inches thick. E. G. Harrison, of Asbury Park, engineer ; Messrs. B. M. & J. F. Shanley, of Jersey City, contractors ; Enoch Evans, supervisor.

Bridgeboro and Stanwick road, in Chester township, about two and a half miles in length, twelve feet wide, ten inches thick, of macadam throughout, at ninety-five cents per square yard. E. G. Harrison, engineer ; Messrs. B. M. & J. F. Shanley, contractors ; John S. Rogers, supervisor

Mount Laurel road, from Chester township line to the village of Mount Laurel, two and one-fourth miles, telford construction, ten feet wide, ten inches thick, at \$1.05 per square yard. E. G. Harrison, engineer ; Messrs. Barbour & Ireland, of Frankford, Pa, contractors ; John S. Rogers, supervisor.

Beverly City and Coopertown road, one and one-sixth miles in length, of telford center, ten feet wide, ten inches thick, with macadam wings two and a half feet wide, eight inches thick—a total width of fifteen feet—at ninety cents per square yard for telford and seventy-six cents per square yard for macadam. Charles Stokes, of Beverly, engineer ; Thomas J. McGovern, of Trenton, contractor ; Charles K. Van Sciver, supervisor.

Coopertown and Charlestown road, one mile in length, twelve feet wide, eight inches thick, of macadam construction, at eighty-two cents per square yard. Charles Stokes, engineer ; Thomas J. McGovern, contractor ; Edward Van Sciver, supervisor.

Beverly and Delanco road, one and seven-eighths miles in length, of telford construction, twelve feet wide, ten inches thick, at ninety-six cents per square yard. Charles Stokes, engineer ; New Jersey Paving and Construction Co., contractors ; William Baggs, supervisor.

Colestown and Evesboro road, three and three-eighths miles in length, of macadam construction, ten feet wide, ten inches thick, at \$1.10 per square yard. Charles T. Harrison, of Moorestown, engineer ; Messrs. Barbour & Ireland, contractors ; William R. Lippincott, supervisor.

Mount Holly and Masonville road, four and one-fourth miles in length, telford construction, ten feet wide, ten inches thick, at eighty-

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four cents per square yard. Charles T. Harrison, engineer; Messrs. B. M. & J. F. Shanley, contractors; William P. Younker, supervisor.

Marlton and Medford road, five and one-half miles in length, telford construction, ten feet wide, ten inches thick, at eighty-four cents per square yard. Charles T. Harrison, engineer; Messrs. B. M. & J. F. Shanley, contractors; John R. Jones, supervisor.

Riverside and Bridgeboro road, about four miles in length, telford construction, twelve feet wide, ten inches thick, at ninety cents per square yard. Charles Stokes, engineer; New Jersey Paving and Construction Co., contractors; Xavier Walters, supervisor.

Five Points and Palmyra road, two miles in length, telford construction, twelve feet wide, ten inches thick, at eighty-four cents per square yard. Howard Parry of Riverton, engineer; P. McManus, of Philadelphia, contractor; William J. McIlhenny, supervisor.

High Street and Wood Lane road, being the main street in Mount Holly, leading past county buildings and fair-grounds, one and three-fourths miles in length, telford construction, ten inches thick, at eighty-five cents per square yard; 2,315 of this road is twenty feet wide (ten feet on each side of a street railway track), the balance of the stone construction being twelve feet wide. Charles T. Harrison, engineer; P. McManus, contractor; Winfield Scott Gale, supervisor.

Evesboro and Cross Roads road, five and one-fourth miles in length, of telford construction, ten feet wide, ten inches thick, at \$1.10 per sq. yard. Charles T. Harrison, engineer; Messrs. Barbour & Ireland, contractors; William Jones, supervisor. Work on this road was stopped in December on account of bad weather, leaving about one mile to be finished in the spring. With the completion of this road and the projected Vincentown road, the county will have over thirteen miles of a continuous *free* stone road, connecting with the church road, in Camden county, three and a half miles long, ending at Merchantville.

The average cost of the roads was ninety-two cents per square yard. In many cases the haul of material exceeded two and a half miles, over the worst possible roads, often requiring extra teams to aid in getting the material to the point of work. Taking all conditions into consideration, the price is much lower than paid in other counties.

A great saving to our county in the cost of stone roads is the item of grading, the expense of which (outside of that done by the contractor in the immediate preparation of the roadbed), is borne by the townships in which the roads are located. In the preparation of the roads to be improved the engineer makes a profile plan showing the

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cuts and fills necessary to make as easy a grade as practicable. Separate specifications showing the amount of cuts and fills in excess of one foot in depth, are submitted to the township committeemen, who agree to do the grading in accordance with said plans. This is done in consideration of the townships being relieved of further expense by the county in the care of the roads.

The Mount Laurel, Mount Holly and Masonville, and Marlton and Medford roads, were constructed on the beds of abandoned gravel turnpike roads, travel on which was a great hardship to loaded teams, requiring extra horses and long hours to get to and from market. Since the completion of the stone roads, travel and amount of produce carted has greatly increased, and the cost for extra teams and time expended has proportionately decreased. Loads of three, four and often five tons, with but a single pair of horses, are a common, everyday occurrence, an unheard-of thing in the days of dirt and sand roads.

With this great increase of weight in loaded teams, the narrow-tired wagons (relics of past ages) do much to destroy the beneficial effects of the stone roads, by making ruts that give an endless amount of trouble and expense in the proper care of these great improvements. What is urgently needed is a uniformity in wide tires, which act in the nature of rollers on the stone and tend to keep it hard and smooth. Until the people learn that with wide tires horses can pull heavy loads with greater ease, our roads will continue to be cut up, unless by legislative enactment wide tires are made a necessity.

The early applications were for short roads, which benefited local sections only. During the past year the petitions have been for leading roads, and roads supplementing those already built, thus tending to combine the roads into a system which will eventually extend throughout all sections of the county. These roads generally lead in the direction of the city of Camden.

When the roads were first projected the opposition was very strong, on the ground of such great expense, but since their completion applications have come in from sections where the opposition was strongest, thus seemingly proving that the citizens of those sections know a good thing when they see its practicability demonstrated.

CAMDEN COUNTY.

To Hon. E. Burrough, Commissioner of Public Roads, Merchantville, N. J.:

DEAR SIR—I herewith beg to submit a synopsis of the public road improvements. This subject began to agitate the people of Camden county during the Winter of 1892 and 1893. In the early Spring of 1893 our Board of Freeholders was petitioned to improve the "Church Road," the "Gloucester Road" and the "White Horse Road," the latter of which was at that time a toll road, it having been constructed at a cost of about \$43,000, of which there still remained a bonded debt of \$7,000. The stockholders of this turnpike company having received no dividends for a long time and realizing what a great advantage to the public this road would be if put in first-class order and freed from what has now become an acknowledged nuisance, the "toll-house," by almost unanimous consent, agreed to relinquish their charter and did convey this expensive franchise to the county, all bridged and graded, for the nominal sum of one dollar.

And, as a further testimonial of the appreciation of the owners of real estate along the line of this road, the property owners, with few exceptions, entered into a voluntary agreement to pay six (6) cents per lineal foot for their respective frontages, the proceeds of which to be used toward retiring the bonded debt. The holders of the bonds accepted a liberal discount, thereby enabling the stockholders of the "old White Horse Turnpike Company" to deliver this expensive roadbed to the county freed from debt on condition that the county would improve the road, which could no longer be maintained with gravel. In addition to the above voluntary assessment, the abutting property owners paid the legal ten per cent. of the entire cost, which in no way relieved them from their regular county and township taxes.

We then entered upon the construction of these three roads in accordance with the then approved plan, the specifications and profiles having been prepared by me and approved by the board. Delaware township, through which the Church road passes, made a liberal appropriation of over \$1,600 for grading this road, which, up to this time, had been very hilly. It runs direct to the Burlington county line in Mount Laurel township, the residents of which were so anxious for this improvement that they, too, made an appropriation to help to defray the expense of the grading within our county's

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limits, and also came with their teams and aided in the work, it being known that they would use this road more than the Camden county people. As soon as the contract was awarded to improve this road to the Burlington county line, the proper authorities in the latter county took the necessary steps to continue this artery of travel, and have since completed the same to the very center of the rural districts of Burlington county, a distance of nine miles, to which four miles will be added the coming year, thus making a thoroughfare of over sixteen miles. Having received bids from a half dozen different road builders, the contracts were, on May 13th, 1893, awarded for all three roads to B. M. & J. F. Shanley, at *\$1.15 per square yard, one foot deep.*

The Church road is three and one-half miles long, twelve feet wide and twelve inches deep, and cost, including telford construction, strengthening bridges, extra grading and ditching, a French drain two hundred and seventy feet long, with the officers' salaries, \$30,-821.16. Peter Greenwald was appointed supervisor to look after the work. During 1893 our Governor made all these appointments.

The improved White Horse road was accepted by our board on May 3d, 1894. This great highway runs directly through the middle of our county, and is greatly appreciated by the residents of Camden city who use horses or bicycles and by the farming and mercantile interests generally. The public demand for the extension of this road to Berlin was so great that on the 23d instant our board entered into a contract for its construction along the line of the abandoned gravel turnpike, which we consider a very good foundation for a stone road. East of Berlin we come into a district favored with excellent gravel beds, the material from which we trust will soon be used to finish this great road to the Atlantic county line. We are informed by the Atlantic county officials that they intend the further extension of this road from our county line to America's great seaside resort—Atlantic City—thereby enabling the bicyclist to breakfast in Philadelphia, take a spin over this State road and have time to plunge into the ocean before dinner. The residents of Atlantic county realize what a boom it will be for them and are willing and anxious to defray their share of the county tax that will be used in the improvement of this road. Jackson Briggs was supervisor. The completed portion of the White Horse road, which is nearly eight miles long, is fourteen feet wide and twelve inches deep. The contract price was *\$1 15 per square yard*, total cost of which was \$76,337.17.

On Mt Ephraim and Gloucester road Thomas A. Wilson was appointed supervisor. It is one and fifty-two hundredths miles long, fourteen feet wide and twelve inches deep. On this road there was

\$830 expended for grading ; the old wooden bridges were all replaced with iron pipe ; this I consider economy in every case where a thirty-inch pipe or less will answer, especially at present prices of eighty-five cents per one hundred pounds. Its total cost was \$16,988.75. The efficacy of this road is impaired by the fact that it ends at Gloucester City line, from which point to the ferry there is about one mile of very bad sandy road, entirely worn out, and which requires immediate attention to make this last-named expenditure operative.

With road-making in this country, as with many other of our enterprises, we are only beginners. We have learned much by experience during the past two years, and are now able to materially reduce the cost of these great public improvements. With the liberal "State aid," we are bringing them within the reach of almost any reasonably progressive community. (The old gravel turnpikes of forty years ago taught us the first lessons in scientific road-building, thereby enabling our most faithful animal, the horse, to do double the work he had previously done. Now, with the advent of our improved stone roads, the loads are again doubled, or the horse of to-day draws four times the weight, and with greater ease, than the horse of forty years ago.) Our specifications are prepared differently from those under which our first roads were constructed, eliminating all the known weak points and attaining better results at a much less cost. It is a well-established fact that the middle or crown of a road is subjected to greater wear than the sides or wings. For this reason we now build the center for a width of eight or nine feet double the depth or thickness that we build the wings, thereby saving quantities of stone. Two years ago we considered the contractor's bond sufficient security for his keeping the road in order for one year after its acceptance. In addition to the conventional bond, under our new contract we retain five per cent. of the entire cost for one year after the roads are completed and accepted, all or part of which may be used by our Board to make any necessary repairs should the contractor neglect or refuse to attend to them promptly. We also make the contractor liable for all wear and tear caused by ordinary travel during this period.

We have also given special attention to drainage, which experience has taught us is of the utmost importance. By the adoption of these four innovations, all of which were first introduced in the specifications for Camden county, we are enabled to make great saving to the public and secure more permanent and better results. Then again by close observation, curtailing all unnecessary expenses with improved machinery for quarrying, crushing and road work generally, and sharp

competition among the contractors, the cost of stone roads has been reduced at least 35 per cent. within the last two years, making the construction cost but a trifle more than gravel roads, unless the latter are favorably located as to material. In support of this statement, we herewith submit the prices at which we are now having three roads constructed in Camden county—Collings road, under the supervision of R. T. Collings, has six-inch-deep macadam wings, two feet wide, on each side of a *ten inch-deep* telford center, at *forty-two cents* per square yard. The *ten-inch telford center, eight feet* wide, costs *seventy-eight cents* per square yard. Browning's Lane, six-inch-deep macadam wings, two feet wide, on each side of *twelve-inch-deep telford* center, costs *forty-two cents* per square yard. The *twelve-inch-deep telford* center, *eight feet wide, at seventy nine cents* per square yard and four cents per square yard for each additional inch in depth, should any be required, thus enabling us to get a first-class road twelve inches deep in center and twelve feet wide, at \$4,693.33 $\frac{1}{3}$ per mile. James Bell is supervisor of this road. The Berlin road, now under contract for *ten-inch-deep telford, ten feet wide*, is to cost *seventy-three cents* per square yard, or \$4,282.66 $\frac{2}{3}$ per mile. You, as our State Road Commissioner, now appoint the Supervisors and make your selection from nominees named by the owners of property abutting on the proposed improvement, well knowing these will be deeply interested in getting good work. Hon George Higgins has been entrusted to the care of the Berlin road.

With better education our masses demand better facilities for sociability and mercantile intercourse, both of which develop a higher civilization. Good roads are no small factors toward attaining these ends. By being brought in contact with our neighbors and the rest of the world, and by comparison, our own imperfections and blessings are shown us, as well as the advantages of others, and each are thereby mutually improved. It is very gratifying to know that this subject is not a partisan one. The Democratic Board of Freeholders, in response to the public demand, started the stone-road improvement in Camden county; the new Republican board, also composed of a number of shrewd business men, are determined to keep pace with the times, and at a special meeting held on the 23d instant, were unanimous in letting the contracts for Collings road and Browning's lane, and upon call of roll voted nineteen in favor and two against the signing of the contract for the Berlin road at the prices already named. The two objected, mainly, on account of stringency of the times. The political composition of our State Legislature has changed within the past two years, but with this turn

in the tide has come no retrograde in the road improvement—the State always generously fulfilling its part, and furnishing thirty-three and one-third per cent. of the entire cost. The county boards in Camden and Gloucester counties have been of opposing political views; each has seen fit to employ the same engineer, regardless of party affiliations; and in Gloucester county supervisors of both political parties have been appointed.

As in my report of the 16th instant to our County Board, we would earnestly recommend that you use your valuable influence toward the adoption of a measure that will lead to the general use of broad-tread wheels on vehicles calculated to carry heavy loads; also to the general practice of shoeing horses with plain shoes, except in icy times, thereby making it more comfortable for the animal and much less wearing upon the surface of the road, and putting in practice usages that are common in the "old countries" where stone roads are no experiment, having been in use for nearly two thousand years, and were built of material far inferior to our New Jersey trap rock. Even with our superior material, we require greater watchfulness than in almost any other locality, since our farming community in the neighborhood of Philadelphia, cart over our well-graded thoroughfares heavier loads of vegetables and manure than do farmers anywhere else on the whole globe. This is no exaggeration, but an established fact.

Very truly yours,

J. J. ALBERTSON,

Camden County Engineer, in Charge of Construction.

Magnolia, N. J., January 26th, 1895.

History of Road Construction in Essex County, New Jersey.

BY JAMES OWEN.

The first attempt at what may be called legitimate road construction began in Essex county in the year 1868, in the city of Orange, when the main street of that city was paved with telford pavement sixteen inches thick; the extension of this pavement was afterwards laid in the main street in the township of East Orange, I believe of the same depth. These were all the deep pavements laid in the

county, and as the county authorities soon after commenced building and improving the county avenues, and laying the pavement to a depth of only twelve inches, and that depth proving perfectly successful, it furnished an example to the other communities, which they speedily adopted, and in later years the depth has been reduced to eight inches for local roads with the same good results.

In 1871 the construction of the county roads was started and kept up in full vigor for a period of seven years, when the work was practically stopped, and only intermittent attempts have been made to finish up the original proposed system, in which now even gaps are left.

The system as outlined and constructed consisted of seven radiating avenues, converging in the city of Newark and extending to the county line, to the salient points in all directions, except to the east, and affording easy communication from that city to all the surrounding towns and cities of the county.

The total number of miles of county roads that are now constructed is $36\frac{1}{2}$, all of 12-inch telford. During the progress of the construction of the county roads the city of Orange, the townships of East Orange and West Orange, were also busily engaged in extending their local connections, and the two first have continuously kept the work up till there are hardly any unimproved streets within their corporate limits. All their construction was of telford pavement, and almost uniformly twelve inches thick. The cost of the work done by them was assessed on the property benefited, and could only be done by petition of the owners.

The township of West Orange bonded itself in 1872, and constructed at that time a system of improvements on its main roads and then stopped, and since 1875 hardly a mile of new roads has been built; all the pavements were of telford, and varied from eight to twelve inches in depth, and the cost, by law, was made a general township tax.

The city of Newark, at the onset of the county improvement, started to telfordize a number of its streets, but after building a few miles the results were found to be unsatisfactory, and future improvements were made, in the line of ordinary city practice, either of block cobble or asphalt.

Excepting the work before outlined no further systematic improvement of local highways was made till about 1883, when there seemed to be a general awakening. Montclair started in with a special appropriation in their annual tax levy. Bloomfield followed suit with the same practice, and both of these townships have steadily persisted in the work, till, at this time, a goodly proportion of their roads are

improved—Montclair with eight-inch telford and Bloomfield with varying thicknesses, as to them seemed best. In 1888 the township of Belleville bonded itself under the Township law for \$50,000 and built a system of improved roads within its limits, which, year by year, has been steadily increased by annual appropriations. The Belleville roads were nearly all telford, varying from six to ten inches in depth.

In 1889 Franklin township also bonded itself for \$50,000 and constructed a similar system, which has since been slightly increased. The Franklin township roads are mostly six inches in depth.

The village of South Orange has, during the last fifteen years, slowly but surely improved its roads, partly with telford and partly with macadam, till but few dirt roads are left. The township of South Orange has had no systematic work done within its limits, except to buy broken stone and spread it on the existing surface of the roads, affording some relief; but such a practice can hardly give a return in the shape of improved roads.

Clinton township has followed out the same practice as South Orange with about the same results, and Milburn township has done the same thing in its corporate capacity, although there are numbers of improved roads within its limits, at Short Hills, built by private enterprise.

Caldwell township did nothing in road improvements till about four years ago, when it raised \$10,000 in one year by tax and spent it. The effort, however, practically paralyzed the township, as it was soon after dismembered by setting off from it the township of Verona and the borough of Caldwell, and since then nothing has been done.

Up to date Livingston has not one foot of improved road within its limits.

This gives a brief outline of road improvements in Essex county with the following results:

Essex county,	36½ miles.	
East Orange township,	33	"
Orange City,	24	"
West Orange township,	12	"
South Orange "	6	"
Belleville "	12	"
Franklin "	12	"
Montclair "	20	"
Bloomfield "	17¾	"
Milburn "	4	"
Clinton "	5	" macadam.
Caldwell "	2	"
City of Newark,	5	"
Total,	189¼ miles.	

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I doubt if it would be of importance, if it were possible, to give the cost of all this construction, as it can be readily conceived that during a period of twenty-seven years, when the work was first commenced, to date, the improvement in road construction has so reduced the price as to make the comparison only interesting, but not of moment.

Pavements of telford that cost, twenty years ago, \$2 00 per square yard, twelve inches thick, now are built at a cost of eighty cents, and eight-inch pavements are now being built steadily at a price that varies but little from forty-five cents per square yard

The improvement of the Essex county roads by local effort bids fair to be continuous, till at such time the necessity for such work will stop, and the task can then be considered as complete. It can be safely said, however, that no county in this State, and probably in any other State, has spent so much money for road improvement and achieved such good results, and in no county has the enhancement in value of lands by such achievement been exceeded.

Yours resp.,

JAS. OWEN,

County Engineer Essex County.

GLOUCESTER COUNTY.

MAGNOLIA, N. J., January 26th, 1895.

*To Hon. E. Burrough, Commissioner of Public Roads, Merchantville,
N. J. :*

DEAR SIR—In compliance with your request, I furnish the information in regard to the stone road movement in Gloucester county.

This county took an early interest in the movement for permanently improved roads, Hon. James J. Davidson being, at the time the law was introduced, a member of the Legislature and voted for the law, and again in 1892 he took an active interest in securing the amendment that made the law effective, being Chairman of the committee that had the bill in charge, by which circumstance it is sometimes called the "Davidson Bill."

He clearly realized the fact that the State could not make a better investment of its revenues than by applying a portion to the improvement of its public roads. Mr. Davidson was instrumental in having

the people of his own town benefited, and presented one of the earliest applications for the improvement of their main avenue under the new law. With this, as with many other pioneer enterprises, there were several legal questions raised and after the usual delays the law was sustained in every particular. On December 16th, 1894, the Board of Freeholders of Gloucester county awarded the contract for the construction of a stone road, as per approved specifications, to Mr. R. A. Montgomery, of Lambertville. I do not consider that this county has lost anything by the delay. The general prices are much lower than two years ago. It has also had the advantage of two years' experience in watching the scientific road work in Camden county. Mr. Davidson has been appointed supervisor of the Swedesboro road, which is one and one-quarter miles long. We are building a telford center nine feet wide and twelve inches deep, at a cost of eighty-six cents per square yard; upon each side of this center is built macadam wings three feet wide and six inches deep at fifty-nine cents per square yard, thereby getting a road fifteen feet wide with a twelve-inch deep center and using no more stones than would be required to build an ordinary twelve-inch deep road. Part of this road will be built over what is now very bad foundation, through which the contractor is now building a tile drain and filling the ditch with broken stone at a cost of eighteen cents per lineal foot. Gloucester county is no exception to the rule. When the movement once got fairly started applications came pouring in for twenty miles of stone road.

The inhabitants of West Depford township, through which the Crown Point road passes from Westville on a good, stone toll road to Paulsboro, a distance of about six and one-half miles, seized this opportunity for their advancement. On October 18th, 1894, bids of five different parties were opened at Woodbury. They ranged from \$1.09 per square yard to seventy-four cents per square yard. On November 15th the contract for a ten-inch-deep telford, ten feet wide, was awarded to B. M. & J. F. Shanley, they being the lowest bidders. Thomas Wyne is supervisor of this work. The Township Committee of West Depford township, at a special meeting for the purpose, appropriated \$1,000 for the grading, which work was being rapidly pushed until the freeze of December 26th, when further operations were suspended. There seems to be an injustice in the fact that the State chartered companies to build toll roads; private individuals invested their money in good faith and now the State, with the county and abutting property owners, build a *free* improved road, better than the turnpikes and often almost paralleling them. This is unjust competition. I should recommend some action on the part of the State,

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with a portion of its accumulating surplus, to make some provision for acquiring all the toll road franchises, then dedicate the same to the public.

Under our present law the counties are compelled to keep the stone roads in repair. We would recommend that you lend your influence toward the general adoption of broad-tread wheels, and would suggest that a law be enacted allowing (during 1895) a rebate from the county tax of \$10.00 to the owner of every broad-tread vehicle, four inches or more; \$8.00 for the year 1896; \$6.00 for the year 1897; \$4.00 for the year 1898; \$2.00 for the year 1899, and no rebate for the year 1900. Then begin the new century of 1901 by imposing a tax of \$2.00 upon the owner of a narrow-tread vehicle calculated to carry heavy loads, to be paid into the county treasury; at each succeeding year increase this tax \$2.00. By this means all our roads, whether of stone or ordinary earth, would be practically rolled and greatly improved. The change would be gradual, but positive, without working any hardships.

Very truly yours,

J. J. ALBERTSON,

Engineer in Charge of Gloucester County Work.

HUDSON COUNTY.

Edward Burrough, Esq., State Commissioner of Public Roads:

DEAR SIR—It will be impossible to answer categorically all the questions contained in your circular-letter, for Hudson county, for many reasons

The county differs from all others in the State, having the smallest area and in being occupied as to nearly all its extent by thickly built-up cities or towns under chartered governments, each controlling its own streets. The area not built up is mainly salt marsh, crossed by few wagon-roads but many railroads.

In the cities and towns the prevailing pavement has been trap-block on sand, some few important streets being paved with granite block, and during the past year Jersey City has laid several streets with asphalt.

Now as to roads at all comparable with the county roads existing in the rural counties:

The county, being a very old settlement, was traversed early in the history of the State by several important highways, some running

east and west, forming links in the route between New York and Philadelphia; others north toward Hackensack and Paterson, and south to Staten Island. As a general thing, these roads were covered roughly with broken trap-rock, when near quarries, probably thirty or forty years ago; where rock was not convenient, the roadway was mud and dirt. Two or three roads, owned by turnpike companies, were kept up fairly well with stone, from an early date, but the stone was put on the others hap-hazard, with no attempt to construct a scientific roadbed. One of these roads, the Paterson plank-road, is still a macadam road, kept up by the county in fairly good condition.

The first scientifically-built broken-stone roads in the county were laid about 1876, about two miles 12-inches-thick telford-macadam, and about five miles 16-inches-thick telford-macadam. Between that time and 1894, about three miles of telford-macadam has been laid, mostly twelve inches, making about ten miles of telford-macadam road and about twelve miles of macadam in the county at beginning of 1894.

All these roads are in fairly good condition, and cost very little for repairs, except one stretch of one and three-quarter miles telford, built in 1876, and subjected to very hard usage at once, being torn up throughout its whole length for car-tracks, and left without sprinkling and repairs, and subject to very heavy traffic, and this year taken up and replaced by trap-block. The telford foundation shows firm and good, and if a little care had been taken of this road it would have been good to-day.

These roads are all from thirty to forty feet wide, average cost about \$1.25 per square yard for telford-macadam. They were built partly by municipal boards, partly by commissioners under special acts, and in both cases assessed upon property benefited.

The county is now engaged upon extensive work of road-building, under the act of 1888, authorizing Boards of Chosen Freeholders to lay out, open and construct public roads through the county. Our system of road, when completed, will be equal to anything in the country; will be about nineteen miles long, generally one hundred feet wide, with sixty feet roadway, curbed and lined with trees throughout, drained, paved gutters, two carriage-ways of telford-macadam twelve inches deep, eighteen feet wide each, and a speedway or bridle-road of gravel, sixteen feet wide in center; steel bridges with asphalt roadways; whole road lighted with electric arc lights. The road extends from Bergen Point to the Bergen county line, then bends across the north end of the county to the edge of the Palisades and follows the bluff, giving a bird's-eye view of the Hudson

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river, New York bay, New York and Brooklyn for four miles. The greater part of right of way (all through improved property) was condemned, and many houses purchased and moved. The total cost of the whole system will be about \$2,250,000, divided about as follows: Right of way, about \$1,000,000; grading and drainage, about \$400,000; paving, curb and gutters, about \$600,000; bridges, about \$150,000; electric-lighting plant, about \$100,000; trees, planting, about \$10,000.

Fourteen miles are opened, graded and drained and contracts for paving same distance are now under way. At this date about seven miles of road is practically paved in shape for use. By the middle of 1895 the whole fourteen miles of the main road will be completed. The remainder, or branch road along the Palisades, will be graded the coming year. The work has been done within the estimates. Cost per square yard of twelve-inch telford, average about ninety-five cents, including all excavations for sub-grade. The work is paid for by the issue of county bonds, running for thirty years and drawing four and one-half per cent. interest. One million five hundred thousand dollars of bonds have been issued. The favorable effect upon real estate value in the county already has been very marked.

Yours, respectfully,

E. W. HARRISON,
Chief Engineer.

MERCER COUNTY.

To the Hon. Edward Burrough, State Commissioner of Public Roads :

DEAR SIR—In reference to the matter of county roads improved under what is known as the State Aid law, I am glad to be able to report progress for Mercer county.

During the month of September, 1893, contracts were awarded for improving three roads under said act. And in the early part of October of the same year work was begun on two of them, and by the latter part of the following December, at which time work was stopped on account of the weather, there were about two miles built on one road and about one and a half miles on the other; a sufficient portion on each road for a good object-lesson during the succeeding winter and spring, and, I might add, the object-lesson was closely studied and with satisfactory results, because it made a number of converts

to improved roads. Each section of road built extended over portions of such a nature that they had at times been almost impassable with a light wagon, and during the progress of the work we were told that "on those spots our roads would never stand; the stone would sink out of sight," &c. But, although they were built in the fall, when rains were frequent and the roads new and soft, they did stand remarkably well, being put to a severe test, on each section, by being used by heavy, narrow-tired brick wagons and carts in hauling clay for brick making to the brickyards in Trenton, this being in addition to a great deal of ordinary travel over the usual country roads and extended through the greater part of the winter. I consider this a very severe test; but the roads stood well and only slightly rutted.

These two roads, with the third, were finished during last year (1894). There being, in the meantime, another contract awarded for building nearly another mile of road as a connection between one of the first roads and the city of Trenton; furnishing an unbroken line of macadam road from the city for about six miles.

The three first roads were each built, chiefly, of ten-inch macadam, fourteen feet wide, with an occasional section of ten-inch telford where the nature of the soil seemed to require it. The last being built of twelve-inch telford entire, as it is a main inlet from several roads north of the city and being in the vicinity of a number of brick yards, has very hard wear.

The names of the supervisors on the respective roads, with the contractors who did the work and their bids, follow:

Scotch road, about five and one-half miles—

Robert A. Montgomery, Contractor.	{	Ten-inch telford, 89c. sq. yd.
C. C. Ivins, Supervisor.		Ten-inch macadam, 89c. sq. yd.
		Eight-inch macadam, 79c. sq. yd.

Ewingville road, three and one-third miles—

William S. Keihn, Contractor.	{	Ten-inch telford, 94c. sq. yd.
John Roche, Supervisor.		Ten-inch macadam, 94c. sq. yd.
		Eight-inch macadam, 82c. sq. yd.

Lawrenceville road, three and eighty-four one-hundredths miles—

William S. Keihn, Contractor.	{	Ten-inch telford, \$1.05 sq. yd. (none built).
Stephen Eldridge, Supervisor.		Ten-inch macadam, 92c. sq. yd.
		Eight-inch macadam, 81c. sq. yd.

Ingham Street road, forty-five one hundredths of a mile

Robert A. Montgomery, Contractor.	{	Ten-inch telford, 79c. sq. yd.
C. C. Ivins, Supervisor.		Ten-inch macadam, 79c. sq. yd.

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I might add that the demand for stone roads is increasing very rapidly in this county, as we now have petitions for ten other roads, with still others talked of.

I wish, also, to call attention to the necessity for the use of wider tires on heavy wagons. If legislation could be secured that would gradually (without hardship) bring into use wagons having the tread of the wheels proportioned in width to their weight when loaded, it seems to me most satisfactory results would follow.

Respectfully,

JOS. L. WATSON,

County Engineer.

MIDDLESEX COUNTY.

BY ASHER ATKINSON, COUNTY ENGINEER.

Report on road work in Middlesex county:

In the spring of 1892 the board of freeholders of Middlesex county decided to place an appropriation in the annual budget for that year for the construction of permanent stone roads in the county. With this money available for road work, petitions were circulated along the line of several roads in the county, and after some opposition from property-owners, who feared the expense of the assessment, the consent of enough was obtained, and the county applied for the State aid under the act of 1891.

The preliminary work of getting the petitions, advertising for bids, and preparing the contracts, occupied the summer months, and it was not until the fall of 1892 that the first work of construction was begun. In that year the county constructed 10 55 miles of road, as follows:

The road from New Brunswick to Metuchen, 4.85 miles; part of the road between Metuchen and Plainfield, 1.70 miles, and part of the road from Old Bridge to Mattawan, 4 miles

All of these roads were of macadam construction. The road from New Brunswick to Metuchen was twelve feet wide, eight inches thick, and cost \$1.09 per lineal foot, or 91 cents per square yard. B. M. & J. F. Shanley, of Jersey City, were the contractors

The road between Metuchen and Plainfield was fourteen feet wide and eight inches thick, and cost \$1.00 per lineal foot, or 64 cents per square yard. The contractor was J. H. Wilson, of Dunellen.

The Old Bridge road was ten feet wide and nine inches thick, and cost \$1.19 per lineal foot, or \$1.07 per square yard. B. M. & J. F. Shanley were the contractors

The supervisors on these three roads were Judge Manning Freeman, of Metuchen; Nathan Robbins, of Metuchen, and Judge H. H. Brown, of Old Bridge.

In the year 1893 the remainder of the road from Metuchen to Plainfield was completed, a distance of 3.18 miles. The width of the roadway was fourteen feet, depth eight inches, and the cost \$1.19 per lineal foot, or 85 cents per square yard. Nathan Robbins was supervisor of the work.

The completion of this work made a continuous line of macadam road between New Brunswick and Plainfield, and connects the first place with the splendid road system of Union county. It is now possible to take the heaviest loads from New Brunswick to Plainfield, Newark or Orange at any season of the year over roads formerly impassable in the winter.

During the past year the road from Old Bridge to Mattawan has been completed as far as the county line, 2.36 miles. The road is fourteen feet wide, eight inches thick, and cost \$1.65 per lineal foot, or \$1.06 per square yard. Judge H. H. Brown was the supervisor.

The total amount of work completed to date in the county is 16.09 miles.

There are two roads now under contract and on which work has commenced, and which will be completed in the present year: The road from Perth Amboy to Rahway, through Woodbridge, a distance of 5.85 miles, and 1.83 miles of road at Oak Tree, between Metuchen and Plainfield

The road from Perth Amboy to Woodbridge will be of telford, twelve feet wide, ten inches deep, and cost \$1.06 per lineal foot or eighty cents per square yard. From Woodbridge to Rahway the road will be ten feet wide, eight inches thick and will cost 89 cents per lineal foot or 80 cents per square yard. The contractors are B. M. & J. F. Shanley.

The Oak Tree road is of macadam, twelve feet wide and eight inches thick, costing 96 cents per lineal foot or 72 cents per square yard. J. H. Wilson is the contractor.

Besides these roads others have been petitioned for from South Amboy to South River, 5.19 miles; from New Brunswick to Bound Brook, 6.98 miles; from Stelton to New Market, six miles; from Rahway to New Dover, 2.61 miles, and from Old Bridge to Spottswood, 2.48 miles.

New Brunswick, N. J., Jan. 12th, 1895.

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PASSAIC COUNTY.

*Hon. Edward Burrough, State Commissioner of Public Roads,
Trenton, N. J.:*

DEAR SIR—I have the pleasure to forward this my report upon the road system of Passaic county, New Jersey.

This county, one of the most northern in the State, was organized in 1837, pursuant to an act of the Legislature, and comprises the cities of Paterson and Passaic and the townships of Acquackanonk, Little Falls, Manchester, Pompton, Wayne and West Milford.

The city of Paterson was named for William Paterson, at one time Governor of the State, and was originally the township of that name. It is situated at the great falls of the Passaic river and is three miles above the head of navigation.

The city of Passaic was cut off from Acquackanonk township in 1866, and was called the township of Passaic. In 1871 it was incorporated as the village, and in 1873 as the city, of Passaic. It is situated at the head of navigation of the Passaic river.

Acquackanonk township was formerly a part of Essex county, and the townships of Manchester, Pompton and West Milford originally belonged to Bergen county.

Passaic county is twenty-nine miles long, fifteen miles wide at its widest part, and two miles wide at its narrowest part—at Pompton Lake.

The area of the county of Passaic is 128,100 acres (or 200.156 square miles), of which 125,660 is upland and 2,440 under water; of the upland 50,234 is cleared and 75,376 is still in forest, the major part of this being in Pompton and West Milford townships.

Below will be found a table which gives the population, the acreage, the number of square miles of area and the total number of miles of roads in the various cities and townships in the county :

	Population.	Acreage.	Sq. Miles.	Road Miles.
Paterson,	80,000	5,442	8,472	129
Passaic,	18,000	2,074	3,241	47
Acquackanonk,	2,950	7,256	11,338	41
Little Falls,	2,100	3,715	5,804	22
Manchester,	3,500	6,998	10,934	55
Pompton,	2,500	34,172	53,394	55
Wayne,	2,250	17,107	26,729	57
West Milford,	2,575	51,356	80,244	110
Total,	113,875	128,100	200,156	490

The southern part of the county is somewhat rolling, with much good farming land, and has a large population, while the northern portion is mountainous, rising to an elevation in West Milford township, in Bearfort mountain range, of 1,490 feet above the level of the sea. This section of the county is sparsely settled. In the townships of Pompton and West Milford are many noted lakes and natural, as well as artificial, reservoirs, the areas of these bodies of clear, cold water being about 2,440 acres. The natural beauty of the scenery of this section, with its pure air and water, in connection with the fine system of macadamized roads, has been the means of bringing the county of Passaic most prominently into public notice. The public-road system has been of greatest value to the county. It has increased the value of lands to a marked degree, has converted farming lands into residence property and has put the farmers into easy communication with their markets and so increased the trade. They were quick to see the advantages which accrued to them in this direction. It was only a few years ago that I attended a meeting in an adjoining county, called for the purpose of educating the public to the necessity of improving the public highways, and the farmers were the main opponents of the project. Now, these same objectors are the ones who are foremost in the advocacy of good roads.

Fifteen to twenty years ago the agitation for improved roads in Passaic county commenced, but it was not until the year 1882 that the Freeholders took any steps to macadamize the public roads. Between 1882 and 1889, when the Freeholders began to work under a new law passed in the spring of 1889, there had been spent in the improvement of the roads of the county the sum of \$60,756.00. Since that time there has been spent in new construction \$567,000.00, and in repairs and maintenance \$89,000.00. The total number of miles macadamized is about one hundred and twenty-eight, and the number under contract for repairs is about fifty. Passaic county is particularly fortunate in having, within her borders, an abundance of suitable materials for macadamizing her roads. In Paterson, Acquackanonk and Little Falls are trap-rock quarries; in Pompton and West Milford granite and gneiss, and in Wayne and Manchester immense deposits of fine gravel. There are, I believe, eight crushers at work in the county crushing rock for macadam, six of which are crushing trap-rock and two breaking granite. The price per cubic yard at the crusher is \$1.00. The cost per mile for grading and macadamizing the county roads is \$4,900 00, and the cost per mile for repairs is from \$110.00 to \$210.00, the average being not far from \$140.00 per mile. The average cost for macadam laid in the county has been about 13¼ cents per square yard per inch in depth. This cost comprises the

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necessary grading of the roadbed and rolling the same, and the furnishing, spreading, sprinkling and rolling the broken stone; in fine, preparing and completing the road ready for the traffic. The city of Passaic, reaping the benefit of the good hard roads built by the county, over which heavy loads can now be hauled and quick time made, has recently let contracts for the macadamizing of some of her streets at 9 cents per square yard per inch in depth. The general width of the county roads as macadamized is sixteen feet, and the depth four inches. In some cases the width has been increased to the full width of the roadway, and in others reduced to twelve feet. The depth was in a few instances, where the traffic was heavy, increased to six inches. In the construction of the macadam the following was the procedure, viz.: The roadbed was first graded and then rolled with the horse-roller. Then the first layer of two-inch stone was spread to a depth of two and one-half inches, and over this was cast a thin coating of clay. This was then rolled. The finishing coat of one-inch stone was then spread to a depth of one and one-half inches, and upon this was thrown the top dressing of fine screenings. This coat was wet with the sprinkling-cart and well rolled. For the six-inch macadam one inch more of each of the larger sizes was added to each coat or layer of the above. The roads have a crown of about one-fiftieth of the width of the street. While the county has done little within the past eighteen months in the direction of macadamizing or improving any of the public highways, some of the townships have taken hold of the matter and are going on with the improvement of their most important highways. This is particularly the case of Acquackanonk township.

Under the law of March 19th, 1889, the county paid two-thirds and the city or township through which the improved road ran paid the remaining one-third of the cost. The engineers of the Boards of Freeholders who have been in charge of the improvements of the county roads were C. V. W. Fonda and Peter Sears. In December last the new board elected William L. Whitmore to the position of County Engineer. The county has also an Inspector of County Roads, Mr. Leslie S. Menger, who has charge of all repairs of roads, and reports to the board every month. To the Boards of Chosen Freeholders and other officials who planned and constructed the fine system of county roads of the county of Passaic are due the greatest credit. It is to be hoped that the present and future boards will provide for their proper maintenance, and for further extensions as fast as the public interest demands

Very truly yours,

Passaic, N. J., February 4th, 1895.

COLIN R. WISE.

PASSAIC COUNTY.

 BY DENNIS C. CRANE.

Passaic county is one of the northern counties of the State, eight to ten miles wide and twenty-four miles long from the Essex county line to the northern border. The southern half is somewhat rolling, with considerable good farming land. This part is within easy reach of New York city by several railroads. The northern half is more hilly and mountainous and sparsely settled. In the lower portion are the cities of Paterson and Passaic, the former containing a population of eighty-thousand and the latter twenty thousand. There are also a number of growing villages. Like other parts of the State the necessity for better roads was evident to the minds of thinking people for many years back, but not until about the year 1886 or 1887 were any advance steps taken. In 1886 and 1887 \$25,000 was raised each year and spent by the Freeholders for macadamizing its principal roads. In 1888 \$60,000 was also raised for the same purpose. This money was raised and spent under the law of 1882 allowing Freeholders to raise \$25,000 a year for road purposes. In 1889 the Freeholders commenced working under the County Road law passed that year, the county at large paying two-thirds of the cost and the townships through which the roads passed one-third. (Under this law the city of Paterson paid eighty per cent. of the general tax, and, consequently, pays eighty per cent. of the two-thirds county road tax. This help to country districts is apt to be lost sight of by farmers.) Since 1889 it has graded and macadamized one hundred and thirty miles of road, or about half the roads in the county, coating from twelve to eighteen feet of the center four to six inches deep, at an average cost of \$5,000 a mile. The expense for engineering and inspection amounted to \$110 a mile. Small amounts have also been raised by individual townships for roads. The trap-rock from the hills in the vicinity of Paterson was mostly used. A bastard granite, found in the upper part of the county, was used on some roads for bottom-stone. All roads were graded as profiled by the engineer, then rolled with a horse-roller before putting on the stone. The first coat consisted of two and a half inches deep of two-inch stone, evenly spread, for the four-inch macadam, and a light coat of common clay spread on for binding and then thoroughly rolled with a heavy horse-roller; then one and a half inches of one-inch stone was evenly spread, with sufficient stone screenings to fill crevices,

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then moistened with a watering cart and heavily rolled. For six-inch macadam one inch more was added to each layer. The roadways from ditch to ditch run from twenty to thirty feet wide, and have a regular crown of one foot. The contract price paid for this work ran from twenty-seven cents a square yard to fifty-four cents, according to location. To pay for this work the Freeholders issued county road bonds. The first issue was for \$100,000, to be paid after five years. The second issue was for \$200,000, to be paid for in six years in equal payments of \$33,333.33, the rate of interest five per cent. There is no special call for new work at present, but some contracts have been given out for putting the first built roads in repair. One hundred and fifty dollars to \$210 a mile is to be paid for one and a half inches of one-inch stone with screenings to fill crevices, watered and rolled to the satisfaction of the inspector. Lesley S. Menger, C. E., is the present inspector of county roads.

The improved roads are commended by taxpayers and the public generally. They have started into existence a number of villages which promise to become important places in time. Real estate has increased in value, and it is the general sentiment that good roads pay. Civil Engineer C. V. W. Fonda, of Paterson, N. J., had charge of the construction of the roads up to 1892. There are eight stone crushers in the county. One dollar a cubic yard at the crusher is the ruling price for crushed stone. Mr. Fonda thinks it would be well for the county to own a tract of land, as near the center of the county as possible, containing trap-rock, establish its prison there and a stone-crushing plant and set the prisoners to work handling stone for making and repairing roads in the county, teamsters and farmers being invited to bid for hauling the stone to certain points at so much a ton. The winter season would be favorable for having the carting done cheaply. He favored the State and possibly the National government aiding the building of stone roads between the larger cities and important centers, not only for use in times of peace but for the rapid movement of our militia should our country be invaded by an enemy. At present there is no special movement for State aid in the county. His experience has led him to believe that county roads controlled by the Board of Freeholders had better end at the city line. The government of the city and county and its officers may conflict. The laying of sewers, gaspipe, crosswalks, &c., may give cause for offence.

DENNIS C. CRANE.

FIRST ANNUAL REPORT

UNION COUNTY.

 BY DENNIS C. CRANE, WESTFIELD, N. J.

Union county has been a sufferer from bad roads from prehistoric times to within a few years. The land being but gently rolling and the soil of rather a clayey nature, the water could not run off or soak away readily. These two conditions, with ignorance and carelessness on the part of road makers, gave us the reputation of having the worst roads in the country. It was deep mud in the winter and a blinding dust in summer. This was so up to within a few years ago. To the Union County Farmers' Club is due the credit of publicly agitating the question for better roads, and giving birth to the County Road law. For twenty years they annually devoted one day to the discussion of the question, and reported the proceedings in the local papers, but not until 1889 was the interest sufficient to accomplish anything practical. In the winter of 1889, with the united help of progressive, enterprising citizens, a law was framed and passed the Legislature called the "County Road Law." This gave the County Freeholders the power to assume control of and improve the main roads of the county, one-third of the cost to be borne by the townships through which the road passed, and two-thirds by the county at large. At once the Freeholders selected forty miles of the principal roads running out from the county seat (eight miles have since been accepted and improved) and issued \$350,000 worth of 10-20 4 per cent. County Road bonds, and contracted for the grading and paving with telford 12 feet and 16 feet of the centers of these avenues, 8 to 12 inches deep. The price for this work varied from 8 cents to \$1.63 a square yard. At first among the conservative there was some fear and anxiety lest the bonding the county and extravagant methods often practiced by public bodies might bring trouble, but looking back we see that these fears were only in a small measure realized. In two years the roads were completed and, for the most part, we were out of the mire—on top of the hill on the road question and where it now runs itself. To-day our hard, smooth, well-graded roads are the admiration of all who ride over them. It has changed our calculations and our opportunities; distances have been changed more than one-half; Winter storms and darkest nights have not in them the dread they had. Friends who came out from New York to live with us, especially the desirable

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ones, with means, taste and intelligence, do not return at the end of the year, but buy a lot or farm and build. Real estate is no more a drag in the market, but sells, rents easily and readily at one-third to double what it did two years ago. County road taxes, which we feared might be burdensome and cause discontent, are a surprise to the taxpayers, because so much less than they expected. County road tax (not including township road taxes) is five cents on \$100 valuation ; that is, if a farm is assessed at \$10,000 the annual tax is \$5.00. Vehicle traveling, especially bicycle and pleasure riding, has increased fourfold ; teamsters who counted twenty to thirty hundred a two-horse load now frequently take two, three and four tons, with no more strain on their horses. Our county is fortunate in having a range of trap-rock hill running through it, which furnishes us with the very best material for making roads. There are ten crushers at work breaking this stone for the home and distant markets ; 75c. a ton at the crusher is the average price ; about 2,700 pounds make a cubic yard. In repairing the roads the Freeholders are now trying the contract system. The lowest bid this year was 23c. a square yard for one and a half inches of one-inch stone and stone dust sufficient for binding, well watered and rolled ; before putting on the stone a light coat of clay is spread over the old road to form a connection with the new stone ; nine miles were repaired in this way last year and gives satisfaction.

The limit established by law for bonding the county has been reached, but we are happy as it is.

Need of Engineering Skill in Permanent Road-Building.

Road Convention.

BY ROBERT E. MEEKER, PLAINFIELD.

JANUARY 21ST, 1892.

One of the first questions that come before a Road Board, Highway Commission or other body appointed by the citizens of any community to look after their interests in this particular is: Shall we or shall we not employ an engineer to assist us in our work? And more and more frequent becomes the answer, yes. Why? Because the people have learned, by costly experience, that it pays. On the score of economy, if for no other reason, a competent engineer should be secured at the very outset. Who would think of commencing a lawsuit without consulting a good lawyer? Why? Because we know that he has made a study of the law in all of its bearings, and can tell us at the very outset whether we have a good case or any case at all; and what we must do and in what form we must present our case before the court. This we all recognize as the proper and only thing to do in a lawsuit; the same reasoning applies in road-building. At the outset we consult our engineer because he has made a study of road-building under all possible conditions, and hence is able to not only advise us what to do, but often, what is equally important, what not to do. For example, the road may be covered with a stratum of clay or loam, full of ruts, holes and hollows. The natural impulse, in fact common practice, is to take the dirt from the sides of the road and fill these. But our engineer says, "No, gentlemen, this is dead dirt, and if you place it on the road you will only have deeper mud the next time it rains. Plow out the sides, which are generally as high, if not higher, than the center, and use it to fill some deep hollow on the line of the road; or, if there be none, dump it in some hollow on one side, out of the way, and fill your center with good gravel from the hill near by, or, better still, with crushed stone. Then the question arises,

what kind of stone? The engineer says trap-rock if possible, if not, tough granite or the hardest and toughest feldspathic rocks and some of the limestones of the transition and cart ; but don't use red shale or the newer sandstones. Why? you ask. Because the experience of the old world and also of the new teaches us that it is cheaper in the end to use the hard, tough, igneous rocks than the softer aqueous rocks. The first cost of delivering the trap-rock on the road may be more, but the cost of spreading, rolling and forming the road will be the same. The trap-rock road will last for fifteen or twenty years, while the softer rocks will grind to powder and become worthless in from three to five years.

Having decided, according to your locality, what the nature of your road-covering shall be, the next question is, how shall we prepare our road to receive this covering so as to obtain the best results? The engineer says we must run a line of levels from one end to the other of our road, noting all watercourses crossing or contiguous to the line of the road and all ditches or other means at present provided for drainage. From these levels we will prepare a profile, so that at a glance we may see where the road requires cutting or filling, and how much of each there is to be done ; whether we will have dirt enough to make our fills or whether we will have too much ; if the latter, what shall we do with it? All these things should be decided before we commence work. In other words, it is just as necessary to have a properly-prepared plan before beginning to build a permanent road as it is to have a plan and elevation of your house before commencing to build, and for the very same reason. First, because you want to know how much it is going to cost ; second, you want to know what you have to do before you begin, so that you will not have to undo and do your work over again, which is the most costly way to build anything, as you all know. A case in point occurs to me right here. Some years ago the Borough Commissioners of a certain town spent \$300 in hauling gravel on to a road and filling it in ; the succeeding winter and spring they saw that they had made a big mistake, for they had backed the water further up the road and made it worse than it was before. So they went to work and paid \$300 more to haul the gravel away again, thus paying \$600 for their experience and leaving the road as they found it. They had a series of levels run, prepared profiles and gave them grades, which they have since followed, with the result that they have not had to pay for undoing work after it was done. Does the engineer's usefulness cease at this point? Most emphatically no ; no more than an architect's when the plans are prepared ; he must supervise the work, and see to it that the contractor

or workmen employed by you by the day do what they should and do not do what they should not. He must furnish grade stakes at proper distances along the line of the road, giving the proper width and correct line of the road and the necessary amount of cut or fill ; that the fill is properly made, making due allowance for shrinkage of the earth ; that the sub-grade or roadbed is in fit condition to receive the coating of stone or gravel (this is one of the most important points, because it is just as necessary to have a good foundation for your road as it is to have a good foundation for your house); that the said stone or gravel is properly applied, *i. e.*, leveled, formed and rolled, so as to make a smooth, hard surface, and that the cross-section of the road has the proper form and convexity, *i. e.*, that it has such a cross-section as will throw off the rainwater from the center to the sides and no more. On a road too convex—high in the center—the tendency is for traffic to follow in the same track along the middle of the road (especially if the load be a large or heavy one), as that is the only portion of the road where the vehicles can run upright, the result being that hollow tracks or ruts are worn by the wheels and the horses' feet, which retain the water, thus softening the road and causing it to wear more unevenly than one of a flatter section on which the traffic is more evenly distributed over the whole width. But even more important is it that the cross-section should be kept uniform and the surface even, so that no catch-waters are formed to cause hollows in the road surface ; that the road-covering is composed of the proper materials, neither too brittle nor too soft, too large nor too small ; in short, all those minor details that go to make or unmake a good road

Thus far we have only considered what must be done to improve an old road. There is another equally important branch of the subject—*i. e.*, the laying out of a new road. Here the services of the engineer are even more necessary, because we must first decide on our line. Shall our road be perfectly straight between the two points, without regard to hills or hollows, or shall it wind around them so as to be nearly level? Of course, we all recognize the fact that the ideal road should be perfectly level and perfectly straight and perfectly drained by means of covered channels on each side. Except in a flat and level country, it will seldom be practicable to run a perfectly straight line for our road. In crossing a ridge we look for the lowest point in proximity to our line to avoid expensive cutting or steep or impractical grades ; in traversing a valley longitudinally we must so locate our line as to avoid crossing and re-crossing streams, which

would involve the expense of building bridges. Hence, a perfectly straight or perfectly level line will seldom be practicable.

To determine where our line shall run between the points of departure and destination the services of the engineer are absolutely necessary, because we want to obtain the shortest and most level line at the least expense. In other words we want to get the best possible for the least money. The engineer runs a series of levels over what appears to be the most practical route, at the same time taking levels for some distance on each side of the proposed line, so that in case the cuts or fills are too great he may swerve his line to the right or the left, as circumstances may require, thus enabling us to determine how we may obtain the required result with the greatest economy. The location of the line having been determined, the engineer must carefully locate it, starting from some point which must be accurately located and giving the courses and distances to the other extremity, which must likewise be accurately fixed. This line must be mapped and the map filed in the County Clerk's office, so that in case of any dispute arising in the future as to the boundaries of the road or any encroachments thereon, they may be easily and positively settled. Then, as to gradients; they should, if possible, never exceed five feet to the one hundred feet and should never be less than six inches to one hundred feet. The first limit should never be exceeded on a good road, for the better the road the less should be the gradient to obtain the best results from your team in hauling a load. The latter limit should never be exceeded unless you have paved gutters; otherwise, you will not be able to properly drain your road by surface-draining, and it will be liable to receive permanent injury from the backing up of the water and the saturating and softening of the foundation of the road. These gradients are a very important part of the work, and it requires constant attention on the part of the engineer to see that they are followed. In many cases the foreman or contractor will fail to cut deep enough or fill high enough, thinking that his eye is a better guide than the engineer's instrument, with the result that we will have hollows and holes ready to be filled with water at the first rain. In short, it is just as necessary for a grader to follow the measurements given him as it is for the carpenter or mason those given them.

The substance of the whole matter is right here: Shall we or shall we not profit by the experience of others? Shall we or shall we not have a well-defined plan? Shall we or shall we not sit down and count the cost and look at the work to be done and the obstacles to be overcome before we begin to work?

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Mr. D. C. Crane—I have been much pleased with this paper. It is in line with what I have advocated all along. A paper of this kind should be accessible to all road-makers, and it would be to the decided advantage of the New Jersey roads if this could be put in the hands of every road-maker in the State. A certain amount of money should be appropriated and invitations given for papers similar to this, and the best published and put in the hands of road overseers, and they required to know the principles of road-making before they could become eligible to the office of road overseer. One of the most serious drawbacks to good roads is the ignorance of road overseers in regard to the fundamental principles of road-making. We should establish some civil service rules in our road-making business, and this would insure us intelligent men. Your school teachers are required to be examined before they can become instructors and enter upon their profession. Why should not the road overseer come under the same regulation? The competent need not fear such examinations, and it is only the incompetent road overseer who has poor roads. I move a vote of thanks to Mr. Meeker for his paper.

So ordered.

Report of Road-Improvement Association for the year 1894.

BY E. G. HARRISON, SECRETARY.

Your Secretary was chosen by the Executive Committee of the Association in place of Franklin Dye, who was elected at the annual meeting, January, 1894, and resigned.

I have the honor to report that the Association has accomplished a large amount of practical work during the past year.

The Legislature Committee, consisting of the President, Vice-President and Secretary, had a bill passed increasing the amount of the State appropriation from \$75,000 to \$125,000, but unfortunately it failed to secure the approval of the Governor. Other bills were passed amending the State Aid Act, but were rendered nugatory by reason of conflicting subsequent legislation. The most important law passed affecting road-improvement was one which divorced the State Board of Agriculture from superintendence of roads under the State Aid Act. The office of State Commissioner of Public Roads was created. The Governor appointed Hon. Edward Burrough to the office. Mr. Burrough was not new at the official business, as he had been acting in that capacity as the President of the State Board of Agriculture for two years and a half, without pay or reward, except the fact that he was doing a good work for the people in road-improvement. You are respectfully referred to his report. It will show the progress of road-improvement in New Jersey.

Your Secretary, soon after his appointment, put himself in communication with the Road Inquiry of the Agriculture Department, at Washington, D. C. Gen. Roy Stone, the efficient head of the Road Inquiry Department, soon realized that New Jersey was in the advance in road-improvement as a State. Your Secretary, at request of Hon. J. Sterling Morton, Secretary of Agriculture, accompanied Gen. Stone to Albany to lay before the Legislature of New York the workings of the New Jersey State Aid Act. He invited the Committee having charge of legislation to visit New Jersey and see the

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roads built by the aid of the State. The invitation was accepted, and the Committee of the New York Legislature having the matter in charge, and representatives of several County Boards of Supervisors, visited New Jersey by the courtesy of the Pennsylvania Railroad. A special train of Pullman cars were placed in charge of your Secretary, and took the distinguished party from Jersey City to Merchantville. Here they were met by the State Commissioner of Public Roads, the President of the New Jersey State Road-Improvement Association, and the citizens of Burlington and Camden counties, and taken over one of the Camden county roads and several of the Burlington county roads. They dined at Moorestown, and at this point the train met them and conveyed them to Jersey City. The Committee were so well pleased with the roads, and the law under which they were built, that they presented a bill to the House similar to the New Jersey law, and it passed that body, but was too late for action in the Senate.

In November last a delegation from North Carolina, appointed by State and county authority, came here for the same purpose. They were met at Merchantville by the State Commissioner of Public Roads, your Secretary and others, and taken over several of the roads in Burlington county. They then went to Passaic and other counties in the northern part of the State, and also into Oneida county in New York State. On their return they made and published an interesting report. In speaking of the New Jersey roads they said they were the best they had seen.

The most important matter in which your Association took a part was the National Road Conference at Asbury Park, July 5th and 6th last. Your Secretary was instructed by the Executive Committee to open correspondence with leading men and associations interested in road improvement throughout the country in reference to a National Road Conference at Asbury Park during the time the National Editorial Association met there.

The following is a part of the correspondence which led up to the assembling of the Conference :

NEW JERSEY STATE ROAD IMPROVEMENT ASSOCIATION,
OFFICE OF THE SECRETARY,
ASBURY PARK, N. J., May 15th, 1894. }

The New Jersey State Road Improvement Association takes leave to suggest to the neighboring kindred organization that the meeting this summer at Asbury Park of the National Editorial Convention (many of whose members belong to Road Improvement Societies, and all of whom will be interested in the subject) furnishes an unequalled opportunity for a conference of the various bodies and leading individuals concerned in the road movement throughout the United States, and a general interchange of views and experiences.

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If the suggestion is favorably received, the New Jersey Association would recommend that the dates of July 5th and 6th be fixed upon and a general invitation issued.

The Association has already had proposals for an exhibition of road-making machinery and of practical road construction if a general road meeting be held.

Very respectfully,

E. G. HARRISON,
Secretary.

The undersigned cordially approve of the suggestion of the New Jersey Road Improvement Association, and join in the proposed invitation.

THE NATIONAL LEAGUE FOR GOOD ROADS,
THE NEW YORK STATE LEAGUE FOR GOOD ROADS,
THE MARYLAND ROAD LEAGUE.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF ROAD INQUIRY,
WASHINGTON, D. C., June 11, 1894. }

The appended extracts from a letter of the Secretary of the New Jersey State Road Improvement Association to a State Commissioner of Agriculture will be of interest to all who contemplate attending the National Road Conference at Asbury Park, N. J., July 5th and 6th, 1894, notice of which was given in Circular No. 9 of this office.

ROY STONE,
Special Agent and Engineer in Charge of Road Inquiry.

"The conference is for the purpose of promoting organization for road improvement where such organization does not already exist; for strengthening the hands of existing organizations, and for the gathering and diffusion of general information on the subject of road improvement.

"We, in New Jersey, have reaped the benefit of good organization, and its results in practical legislation. Several of our counties have now complete road systems, and road building by State aid is fairly inaugurated. Full details of our experience will be communicated to the Conference by those who have administered the State Aid Law, and those who have benefited by it.

"This is not to be a Convention of Delegates, but a conference of Road Associations, State, county, township and municipal authorities, corporations and individuals concerned in road improvement.

"We are in communication with Boards of Trade, Agricultural Societies, Wheelmen's Associations, Wagon and Carriage Builders, Manufacturers of Road Machinery, as well as Civil Engineers, Road Overseers and Supervisors of Roads, and many citizens interested in but not officially connected with road improvement.

"We meet to interchange views and to give and get all the information we can to promote the cause of road improvement. Manufacturers of Road Machinery will be present with their plants to crush rock and lay down roads, materials for which will be furnished by the municipality.

"We trust your Bureau of Agriculture and your State will be represented.

FIRST ANNUAL REPORT.

"The National Editorial Convention meets here July 2d to 5th, and delegates to the Road Conference, or those wishing to attend it can arrange to represent newspapers, and thus get reduced railroad fare.

"Hotel accommodations will also be furnished at greatly reduced rates."

E. G. HARRISON,
Secretary N. J. Road Improv. Asso.,
Asbury Park, N. J.

It will not be practical here to make a full report of the proceedings. The leading papers of the country had their reporters on hand. Full accounts have been published. The Conference was largely attended by delegates who were attending the National Editorial Association, hence, newspapers from all parts of the country had extended accounts of the Conference. The Agriculture Department at Washington had a stenographer, who prepared a report, which will be sent out by the Department to all parts of the country. There were forty-one (41) States represented. Delegates were sent from Road Improvement Associations, State and county Boards of Agriculture, State and city Boards of Trade, city Boards of Commerce, National Carriage Makers, Wheelmen's Associations, county, city, borough and township authorities. Governor Fuller, of Vermont, was President and E. G. Harrison, Secretary. Road machinery was exhibited. A sample of road construction and road repairs was given. The Conference was, on the whole, a grand success and was an honor to your association and to the State. Certainly the fame of New Jersey as the leading State in road improvement has been given great publicity.

Statements of Cost of Roads, &c.

Camden County.

MAGNOLIA, N. J., December 26th, 1893.

Hon. E. Burrough, President of the State Board of Agriculture :

The following is a list of the stone road improvement in Camden county :

CHURCH ROAD.

Preparation of the Roadbed,	\$1,049 53
24,482.4 Square Yards of Telford @ \$1.15,	28,154 76
Engineer's Salary,	876 13
Total Cost,	<u>\$30,080 42</u>
Peter Greenwalt, Supervisor.	

WHITE HORSE ROAD.

Preparation of Roadbed,	\$1,593 04
62,369 2-9 Square Yards, @ \$1.15 for Telford,	71,724 60
Engineer's Salary,	2,199 53
Total Cost,	<u>\$75,517 17</u>
Jackson Briggs, Supervisor.	

GLOUCESTER ROAD.

Preparation of Roadbed,	\$1,305 84
12,915 7-9 Square Yards Telford, @ \$1.15,	14,853 14
Engineer's Salary,	484 77
Total Cost,	<u>\$16,643 75</u>
Thomas A. Wilson, Supervisor.	

RECAPITULATION.

Cost of Church road,	\$30,080 42
Cost of White Horse road,	75,517 17
Cost of Gloucester road,	16,643 75
	<u>\$122,241 34</u>
33½ per cent,	<u>\$40,747 11</u>

Very truly yours,

J. J. ALBERTSON,

Camden County Engineer.

FIRST ANNUAL REPORT

Burlington County.

PEMBERTON, Dec. 21st, 1893.

To Ed. Burrough, Esq., President State Board of Agriculture :

DEAR SIR—I send you the cost of the stone roads built by Burlington county, as I have received :

Bridgeboro Road Contract,	\$10,504 50
Stanwick Road Contract,	3,000 00
Engineer's Salary,	262 61
	<hr/>
Total Cost,	\$13,767 11
John S. Rogers, Supervisor.	

RIVERTON AND WESTFIELD ROADS.

From Steamboat Wharf to Railroad,	\$4,311 11 1-6
From Railroad to Westfield,	7,821 86 6-9
Engineer's Salary,	305 12
At the Intersection Burlington Pike,	72 00
	<hr/>
	\$12,510 00 7-9

Enoch Evans, Supervisor.

CITY OF BEVERLY TO COOPERTOWN.

As from Report of Supervisor,	\$9,527 23
C. K. Vansciver, Supervisor.	

COOPERTOWN TO CHARLESTOWN.

As from Report of Supervisor,	\$6,203 90
E. R. Vansciver, Supervisor.	

MT. LAUREL ROAD.

As from Report of Supervisor,	\$17,267 84
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BEVERLY AND DELANCO ROAD.

Completed in 1893,	\$6,979 40
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COLESTOWN AND EVESBORO.

Completed in 1893,	\$5,391 95
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The above Costs for the said Roads Named,	\$45,570 22
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JOHN H. ANTRIM,
Clerk of Board.

COMMISSIONER OF PUBLIC ROADS.

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Office of
CHARLES STOKES,
Surveyor and Civil Engineer,
Beverly, N. J.

BEVERLY, N. J., December 17th, 1894.

To Edward Burrough, State Commissioner of Public Roads:

The total cost of the stone road leading from the county bridge across the Rancocas river at Riverside, through Riverside to Bridgeboro, through Bridgeboro to Milltown and connects with a stone road previously built leading to Moorestown, a distance of 21,569 lineal feet:

Cost of telford construction, 24,854 square yards, @ 93 cents, . . .	\$23,114 22
" macadam construction, 1,925 square yards, @ \$1.10, . . .	2,117 50
" 340 square yards of telford, over a springy hill 360 feet high (extra, 30 cents),	102 00
" 188 square yards of telford gussets, @ 93 cents,	174 84
" 150 feet of stone drains, 12 to 18-inch, @ 67 cents square foot,	150 00
" 923 square yards of clay binder, @ 95 cents,	876 85
	<hr/>
	\$26,535 41

The whole of the said road lies in the township of Delran, in the county of Burlington and State of New Jersey.

CHAS. STOKES, Engineer,
Supervisor.

Office of
CHARLES STOKES,
Surveyor and Civil Engineer,
Beverly, N. J.

BEVERLY, N. J., October 1st, 1894.

To Edward Burrough, President of the State Board of Agriculture:

The total cost of the county stone road leading from the city of Beverly to Delanco, in the township of Beverly, in the county of Burlington, completed in June, 1894, was as follows, viz.:

Cost of stone construction, 13,864 square yards, @ 96 cents, . . .	\$13,309 44
" clay binder, 210 square yards, @ 85 cents,	178 50
" Tomkin Cove binder, 500 square feet,	60 40
" gusset at angle in road, 25 square yards, @ 96 cents, . . .	24 00
	<hr/>
	\$13,572 34

All of which is hereby certified.

CHAS. STOKES,
Engineer.
WILLIAM T. BAGGS,
Supervisor.

FIRST ANNUAL REPORT

LUMBERTON, N. J., October 24th, 1894.

To Hon. Edward Borrough, State Commissioner of Roads :

I hereby certify that Messrs. B. M. & J. F. Shanley, contractors for the construction of a telford roadway on the road leading from King street, Mount Holly, to the side of the Centreton turnpike, at Masonville, known as the "Mount Holly and Masonville Road," have fully completed the same in accordance with the specifications and contract, and are entitled to the full amount of the contract price, viz.:

Length, 22,127 feet, 10 feet wide, 24,585 $\frac{3}{4}$ sq. yards, @ 84 cents, . . .	\$20,651 87
Clay for shouldering and binding, 72 $\frac{1}{2}$ sq. yards, @ 69 cents, . . .	49 91
Excavation for four drains, 17 $\frac{1}{2}$ sq. yards, @ 25 cents,	4 33
Material for four drains, 32 $\frac{3}{4}$ yards, 12 in. deep, @ 6 cents per inch, or 72 cents per foot,	23 44
Extra shouldering and fills, 252 sq. yards, @ 25 cents,	63 00
Total,	\$20,792 55

WILLIAM P. YOUNKER, *Supervisor.*

Mercer County.

To the Hon. Edward Burrough, State Commissioner of Public Roads :

We herewith present a statement of the cost of construction of the several county roads in the county of Mercer, New Jersey, improved under the provisions of the State Aid law, and completed during the year A. D. 1894, as follows, to wit:

SCOTCH ROAD AND ADDITIONS.

42,112.47 sq. yards, macadam and telford, @ 89 cents,	\$37,480 09
1,641.11 sq. yards, extra 2-in. of stone, @ 4 cents per in., 8 cents,	131 28
Grading road, excavating, shouldering, &c.,	2,327 76
Extra filling and extra stone under P. R. R. R. bridge,	78 50
Surveying and engineering expenses,	1,632 87
	<hr/>
	\$41,650 50

C. C. Ivins, Supervisor.

INGHAM STREET AND ADDITIONS.

5,364.32 sq. yards, 12-in. telford, @ \$1.03,	\$5,525 24
4,059 cu. yards fill, @ 10 cents, and extra haul, @ 60 cents, 70 cts.,	2,841 30
545 cu. yards shouldering, @ 60 cents,	327 00
1,824.52 sq. yards excavating and filling, @ 20 cents,	364 90
Surveying and engineering expenses,	374 62
	<hr/>
	\$9,433 06

C. C. Ivins, Supervisor.

COMMISSIONER OF PUBLIC ROADS.

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EWINGVILLE ROAD.

27,178.44 sq. yards macadam, @ 94 cents,	\$25,547 73
62.66 sq. yards macadam at Walsh's, 94 cents,	58 90
Extra grading work on account of widening road at Judge Reed's,	52 50
Grading road, excavating, shouldering, hauling, &c.,	469 50
Surveying and engineering expenses,	1,043 80
	<hr/>
John Roche, Supervisor.	\$27,172 43

LAWRENCEVILLE ROAD.

30,982.46 sq. yards 10-in. macadam, @ 92 cents,	\$28,503 36
184.33 sq. yards, extra, 4-in. stone, @18 cents per inch, 40 cents,	737 33
Grading road, excavating, shouldering, hauling and placing, . .	835 77
Surveying and engineering expenses,	1,198 65
	<hr/>
Stephen Eldridge, Supervisor.	\$31,275 61

JOSEPH L. WATSON, *Engineer.*

Middlesex County.

To Edward Burrough, President of the Board of Agriculture of the State of New Jersey:

The Board of Chosen Freeholders of the county of Middlesex hereby certify that said board did by resolution declare the following-described public roads to be county roads and its intention to improve said adopted roads, under the provisions of an act entitled "An act to provide for the more permanent improvement of public roads of this state," approved April 14th, A.D. 1892, and the supplement thereto; and that said board did advertise and award contracts for the construction of said roads according to the provisions of said act and the supplement thereto, as follows:

COUNTY ROAD NO. I.

Beginning at Old Bridge and extending in an easterly direction toward Matawan, a distance of four (4) miles, in the township of Madison.

Specifications were approved by Edward Burrough, President State Board of Agriculture, September 13th, 1892.

Contract awarded September 27th, 1892, to John F. Shanley, Newark, N. J.

Length of road macadamized, 21,120 feet.

Price per lineal foot, \$1.19.

Amount of contract, \$25,132.80.

Road Supervisor, Hon. H. H. Brown.

County Engineer, Asher Atkinson.

FIRST ANNUAL REPORT

COUNTY ROAD NO. 2.

Beginning at the Union county line near Plainfield and extending in a southerly direction to Holly's Corner, a distance of one and seven-tenths miles.

Specifications approved by Edward Burrough, President State Board of Agriculture, August 27th, 1892.

Contract awarded October 5th, 1892, to Jasper H. Wilson & Co., North Plainfield, N. J.

Length of road macadamized, 8,976 feet.

Price of lineal foot, \$1.

Amount of contract, \$8,976.

Road Supervisor, Nathan Robins.

County Engineer, Asher Atkinson.

COUNTY ROAD NO. 3.

Beginning at the city of New Brunswick at the easterly terminus of the Albany street bridge, on the road known as the Middlesex and Essex turnpike, and continuing on said road to where it intersects with Essex street, in the village of Metuchen, and on said Essex street to where it intersects with Lake street, and on said Lake street, in a northerly direction, to the Lehigh Valley railroad bridge, a distance of five (5) miles, in the township of Raritan.

Specifications were approved by Edward Burrough, President State Board of Agriculture, September 9th, 1892.

Contract awarded October 11th, 1892, to John F. Shanley, Newark, N. J.

Length of road macadamized, 25,575 feet.

Price per lineal foot, \$1.09.

Amount of contract, \$27,876.75.

Road Supervisor, Hon. Manning Freeman.

County Engineer, Asher Atkinson.

The road supervisors of the respective roads above mentioned have reported the said board (a copy of which report is hereto annexed) the completion of said roads according to the specifications and contracts.

SUMMARY.

Road Number 1, Contract,	\$25,132 80
Road Number 2, Contract,	8,976 00
Road Number 3, Contract,	27,876 75
Total,	<hr/> \$61,987 55

The one-third Amount Due from the State to Middlesex County, \$20,661 85

In witness whereof the Director and Clerk of said Board have hereunto set their respective hands this 24th day of December, A.D. 1892, pursuant to resolution.

MICHAEL WELCH, *Director*,
LUTHER H. TAPPEN, *Clerk*,
ASHER ATKINSON, *County Engineer*.

Signed in the presence of
H. BREWSTER WILLIS.

COMMISSIONER OF PUBLIC ROADS.

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Statement of supervisor of construction of macadam road leading from Metuchen to Holly's Corner by way of Pumpton, in Middlesex county, New Jersey, as to cost of said road.

As required by the said act, I herewith submit a detailed and itemized statement of the cost of said improvement, said road having been fully completed, to wit, 3.19 miles.

16,836 feet of macadam, @ \$1.19 per foot, as per contract,	\$20,034 84
Asher Atkinson, Surveyor, making surveys, maps, &c., services of self and assistants,	92 50
Total cost of constructing said road,	\$20,127 34
State's share,	\$6,709 34

The said road has been completed and accepted by the Board of Freeholders of said county.

Dated New Brunswick, N. J., December 14th, 1893.

NATHAN ROBINS, *Supervisor.*

Middlesex County.

Statement of Supervisor of Construction of macadam road :

I, H. H. Brown, of Browntown, Middlesex county, New Jersey, do hereby certify that I was appointed by the Governor of this State Supervisor of the construction of the macadam road, beginning at a point on the Old Bridge and Matawan turnpike, distant about four miles from Old Bridge, and extending easterly on said turnpike a distance of 12,490 feet, to deep gully, which said road was constructed by the Board of Chosen Freeholders of the county of Middlesex, under and pursuant to the provisions of an act to provide for the more permanent improvement of the public roads of this State, approved April 14th, 1891, and the supplements thereto and the amendments thereof.

As required by the said act, I herewith submit a detailed and itemized statement of the cost of said improvement, said road having been fully completed, to wit :

12,490 feet of macadam road, at \$1.65 per foot as per contract,	\$20,608 50
Fredonian Publishing Company, advertising for bids,	30 60
Times Publishing Company, advertising for bids,	31 20
Asher Atkinson, County engineer, making surveys and services of self and assistant,	79 00
James Fountain, grading road for macadamizing,	800 00
Total cost of road,	\$21,549 30
State's share,	\$7,183 10