

Annual Report of the Chief Engineer State Highway Department

1933



Dover, Delaware
January 1, 1934

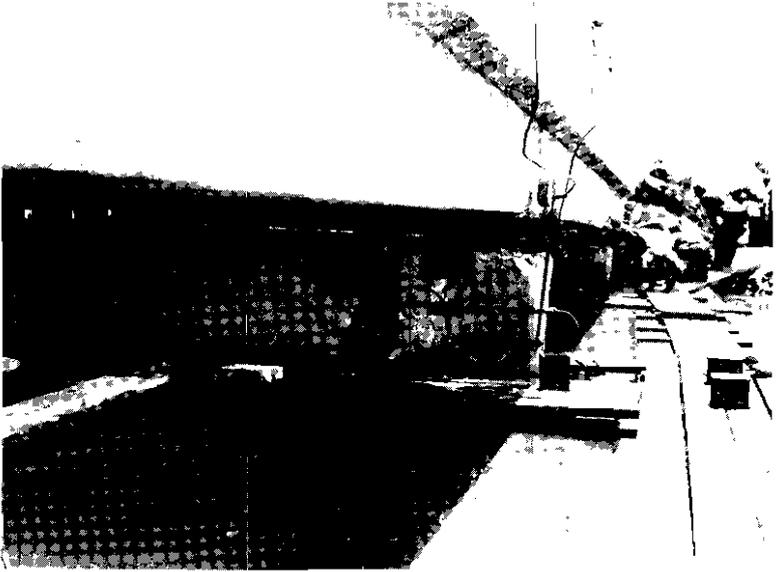
To the Chairman
and Members of the
State Highway Department,
Dover, Delaware.

Sirs:

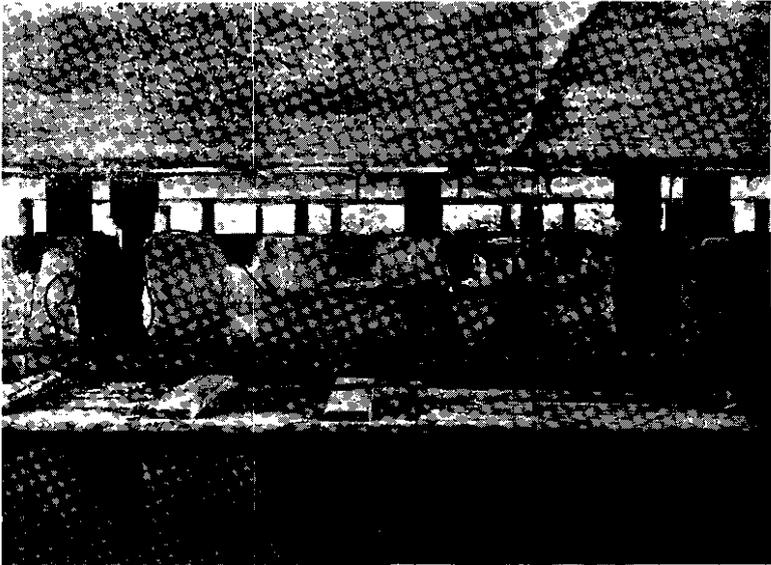
Pursuant to the statute, I herein submit a report of the activities of the State Highway Department for the calendar year 1933. Included therein is a list of roads for which petitions have been received asking that they be taken over by the Department as State Highways. There are also several recommendations as to the future work of the Department.

A greater number of contracts have been awarded than ever before in the history of the Department. The mileage of all types of highways under contract, including widening projects, has been almost double that of any previous year. This has been made possible by the construction during the year of 115.1 miles of low cost secondary roads and not to increased funds available.

The larger number of contracts and the continuation of unsettled employment and economic conditions have introduced new problems and adjustments, which have added much to the work of all divisions of the Department, while the uncertainty of the amounts of both State and Federal Funds available during the first half of the year added to the pressure of work in the six months just closing.



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View under settled spans during raising by means of hydraulic jacks. First lift.



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View under settled spans during raising by means of hydraulic jacks. Second lift.

A brief resume will be given of the work of each Division of the Department:

DIVISION OF SURVEYS AND PLANS Surveys have been made in the field and detail plans and estimates prepared by the office forces for all contracts before advertising for bids. Final surveys and computations have also been made by the Division of all completed contracts.

The handling of the many details required on all Federal projects is a part of the work of this Division.

A tabulation of the activities follows:

Surveys

Base Line	244.6 Miles
Topography	216.3 "
Cross Sections, preliminary and final	101.1 "
Borrow Pits cross sectioned, preliminary and final ..	144 "

Numerous Property Surveys for right of way and maintenance were also completed, but are not shown in the above tabulation.

Draughting Room

Plan and Profile traced	214.7 Miles
Line and Topography	236.1 "
Cross Sections plotted (original and final)	100.5 "
End Areas planimetered and computed (original and final)	98.4 "
Profile plotted and grade laid	216.2 "
Index maps plotted and traced	226.3 "
Borrow Pits plotted and computed	128 "

During 1933 the Department held nineteen road lettings comprising sixty-seven contracts. Three hundred and eighty-six bids were received and each bid was checked and tabulated according to their respective standing. The total of the low bids received amounted to \$2,130,444.05.

A tabulation of the contracts for which bids were received during 1933 is attached.

TABULATION OF CONTRACTS ADVERTISED IN 1933

Cont. No.	Location	Estimated Cost	Date of Award	Contractor	Length in Miles	Type of Roadway
278	Brenford-Seven Hickories	\$69,036.00	1-30-33	George & Lynch, Dover, Del.	3.06	9' Concrete
282	Timber Bridges (Indian River)	11,875.00	1-30-33	W. L. Sowell, Wilmington, Del.	515 Ft.	
283	Rehoboth-Indian River Inlet	67,940.00	1-30-33	Highway Engineer. & Const., Selbyville, Del.	6.2	18' Gravel
231	Lincoln City-Waples Pond	40,352.00	2-23-33	Old Line Const. Co., Chestertown, Md.	7.62	16' Slag
261	Glasgow-Bear (Dual Grading)	81,949.50	3- 4-33	A. Petrillo Co., Wilmington, Del.	4.71	Grading
289	Rice's Corner-Canterbury	58,852.00	2-23-33	W. W. Truitt, Lincoln City, Del.	3.24	9' Concrete
277	Georgetown-Milton	23,927.50	3- 1-33	M. J. McDermott, Georgetown, Del.	7.83	16' Slag
290	Viola-Petersburg	18,008.00	3- 1-33	W. W. Truitt, Lincoln City, Del.	4.7	16' Slag
291	Delmar-Laurel (Widening)	52,523.50	3-29-33	Waller & Phillips, Salisbury, Md.	7.53	4' Conc. Widening
276	Whitesville-Pepper	14,290.00	3-29-33	E. Finley Mixer, Dover, Del.	4.75	16' Slag
293	Staytonville-Farmington	13,515.00	3-15-33	George & Lynch, Dover, Del.	4,155	16' Slag
295	Richardson Park-Elsmere (Sidewalk)	4,611.10	3-29-33	A. Ventresca & Sons, Wilmington, Del.	2,400 Ft.	Sidewalk
297	Thompsonville-Sour Apple Tree	16,740.00	3-29-33	Wilson Cont. Co., Wilmington, Del.	1.8	16' Slag
298	Cranston Heights-Cedars (Sidewalk)	6,320.40	3-29-33	J. A. Bader & Co., Wilmington, Del.	1800 Ft.	Sidewalk
239-A	duPont School-Kennett Pike (Sidewalk)	1,420.50	3-29-33	F. C. Sparks Co., Wilmington, Del.	600 Ft.	Sidewalk
299	State Road-Hares Corner (Paving)	85,907.50	4-12-33	Giacomo Gentile, Bridgeton, N. J.	1,780	31' Conc. Dual
300	Hares Cor.-Farnhurst (Paving)	78,683.00	4-12-33	Vincent Schiavi, Townsend, Del.	1.84	31' Conc. Dual
182-E	Appoquinimink & Drawyers App'ches.	16,202.50	4-28-33	Wilson Cont. Co., Wilmington, Del.	2000 Ft.	22' Concrete
2(N-4)	Jetty, Indian River Inlet	7,490.00	4-28-33	George E. Shockley, Rehoboth, Del.		
260	Bridges, Love Creek & Burton's Pond.	5,520.00	6-12-33	S. D. Collins, Port Penn, Del.		
292	Todd's Chapel-Prospect Church	21,207.00	7-21-33	George & Lynch, Dover, Del.	5.7	16' Slag
302	Coverdale X Rd.-Smith School	9,751.75	7-21-33	Old Line Construction Co., Chestertown, Md.	3.7	16' Slag
303	Pearson Corner-Pratt School	6,522.50	8- 4-33	E. Finley Mixer, Dover, Del.	2.3	16' Slag
304	Hollandsville-Maryland Line	14,266.50	7-21-33	George & Lynch, Dover, Del.	4.03	16' Slag
309	Zoar Camp-Angola	20,450.00	7-21-33	Highway Engr. & Const. Co., Selbyville, Del.	6.9	16' Slag
316	Porters-Salem Church	25,060.50	7-21-33	A. Petrillo & Co., Wilmington, Del.	4,227	16' Slag
215-A	Barker's Landing Fill	3,680.00	7-28-33	D. E. O'Connell & Sons, Wilmington, Del.	0.49	Grading
317	Hazlettville-Dover	4,713.00	8-15-33	Short & Walls, Middletown, Del.	5.5	Oiling
318	Bethany Beach-Indian River	5,666.50	8-15-33	Short & Walls, Middletown, Del.	4.65	Oiling
237-A	Augustine Bridge-Concord Pike	47,969.50	9-15-33	D. E. O'Connell & Sons, Wilmington, Del.	.976	22' Concrete
328	Milford-Frederica (Widening)	47,135.75	9-15-33	W. W. Truitt, Lincoln City, Del.	7,387	4' Conc. Widening
329	Frederica-Dover (Widening)	71-775.50	9-15-33	George & Lynch, Dover, Del.	10.09	4' Conc. Widening
281	Smyrna Bridges Ext.	26,220.00	9-18-33	Spear-Jones & Co., Middletown, Del.		
335	Lewes School Drive	2,053.00	9-21-33	Albert P. Croll, Georgetown, Del.		Concrete
301	Bacons-Ralphs-Salem School	13,203.50	8-28-33	Old Line Const. Co., Chestertown, Md.	5.0	16' Slag
307	Downes' Chapel-Hazel School	12,954.00	8-28-33	Wilson Cont. Co., Wilmington, Del.	4.4	16' Slag
315	Selbyville toward Gumboro	11,444.50	8-28-33	M. J. McDermott, Georgetown, Del.	3.1	16' Slag
319	Denny's Cor.-Barber's Cor.	18,026.50	8-28-33	George & Lynch, Dover, Del.	5.9	16' Slag
320	Lincoln City-Milford	12,959.00	8-28-33	Old Line Const. Co., Chestertown, Md.	2.8	16' Slag

321	Greenspring-Vandyke	36,371.00	8-28-33	George & Lynch, Dover, Del.	11.5	16' Slag
322	Lord Baltimore School Sidewalk	7,016.00	8-28-33	Wm. P. Short, Bethany Beach, Del.	4900 Ft.	Sidewalk
224-A	Washington Blvd. Philadelphia Pike	47,572.00	9-2-33	Vincent Schiavi, Townsend, Del.	1.183	20' Conc.
315	Laurel Bridgeville (Widening)	81,320.00	9-2-33	Walter Roach & Sons, Georgetown, Del.	12.107	4' Conc. Widening
314	Bridgeville-Farmington (Widening)	72,009.00	9-3-33	Giacomo Gentile, Bridgeton, N. J.	9.265	4' Conc. Widening
331	Edgewood Sanatorium Driveways	1,077.75	9-7-33	Julian T. Jones, Wilmington, Del.	550 Sq. Yds.	Amiesite
332	Fetris Industrial School Driveways	7,350.00	9-7-33	W. H. Hollingsworth, Wilmington, Del.	5,000 Sq. Yds.	Amiesite
333	Farnhurst Sanatorium Driveways	17,291.00	9-7-33	A. Petrillo & Co., Wilmington, Del.	14,000 Sq. Yds.	Amiesite
334	Delaware College Drive	5,803.75	9-7-33	R. H. Johnson Co., Wilmington, Del.	2,950 Sq. Yds.	Amiesite
336	Delaware Welfare Home Driveways	8,968.00	9-7-33	D. E. O'Connell & Sons, Wilmington, Del.	4,500 Sq. Yds.	Amiesite
337	Lake Como Causeway Widening	2,880.00	9-7-33	W. W. Truitt, Lincoln City, Del.		Grading
217-A	Bear-State Road Paving	115,987.50	10-2-33	Vincent Schiavi, Townsend, Del.	2,670	20' Conc. Dual Road
227-B	E. Loockerman St. Ext., Dover	34,145.00	10-2-33	George & Lynch, Dover, Del.	1050 Ft.	Amiesite on Conc.
227-A	E. Lnockerman St. Bridge, Dover	27,085.00	10-23-33	Snyder Engineering Co., Middlesex, N. J.		
275	Milton-Broadkill	61,900.50	10-23-33	Old Line Const. Co., Chestertown, Md.	2.7	18' Concrete
134-A	Timber Bridge, Webb's Landing	1,468.00	11-13-33	W. W. Truitt, Lincoln City, Del.		
E-1	Indian River Inlet Dredging	14,925.00	11-13-33	W. V. Steen, Dagsboro, Del.		
341	James Branch & Meadowbrook Bridges	10,060.00	11-16-33	M. J. McDermott, Georgetown, Del.		
342	Lanrel Bridgeville (3 bridges)	11,555.00	11-16-33	M. J. McDermott, Georgetown, Del.		
343	Kenton Sidewalks	1,540.00	11-16-33	A. Ventresca & Sons, Wilmington, Del.	1240 Ft.	Sidewalk
344	Harbeson Sidewalk	2,905.00	11-16-33	A. Ventresca & Sons, Wilmington, Del.	2900 Ft.	Sidewalk
287	Bishop Corner-Smyrna	290,235.00	12-22-33	D. E. O'Connell & Sons, Wilmington, Del.	4.78	20' Conc. Dual Road
345	Thru Frederica	44,508.30	12-22-33	W. W. Truitt, Lincoln City, Del.	1.03	22' Concrete
346	Delaware City Bridge Approaches	10,765.75	12-22-33	Wilson Cont. Co., Wilmington, Del.	800 Ft.	20' Concrete
266	Little Heaven-Barker's Landiug	43,905.00		George & Lynch, Dover, Del.	2.717	Grading
339	Maryland Line-Glasgow	49,636.00		Fox Reynolds Co., New York, N. Y.	2.574	Grading
349	Barker's Landing Fill	4,700.00		A. Citro, Wilmington, Del.		
168-A	Barker's Landing Bridge	72,242.00	9-8-33	Snyder Engr. Co., Middlesex, N. J.		
		\$2,130,444.05				

DIVISION OF TESTS Since modern road construction started in Delaware in 1912 the sources of all available materials, with the possible exception of sand for use as fine aggregate in cement concrete, have been very definitely established and their quality and variations in quality generally known and are a matter of test record. The duties of the Testing Department, therefore, have been to maintain a sufficient number of routine tests to supervise the quality of materials being produced from these sources, so that not only the specifications were met but that the best possible available materials were used. In addition to this work, efforts have been made to increase the general quality of all concrete produced by more efficient combinations of the constituent materials and by putting into use certain developments in methods of construction after they have been thoroughly investigated either in the laboratory or on actual construction work under the supervision of the laboratory.

In the past two years the development and changes which appear to have given the most beneficial results are:

(A) The method of re-combination of coarse aggregate in two sizes has been thoroughly investigated both in the laboratory and in actual construction work and has been adopted as standard practice. It consists of requiring the coarse aggregate to be furnished in two different sizes which are produced, shipped and proportioned separately. These sizes are from $\frac{1}{4}$ -inch to $1\frac{1}{4}$ -inch and from $1\frac{1}{4}$ -inch to $2\frac{1}{4}$ -inch. In this manner segregation in handling, which was always present in a greater or less degree when the material was shipped in one size, has been almost entirely eliminated. The direct result of this change is that all roadway concrete is more uniform and areas containing segregated sizes with a resulting decrease in ultimate strength are not present.

(B) The method of proportioning materials for concrete by weight has been standard practice for two years. By this method a unit weight is determined in the laboratory for both the fine and coarse aggregate and the mix is designed taking into consideration the moisture content and the specific gravity of the materials. The inaccuracy and lack of uniformity of the old method of volume proportioning is thereby prevented.



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View showing settlement of three spans at South end. West side.



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View showing bridge restored to its original position. West side.

(C) There has been a constant effort in the past few years, with the co-operation of the producers, to secure a more efficient and uniform grading of coarse aggregate. This effort has shown a decided effect and very little difficulty is now experienced with the material as furnished. The maximum size of coarse aggregate has been reduced to $2\frac{1}{4}$ inches and stress has been laid on uniformity. This has had its effect in the increased workability of the concrete produced and not only has a beneficial effect on the ultimate strength but on the riding qualities of the road as well.

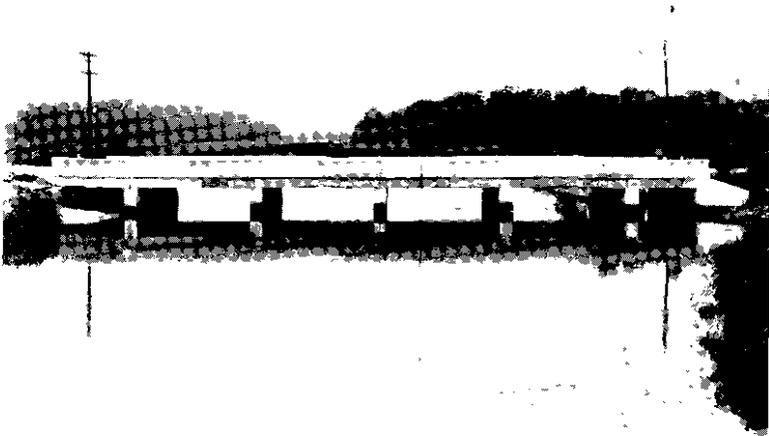
(D) There are a number of sand deposits located within the State which are available for concrete construction. Relatively few of these deposits, however, conform with the requirements of the specifications covering grading and uniformity. In the past, the acceptable deposits have been used wherever possible and have required incessant testing to secure the best available material and the results have not always been all that could be desired. Therefore, for 1933 and future construction it has been required that all local sandpits install a suitable type of washing plant. By the process of washing, the grading of sands is made more uniform, all objectionable material removed, and the quality of concrete in which local materials have been used is greatly improved.

A total of 4091 individual samples were tested during 1933. These samples included Portland cement, sand, crushed stone, water for use in concrete, drilled roadway cores, crushed slag, reinforcing steel, gravel, reinforced concrete pipe, building brick, concrete cylinders, guard rail and anchor posts, top soil, water proofing cement and asphalt. Samples representative of 158,116 barrels of Portland cement were tested. This amount of Portland cement is in excess of that which was used the previous year.

A study of the relative strengths of cores drilled from regular concrete roadway composed of 1:2:4 concrete and those drilled from concrete widening projects built from 1:2:3 $\frac{1}{2}$ concrete indicate that there is no gain in strength on account of the richer mix. A total of 187 cores drilled from seven widening projects of 1:2:3 $\frac{1}{2}$ concrete completed during 1933 shows an average strength of 5128 pounds per square inch. A total of 276 cores drilled from twelve regular roadway projects of 1:2:4 proportions shows an average of 5163 pounds per square inch. A study of the work-



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View showing settlement of three spans at South end. East side.



Bridge over Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. View showing bridge restored to its original position. East side.

ability of the concrete used on all of these contracts shows that the richer mix has very little, if any, advantage in workability and finish. Future concrete widening projects will therefore be constructed of the regular 1:2:4 concrete.

During 1933, a greater amount of laboratory work was done on asphaltic materials, sand and clay mixtures and various other materials which will be used in the construction of secondary roads in the future. It is realized that an increasing amount of secondary road construction will be done in the next few years. Certain equipment has been added to the laboratory and experimental work done, so that it will be adapted for testing materials entering into this type of construction.

BRIDGE DIVISION The Bridge Division has been actively engaged in the preparation of detail plans and specifications for sixty-three bridges and 461 culverts of various sizes which were placed under contract during the year, at a total cost of approximately \$245,000.

The most important structures under construction were the Lookerman Street Bridge over St. Jones River in Dover and the St. Jones River Bridge at Barker's Landing.

In the design of the Lookerman Street Bridge Mr. E. William Martin, A. I. A., was consulting architect. The resulting design is one which I believe will commend itself to all, and will distinguish it as one of the beautiful small bridges of America. It is a 52-foot concrete arch finished with colonial brick and white marble, the motif being suggested by that of the nearby new State Legislative Building.

The completion of this bridge, the extension of Lookerman Street to the Eastern Boulevard and the improvements contemplated by the Town of Dover along St. Jones River will transform this formerly ugly locality into one of undeniable attraction.

The St. Jones Bridge at Barker's Landing near Magnolia is a rolling lift bascule bridge with overhead counterweight similar to those constructed in previous years at Laurel, Broadkila and Milford. Construction is well under way on both these bridges and they should be completed by early summer.



Creosoted timber bridge over Indian River Inlet on Ocean Highway, Rehoboth to Bethany Beach, Sussex County.

One of the most interesting accomplishments of the year was the repairing of the bridge on the southbound road at Drawyers Creek. Two piers and the South abutment of this bridge had settled a maximum of 30 inches.

Accurate levels over a period of years indicated that the limit of settlement had been practically reached and various plans and studies were made for restoring it to its original position. For most of these the estimates of cost ranged from \$20,000 to \$30,000.

The plan finally adopted provided for raising the entire superstructure of the settled spans by means of hydraulic jacks, and filling the space between the piers and slabs with concrete. After three weeks of preparation the actual work of raising the spans to their proper elevations was done on May 18. The contractors on this work were Spencer, White and Prentiss, of New York. The total cost was \$4,993.00.

Not only is the bridge greatly improved in appearance and stability, but there is also a corresponding improvement in the riding qualities of the road surface.

An increased number of creosoted timber bridges have been built during the year on the secondary or low type highways, the largest being the bridge over the Indian River Inlet on the Ocean Highway. This bridge is 512 feet in length, of the usual pile bent construction, with a removable center span, to allow for the occasional passage of a dredge through the Inlet. The larger part of the timber was produced locally and creosoted at the wood preserving plant at Newport.

Surveys of Rehoboth and Bethany Beaches and Indian River Inlet were made and plotted for the Delaware Waterfront Commission.

RIGHT OF WAY In the year ending November 30th, 1933,
DIVISION the Right of Way Division had 31% more
work than the busiest year in the history of the Department,
namely 1925.

During the current year this division has secured right of way on 25 road projects having a total mileage of 112.75 miles,

and 745 property owners, one dual road project having a mileage of 4.71 miles and 27 property owners, and two sidewalk projects having a mileage of 1.25 miles and 63 owners. Other work of this Division consisted of the writing of 924 descriptions, obtaining 758 options, securing the execution of 734 deeds and 419 releases, and conducting the hearings of 39 condemnation commissions and 6 condemnation juries.

Construction work has necessitated the moving of 25 houses, 9 barns, 5 stables, 4 stores, 4 filling stations, 6 garages, 1 granary and a number of smaller buildings.

An itemized account of the moneys expended is as follows:

Salaries and expenses	\$6,424.98
Legal	18,375.05
Right of way	61,852.78
Fencing	20,265.98
Crops and trees	490.76
House moving	33,969.57
Condemnation awards	46,045.30
Miscellaneous	1,270.89
	<hr/>
Total	\$188,695.31

DIVISION OF CONTRACTS & ESTIMATES During the year approximately 1000 proposals have been prepared, checked and sent to bidders. All items upon 240 construction estimates upon 67 different contracts have been computed, checked and prepared for payment.

All items upon 22 Federal Aid vouchers have been computed and vouchers prepared for payment; also 28 Public Utility Franchises have been prepared and issued.

Weekly payrolls upon 17 Emergency Contracts and monthly payrolls upon 20 National Recovery Act Contracts have been checked and forwarded to Washington.

This Division also has the additional duties of:

Tabulating and filing Construction Data.

Preparation of Special Specifications and assisting in the preparation of General Specifications, a new edition of which was issued in November.



Washout of State Highway near Blades, Sussex County, U. S. Route 13. Storm of August 23, 1933.

MAIN- TENANCE The State Highway System is now comprised of 1136.2 miles of highways or approximately 30% of the entire road mileage of the State and the maintenance of this system in good condition becomes each year of increasing importance.

The surfaces of all types of roads become rougher with age and this with the increased smoothness secured by improved methods of construction makes our older pavements seem doubly rough by comparison.

Especial attention is being given in all maintenance work to the improvement of the riding qualities of all roads, especially at joints, bridges and culverts, in order to give added comfort and safety to the motoring public.

During the year the Department purchased a Mud Jack which has been found to successfully restore settled portions of the road slab to its proper position and to greatly improve the riding qualities of the highway.

Loam and water mixed to the consistency of mud to which a small amount of Portland cement is added is pumped by the Mud Jack through holes drilled in the pavement. The surface is gradually raised to the desired height by hydraulic pressure.

As rapidly as possible all such settlements will be corrected by this method throughout the entire system.

On August 22-23-24, 1933, the State was visited by a storm of almost unprecedented violence accompanied by record breaking tides and a rainfall of 11½ inches. Highways were flooded, hundreds of trees were blown across the highways and serious damage done in all parts of the State. Traffic was suspended and several towns were marooned for nearly 48 hours. The rainfall was especially heavy with correspondingly serious damage in the southwestern portion of Sussex County.

With characteristic energy our Resident Engineers with their assistants and maintenance crews worked night and day clearing the roads of fallen trees and protecting banks and structures but in spite of all efforts five bridges in Sussex County were washed



Town of Laurel. State Highway leading to Lowes Cross Roads, Sussex County. Storm of August 23, 1933.

away and the highways flooded and undermined in many places. It was only by extraordinary efforts that others were saved.

Four of the bridges thus destroyed were on U. S. 13, the main highway between Bridgeville and Seaford. Emergency crews speedily built temporary timber spans which have carried all traffic up to the present.

Contracts have been awarded for the replacing of the five damaged structures and the work is now well advanced.

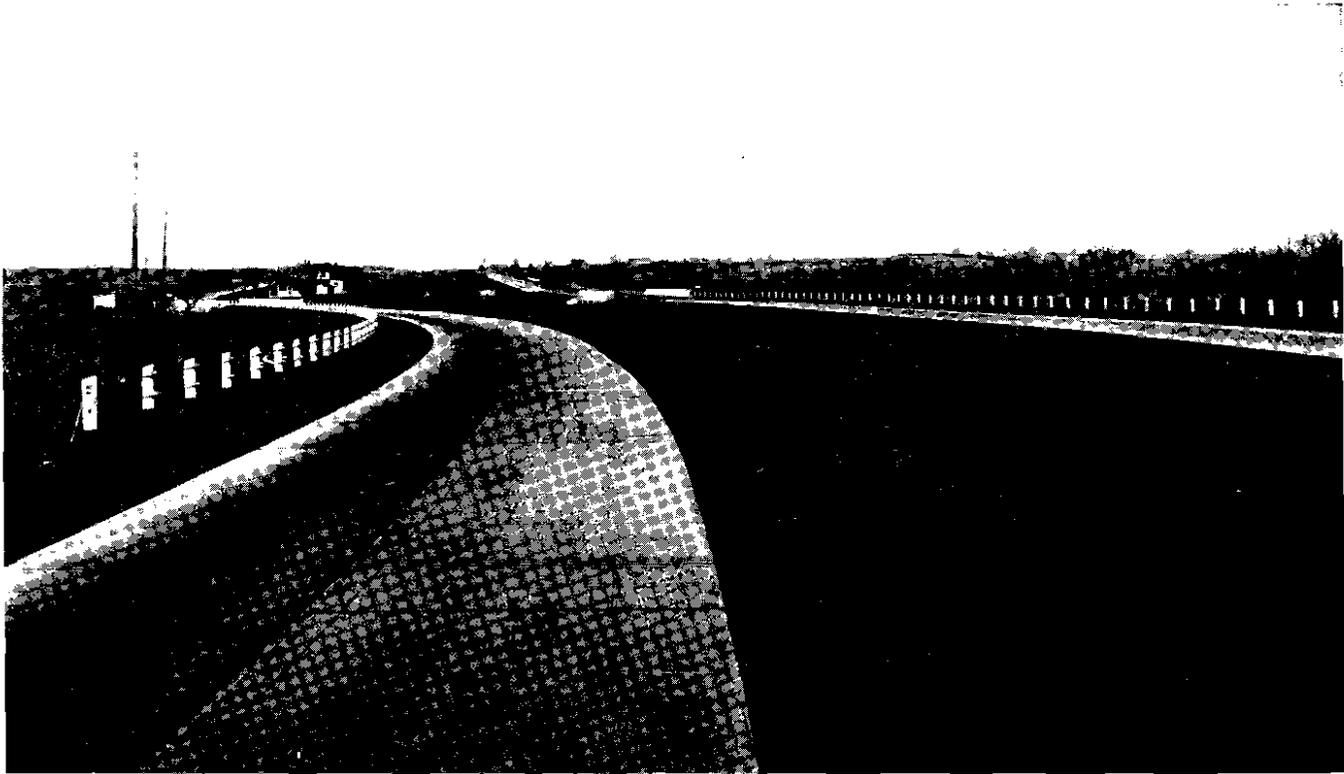
This storm caused an estimated damage of \$100,000 to the highways of the State, part of which is plainly evident; the remainder will be shown in increased maintenance costs over a considerable period of time.

The total cost of maintenance on the State System for the twelve months ending November 30, 1933, was \$334,706.08 or an average cost of \$334.71 per mile. This includes the cost of all new trucks, tools, snow plows, road machinery and all overhead expenses; as well as the cost of maintaining all bridges, culverts, traffic lights, road signs, painting traffic lines, the planting of trees and shrubbery and the salaries of the bridge tenders employed at the Department's seven drawbridges.

In addition to the usual work of maintenance a considerable area of back slopes have been sodded during the year. This has a practical value in preventing the washing of banks and in addition adds largely to the appearance of the highway. I would recommend the continuation of this work on all of the more important highways where practicable.

CONSTRUCTION The Department during the past year advertised nineteen road and bridge lettings comprising sixty-seven contracts which were as follows:

- 36 Complete roadway contracts
- 6 Major grading contracts including structures
- 7 Sidewalk contracts
- 8 Bridge contracts
- 6 Institutional driveway contracts
- 2 Surface treatment contracts
- 1 Jetty contract
- 1 Dredging contract



Drawyers Creek, New Castle County, Coleman duPont Road, U. S. Route 13. Fill and paving over marshes for Dual Highway.

There were 386 bidders who submitted proposals on the above contracts, an average of better than six per contract and the total low contract bid for the projects amounted to \$2,130,444.05.

The mileage and type of roadway and sidewalk contracts advertised this year was divided as follows:

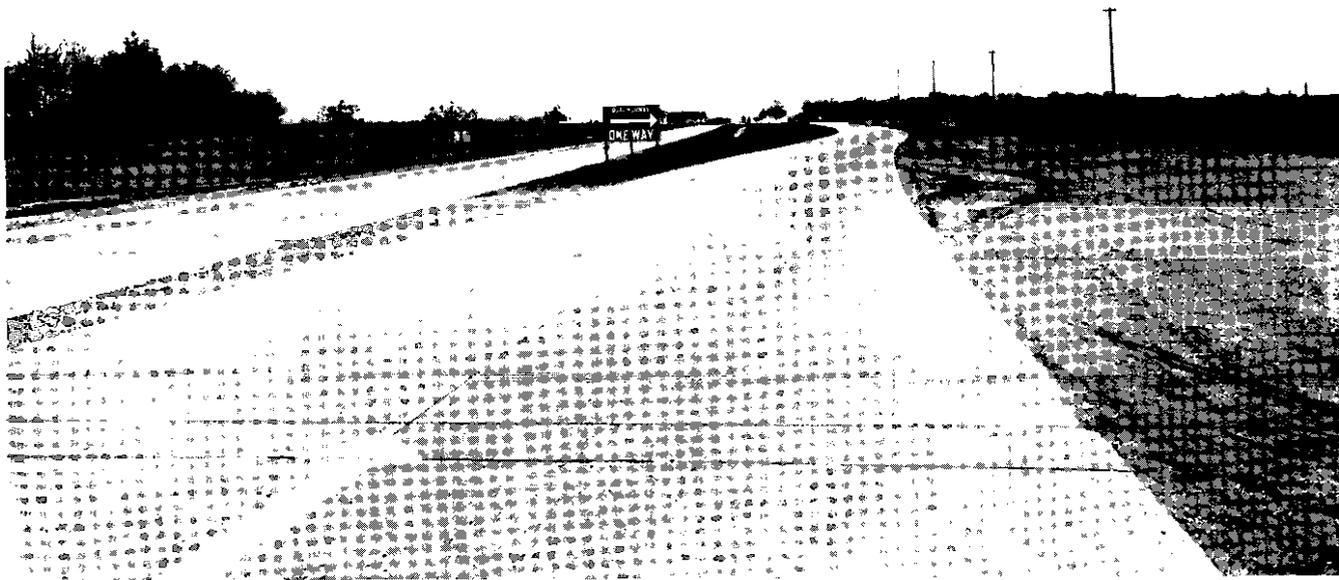
7.25	Mi.	Grading and structures—Dual Road
5.01	"	Grading 20 ft. Roadways
3.62	"	31 ft. Concrete Pav't. Dual Road
7.45	"	20 ft. Concrete Pav't. Dual Road
3.59	"	22 ft. Concrete Pav't.
1.37	"	20 ft. Concrete Pav't.
2.7	"	18 ft. Concrete Pav't.
6.3	"	9 ft. Concrete Pav't.
46.9	"	4 ft. Concrete Pav't. (Widening)
3.8	"	4 ft. Concrete Sidewalks
96.4	"	16 ft. Slag and Stone surface roads
6.2	"	Gravel roads

In addition to the roadway projects listed above were the surfacing of six State institutional driveways and East Loockerman Street, Dover, amounting to 40,000 square yards of surfacing of bituminous surface on macadam and concrete bases, the equivalent of approximately five miles of sixteen-foot roadway and two oiling contracts totalling about twelve miles.

The construction season this year was one of intermittent activity with much work under way during the spring and fall and a lull in construction during the summer. Men were kept at work at a time when employment was most needed, and a greater portion of money on this type of work was expended directly for labor as the use of machinery was restricted on projects in all the counties, especially grading on dual roadways and roadway projects around Wilmington where unemployment was more prevalent.

The mileage of roadway surfaces actually completed during the working season was as follows:

108.92 miles SLAG AND STONE TRAFFIC BOUND SECONDARY ROAD, of which 12.45 miles were a carry-over from 1932.



Smyrna-Reynolds Corner Dual State Highway, New Castle Co unty, Coleman duPont Road, U. S. Route 13. South end of Dual Highway at Duck Creek, near Smyrna.

6.2 miles of GRAVEL SURFACED SECONDARY ROAD.

56.90 miles of 4-FOOT CONCRETE WIDENING, of which 9.7 miles were a carry-over from 1932.

7.35 miles of DUAL HIGHWAYS, of which 3.73 miles were a carry-over from 1932.

20.68 miles CONCRETE ROADS, 9 TO 22-FOOT, of which 9.52 miles were a carry-over from 1932.

The mileage of new roadways completed this year to be added to the State's system omitting dual highways and widening existing roads but including the 49.2 miles of dirt and 12.6 miles of slag roads built and maintained by State forces amounts to 197.6 miles. This added to the State System at the beginning of the year amounts to 1142.4 miles or approximately 30% of the total rural highway mileage of the State.

Simultaneously with the raising of the Drawyers Bridge, contracts were made for the filling and the paving with concrete of the roadways over the marshes at both Drawyers and Appoquinimink Creeks.

These causeways originally built of macadam were rough and uneven due to marsh settlement. Observations indicated that reasonable stability had been reached and that the placing of a rigid pavement was justified.

A great improvement in both the appearance and riding qualities of these structures is the result.

This year saw the completion of the dual highway through New Castle County to Smyrna; the finishing of the widening of U. S. 13 (Bridgeville) and U. S. 113 south of Dover; the building of 115 miles of secondary roads; the construction of several connecting hard surface roads in Kent and Sussex Counties and the Ocean Highway from Rehoboth to Bethany Beach.

Other important highways built this year were two roads out of Wilmington, the Augustine Bridge to Concord Pike road and the continuation of Washington Street from 43d Street to Penny Hill, a relief road for the Philadelphia Pike and North Market Street. The former affords ready access from the western part of



Wilmington: Washington Street Extension to Philadelphia Pike, New Castle County. From intersection at Philadelphia Pike north of Penny Hill.



Augustine Bridge-Concord Pike State Highway, New Castle County, from intersection at Concord Pike.

the city to the Concord Pike and Brandywine Hundred, while the latter makes it possible to avoid the traffic congestion on North Market Street.

The Department is indebted to the Park Board and to Mr. Edward Bringham for a considerable portion of the right of way on the Washington Street Extension. An attempt was made to construct the bridges on this road to harmonize with the natural setting.

Provision has been made for the construction of a dual highway in the future should traffic warrant.

BARKER'S LANDING FILL In the preparation for the by-pass road to be built east of Dover to Magnolia it was necessary to cross 3,150 feet of marsh land at Barker's Landing near Magnolia. The original borings taken along the center line show depths of mud ranging from three to fifty-four feet. Nine hundred feet of this marsh was over forty feet in depth.

Work was started on this contract in December of 1931 and the first fill of 250,333 cubic yards was completed August 30, 1932.

Some trouble was anticipated in getting the fill on solid bottom. In studying the conditions to be met it was decided to carry the embankment considerably above the established grade depending on the depth of the marsh, using the excess weight to force the fill material down and displace the soft mud underneath.

A study of the plans will show the fill stationing to be 71+25 on the banks of the St. Jones' River to 102+50 at the end of the marsh, a distance of 3,150 feet. At the beginning of the marsh, station 102+50, the fill was carried at elevation seven to station 90+00. From station 90 to station 78 an elevation of 13 was established, and from 78 to 71+25 an elevation of 16.5. The actual surface of the marsh elevation averaged two feet above sea level.

In making the fill at the beginning a heavy mat of marsh peat and decayed vegetation was broken up by the use of dynamite. This was accomplished by shooting a trench along the center line of the fill.

Borings taken after the embankment was placed between



Barkers Landing Causeway, Kent County. View taken in Spring, 1933, of embankment across marshes, St. Jones River, showing natural settlement through winter.

stations 102 and 82 indicated that the fill was on or near the solid bottom, and no further filling has been required in this section.

From station 82 to 71 borings showed a depth of mud under the fill from five to thirty-five feet in a very irregular section both longitudinally and transversely.

After the filling was completed in August, 1932, the fill was allowed to settle over the winter and the settlement plotted. No appreciable settlement was found between stations 102+00 and 82 where previous borings indicated the fill to be on hard bottom. The settlement from station 82 to 71+25 was very irregular and was in some places more than four feet.

In the Spring of 1933 it was decided to attempt to force the fill down with the use of explosives. Accurate borings were made and the location of the mud pockets were plotted. From this information loading diagrams were made for the shooting. 40% gelatin dynamite was placed under the fill in various amounts depending upon the depth of the mud to be displaced. The amounts ranging from 50 lbs. per hole to 250 lbs. A series of holes were loaded and set off simultaneously. This resulted in a settlement in some places of approximately ten feet, dropping the fill from elevation twelve down to elevation two which was the elevation of the original marsh level.

After the first series of blasting operations it was necessary to build the fill back up to grade before blasting could be continued. A new contract was therefore let in July, 1933, for the placing of 20,000 additional yards. This contract was completed September 1st, after which the dynamiting was continued.

Going back over the work which had been done previously, the fill was further settled so that the final results show that very little, if any, mud remains under the fill. Two series of blasting operations gave a maximum settlement of from ten to twenty feet. A total of 19,144 lbs. of dynamite were used. To date a total of 276,129 cubic yards of earth have been placed. The cost for the entire project, including the testing, engineering and construction has averaged \$0.262 per cubic yard, or a total of \$72,345.25.

It is estimated that an additional 20,000 yards of fill material

will be necessary to bring the fill from its present elevation back to the established grade, the contract price for this work being 23.7 cents per cubic yard.

It is expected that the care taken to insure the complete settlement of this embankment will make it possible to place a rigid pavement upon it, without the liability of serious settlement such as has been encountered at Frederica, Appoquinimink, Drawyers and other locations where similar deep marshes have been encountered.

Accurate records have been kept of the entire work from the beginning. It is doubtful if as complete data of similar work has been collected elsewhere which makes it a valuable addition to a comparatively new field of engineering.

Attached is a summary of roadway projects, their types and locations in the three counties.

NEW CASTLE COUNTY

Type and Location of Roads and Sidewalks Advertised and Awarded, 1933

Cont. No.	Location	Dual Road Grading	31 ft. Con. Dual Road Paving	20 ft. Con. Dual Road Paving	22 ft. Con. Pav't.	20 ft. Con. Pav't.	16 ft. Slag	Lin. ft. Con. Sidewalks	Bit. Con. Sq. Yds. Institutional Drives
261	Glasgow-Bear	4.71 mi.							
339 NRH	Maryland Line-Glasgow	2.57							
299	State Road-Hare's Cor.		1.78						
300	Hare's Cor.-Farnhurst		1.84						
217A	Bear-State Road			*2.67					
182E	Appoquinimink & Drawer's Approaches .				.40				
237A	Augustine Bridge-Concord Pike .....				.98				
346	Delaware City Bridge Approaches					*.19			
224A	Washington St. Blvd.-Penny Hill					1.18			
295	Richardson Park-Elsmere							2,400	
298	Cranston Hgts.-Cedars							5,800	
239A	duPont School-Kennett Pike							600	
316	Porters-Salem Church						4.27		
321	Green Spring-Vandyke						11.50		
331	Edgewood Sanitarium Drives								550
332	Ferris Industrial School Drives								5,000
333	Farnhurst Sanitorium Drives								14,000
334	Delaware College Drives							2,000	2,950
	Totals	7.28	3.62	2.67	1.38	1.37	15.57	10,800	22,500

* Indicates surfacing to be carried into 1934 season.

KENT COUNTY

Type and Location of Roads and Sidewalks Advertised and Awarded, 1933

Cont. No.	Location	22 ft. Con.	20 ft. Con. Dual Road	9 ft. Con. Road	4 ft. Con. Widening	16 ft. Slag and Stone	Lin. Ft. Con. Sidewalk	Grading	Sq. Yds. Bit. Con. Institutional Drives
345	Through Frederica	*1.03							
343	Bishops Cor.-Smyrna		*4.78						
278	Brenford-Seven Hickories			3.06					
289	Rice's Cor. Canterbury			3.24					
328	Milford-Frederica								
329	Frederica-Dover				7.9				
290	Viola-Petersburg				10.1				
293	Staytonville-Farmington					6.2			
297	Thompsonville-Sour Apple Tree					4.2			
292	Todd's Chapel-Prospect Church					5.8			
303	Pearson's Cor.-Pratt School					5.7			
304	Hollandsville-Maryland Line					2.3			
307	Downes Chapel-Hazel School					4.0			
319	Denny's Cor.-Barber's Corner					5.0			
266 NRH	Little Heaven-Barker's Landing					5.9		4.03	
215A	Barker's Landing Fill .....							.49	
349	Barker's Landing Additional Fill .....							.49	
336	Delaware Welfare Home Drives								**2,200
227B	E. Loockerman St. Ext.								4,500
337	Lake Como and Duck Creek Grading								11,000
227A	E. Loockerman St. Bridge								
168A	Barker's Landing Bridge								
134A	Timber Bridge Webb's Landing								
281	Smyrna Bridges Extensions								
343	Kenton Sidewalks						1,130		
Totals		1.03	4.78	6.30	18.0	39.1	1,130	5.01	17,700

* Indicates surfacing to be carried into 1934 season.
 ** Sq. Yds. Cement Bond Macadam.
 (In addition to above was the oiling of 5.5 miles.
 Dover-Hazletville Road, Contract 317).



Smyrna-Reynolds Corner Dual State Highway, New Castle County, Coleman duPont Road, U. S. Route 13.

SUSSEX COUNTY

Type and Location of Roads and Sidewalks Advertised and Awarded, 1933

Cont. No.	Location	18 ft. Con.	4 ft. Con. Widening	Lin. Ft. Sidewalks	18 tt. Slag	18 ft. Gravel
275	Milton-Broadkill	2.7				
291	Delmar-Laurel .....	..	7.53			
313	Laurel-Bridgeville .....	..	12.01			
314	Bridgeville-Farmington .....	..	9.26			
322	Lord Baltimore School Sidewalk .....	..		4,900		
344	Harbeson Sidewalks .....	..		3,100		
231	Lincoln City-Waples Pond .....	..			7.62	
277	Georgetown-Milton .....	..			7.83	
276	Whitesville-Pepper .....	..			4.75	
302	Coverdale X Rds.-Smith School .....	..			3.70	
309	Zoar Camp-Angola .....	..			6.90	
301	Bacons-Ralphs-Salem School .....	..			5.00	
315	Selbyville-Gumboro .....	..			3.10	
320	Lincoln City-Milford .....	..			2.80	
283	Rehoboth-Indian River Inlet .....	..			....	6.2
282	Timber Bridge-Indian River .....	..			....
2 (N-4)	Jetty-Indian River Inlet					
260	Bridges Love Creek and Burton Pond					
341	Bridges-Laws and Meadowbrook Branches					
342	Bridges-Laurel-Bridgeville					
E-1	Dredging Indian River Inlet					
335	Concrete Widening, Lewis School					
	Totals	2.7	28.80	8,000	41.70	6.2

In addition to the above was Contract 318, the oiling of 4.65 miles, Bethany Beach to Indian River Inlet and Bayard-Roxana, 1.67 mi.



Sidewalk along Kennett Pike at duPont School, New Castle County.

NORTH EAST BOULEVARD First proposed in 1918 the North East Boulevard or Industrial Highway as it is also called is now definitely on the way to construction.

Bids will be received on January 17, 1934, for the construction of the first section, extending from the 11th Street Bridge to Edgemoor Road, other sections will be placed under construction during the winter.

The completed project contemplates the widening of the Heald Street Cutoff from Rogers Corner to City Line, the widening of Church and Spruce Streets to the 11th Street Bridge and the continuation of the Highway beyond Edgemoor to the Philadelphia Pike.

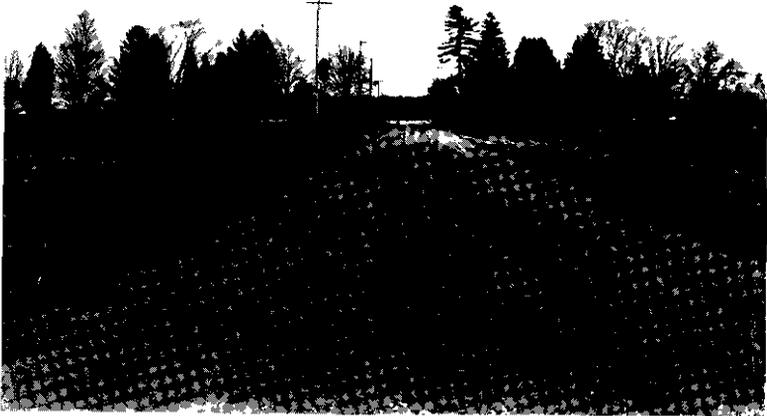
When completed this highway will afford a particularly desirable route for the heavy through truck traffic, avoiding as it does the congested center of the city and North Market Street and eliminating Penny Hill and the heavy grades of the Philadelphia Pike.

WIDENING HIGHWAYS As mentioned previously in this report long needed improvement was completed during the year, viz: the widening of U. S. 13 from Dover to Delmar to a minimum of twenty feet with a curb to curb widening through the towns.

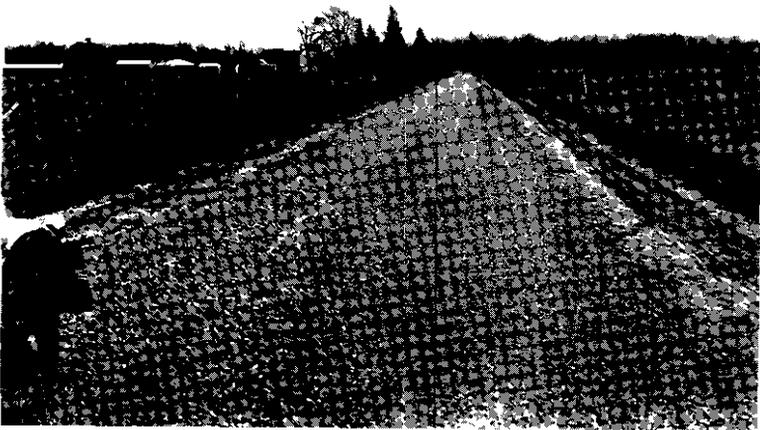
U. S. 113 was similarly widened from Dover to Milford. I believe these widening projects have been the most generally commended of any of the work done in the southern half of the State this year and will add greatly to the comfort and safety of motorists using them.

I would recommend a similar widening of the highways from Milford to Rehoboth and between Laurel and Lewes as funds become available, with priority given to the widening from Rehoboth to Five Points.

SIDE-WALKS The Department constructed 3.8 miles of sidewalk during 1933, this added to those constructed in previous years gives a total of 25.6 miles now completed along State Highways.



Dover-Hazletville State Highway, Kent County. Surface treatment.
Traffic bound slag road.



Pearson's Corner-Pratt's School State Highway, Kent County. Secondary traffic bound slag road, 115 miles of which were constructed during 1933 at an average cost of \$2,489.00 per mile.

Seventeen pedestrians were killed on the highways and streets of Delaware outside of the City of Wilmington during 1933 as compared to twenty-eight in 1931 and twenty-nine in 1932. This is the smallest number of pedestrians killed in any year since 1926. I believe we can claim a considerable part of this gain to the construction of these sidewalks and that this definitely establishes their value as a safety measure and abundantly justifies the cost of their construction.

I would recommend a continuation of the present policy of sidewalk construction where conditions warrant and the adoption of cinder and stone screening surfacing where the cost of concrete is prohibitive.

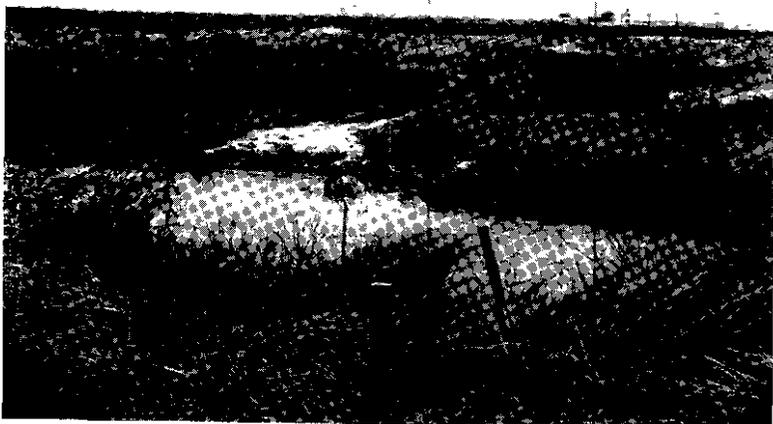
DUAL HIGHWAYS Contracts have been awarded or are advertised for the completion of the dual highway along the Coleman duPont Boulevard between Wilmington and Dover which should be completed by Labor Day, 1934.

The completion of this project on which the Department has been working for the past five years will be a noteworthy event and will be enthusiastically welcomed by the motoring public. In this highway, Delaware will have a connection between its capital and principal city second to none in America and one in which all Delawareans can take pardonable pride.

The dual highway between State Road and the Maryland Line, U. S. 40, has been graded to a point just east of Glasgow and the paving of the roadway from State Road to Bear is now under way. Bids have been received for the grading of the last section and the paving will proceed rapidly as funds are available.

This highway is one of the most heavily traveled of our system, and the completion of the dual pavement will unquestionably eliminate the greater part of the many serious accidents which annually occur on this road.

The Department has received many petitions asking for the continuation of the dual highway south of Dover to the Maryland Line at Selbyville and Delmar. As desirable as such highways would be from the standpoint of safety and convenience, with the shrinking of annual revenues and the increasing expenditures pres-



Site of Ocean Highway, Rehoboth to Bethany Beach, Sussex County.
Before construction of gravel road.



Ocean Highway, Rehoboth to Bethany Beach, Sussex County. Gravel
road south of life-saving station.

ent and prospective, it is difficult to anticipate a possible source of the funds which would be necessary for the carrying out of this plan.

LOW COST As previously mentioned, the Department has
ROADS constructed 115 miles of low cost Traffic Bound Slag and Stone roads during the year at an average cost of between \$2500 and \$3000 per mile.

These projects were widely distributed throughout the State on roads of local importance. They are easily maintained in excellent riding condition at a low cost and after thorough consolidation by traffic over a complete cycle of the seasons may be surface treated with bituminous materials with a resulting dustless highway and riding qualities hardly surpassed by any type of road surface.

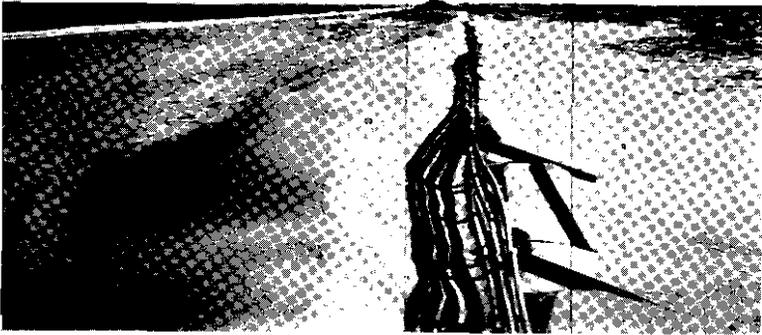
Approximately eleven miles of this traffic bound slag type have thus been successfully treated. I would recommend the construction of approximately two hundred miles of this low cost road in 1934 and the surface treating of such roads where the traffic will justify the added expense.

Important developments have recently been made in soil stabilization, which may have far reaching effects in the construction and maintenance of earth roads. During the past summer such a test road was constructed near Dover with very promising results. The Testing Division is equipped to carry out the tests which are necessary before stabilization can be intelligently attempted.

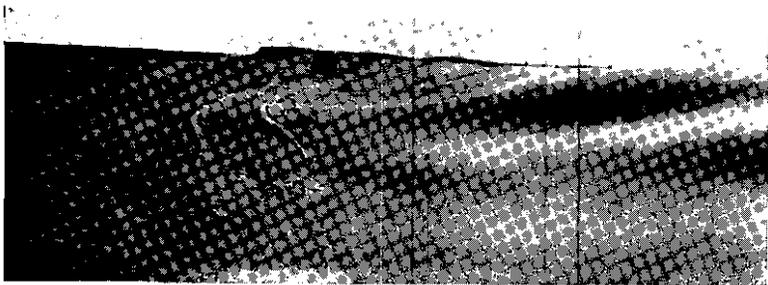
In order to give improved highway service to all our citizens it will be necessary to take advantage of every advance in low cost road development, and to this end I would recommend that study and experiment in the use of these methods be continued.

OCEAN The Ocean Highway constructed of local gravel
HIGHWAY between Bethany Beach and Rehoboth was opened for traffic just previous to the big storm of August 23d.

Making due allowance for the common exaggeration of individual observers it would seem conservative to estimate that a storm of like intensity accompanied by such high tides and heavy



Section of Sand Fence, six feet in height, erected for the protection of the Ocean Highway between Rehoboth and Bethany Beach.



Sand deposited on Ocean Side of Sand Fence. Same location as above photo. Note tops of fence posts.

rainfall is not likely to occur oftener than once in thirty to fifty years. Record tides were observed at all points along the waterfront and winds of hurricane force prevailed for nearly forty-eight hours.

While the section of the Ocean Highway from Bethany Beach to the Indian River Inlet was but little damaged, the newly completed section between Dewey Beach and the Inlet was badly washed in many places, particularly between the old Inlet south of the Coast Guard Station and the present Inlet Bridge. This section received the full force of the waves and was practically washed away with the exception of the bridges and bulkheads which were not damaged.

The sand fences and dikes, recommended in last year's report, and built in the winter and early spring as a protection to this road and the State Lands, had built up enough in most places to successfully withstand the storm. That built in the summer was generally washed away. At the old inlet a 30-foot power boat and other wreckage passed through the fence and over the beach. From one-half to one-third of the dikes held.

The storm of July 2-3, 1933, was considered locally equal in intensity to the average fall or spring equinoctial storm. This storm was held by our fences and dikes at all points where completed.

The road was repaired and again opened to traffic in October. The total damage done to this highway due to the storm is estimated to be approximately \$10,000.

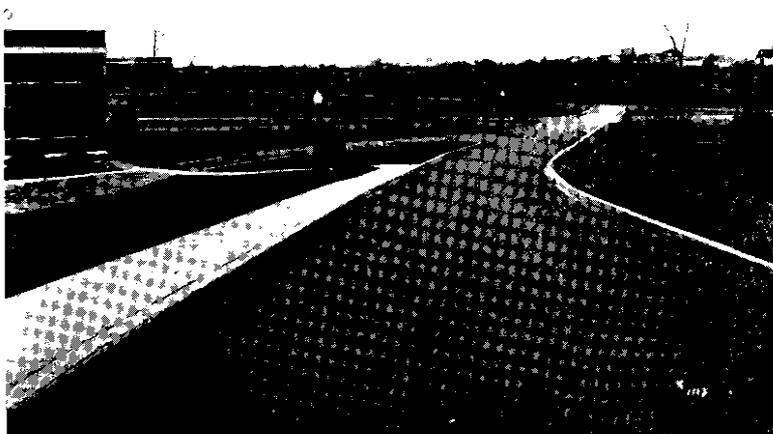
All dikes and sand fences have been rebuilt and strengthened and I believe will successfully withstand any storms likely to be encountered in normal seasons. Occasional serious storm damage to this road must, however, be expected.

The amount of beach built up by the sand fences has surpassed our most optimistic hopes and I believe will prove a very important factor in the maintenance and protection of this road.

The Ocean Highway which now directly connects the two principal shore resorts of Delaware has proved a very popular one



Driveway at Women's College, Newark, New Castle County.



Driveways at State Hospital, Farnhurst, New Castle County.

and has speedily developed a considerable amount of traffic both commercial and recreational.

Surf fishing along this route has become a popular sport as the entire ocean front between these points is now readily accessible.

The Bethany Beach-Indian River Inlet section of this highway was treated with a slow curing, cut back asphalt during the fall using the "Mixed in Place" method. Owing to the unstable subgrade which is largely loose sand, some difficulties were encountered, but in general the results were very satisfactory, some ravelling is expected this winter but with the repair of these weak spots in the early spring and the application of a seal coat, a dustless surface with excellent riding qualities will be secured.

I would recommend that the Rehoboth section be similarly treated in the late spring before summer traffic develops.

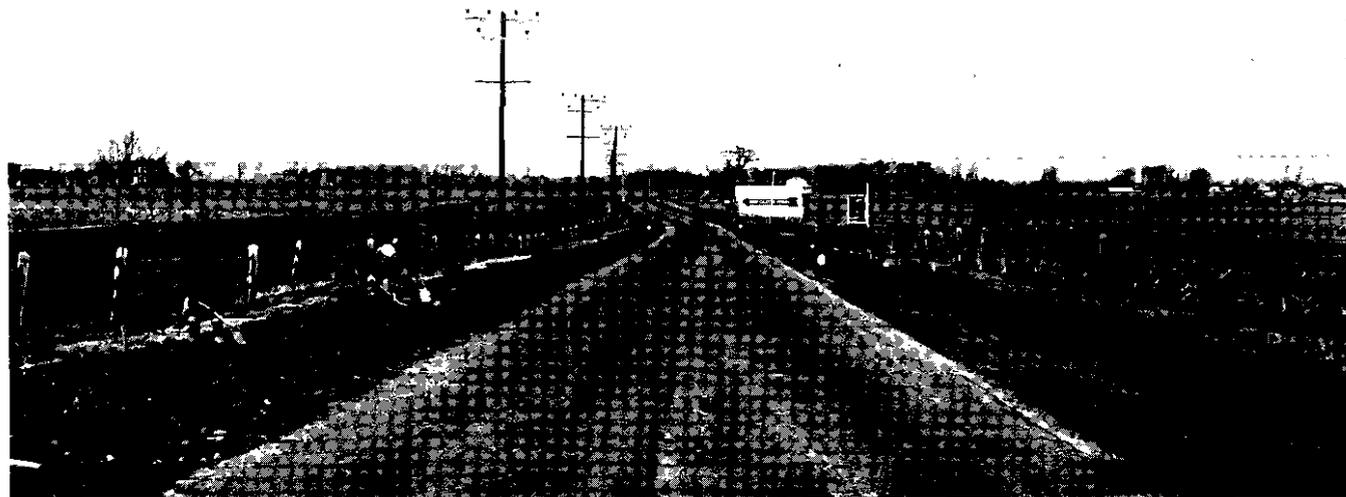
STATE INSTITUTIONS As authorized by Chapter 75, Volume 37 of Laws of Delaware, during the past two years the Department has constructed entrances and drives at various State Institutions viz:

Brandywine Sanatorium, Ferris Industrial School, State Hospital at Farnhurst, Women's College at Newark, Edgewood Sanatorium, State Welfare Home at Smyrna, and a road leading from the duPont Boulevard to the Delaware Colony at Stockley.

The Department has authorized the construction of driveways at the Delaware Colony and at the State Colored College at Dover. On the completion of these two projects these Institutions will have been provided with adequate driveways at no expense to the Institutions themselves.

C. W. A. WORK The Department has cooperated with C. W. A. officials in placing the unemployed on construction work. Beginning November 20th with the first C. W. A. project started in Delaware; the numbers have been increased until approximately 750 men were working on twenty-nine State Highway jobs during the week of December 23d.

These projects consist of clearing and grubbing, grading for



Lincoln Highway near St. James Church, New Castle County. Widening of shoulders under Civil Works Administration.

roads and sidewalks, repairing dikes, and sodding and widening slopes and embankments. The total cost of this work is estimated at \$166,706.00.

FEDERAL AID As noted in last year's report the 73rd Congress failed to make any appropriations for highways. Owing to the uncertainty of Federal assistance but little work was placed under contract during the late spring with the result that employment reached a minimum of 220 men on contract work during the third week of August.

The passage of the National Industrial Recovery Act on June 16, 1933, made available on July 1st, 1933, \$400,000,000 for highway construction. Delaware's share of this amounted to \$1,819,000.

Plans were submitted and work placed under contract as rapidly as possible, with the result that by the middle of October over 2000 men were employed on State and Federal Highway Contracts.

All of these funds are now allocated and will be under contract early in 1934.

Unless further appropriations are made by Congress during the coming session, road building will be practically at a standstill during the latter half of 1934, not only in Delaware but throughout the nation.

UNEMPLOYMENT RELIEF As in the preceding two years the Department has required all contracts to be carried on in such a manner as to employ the maximum amount of labor, with employment limited to thirty hours a week, and an established minimum wage.

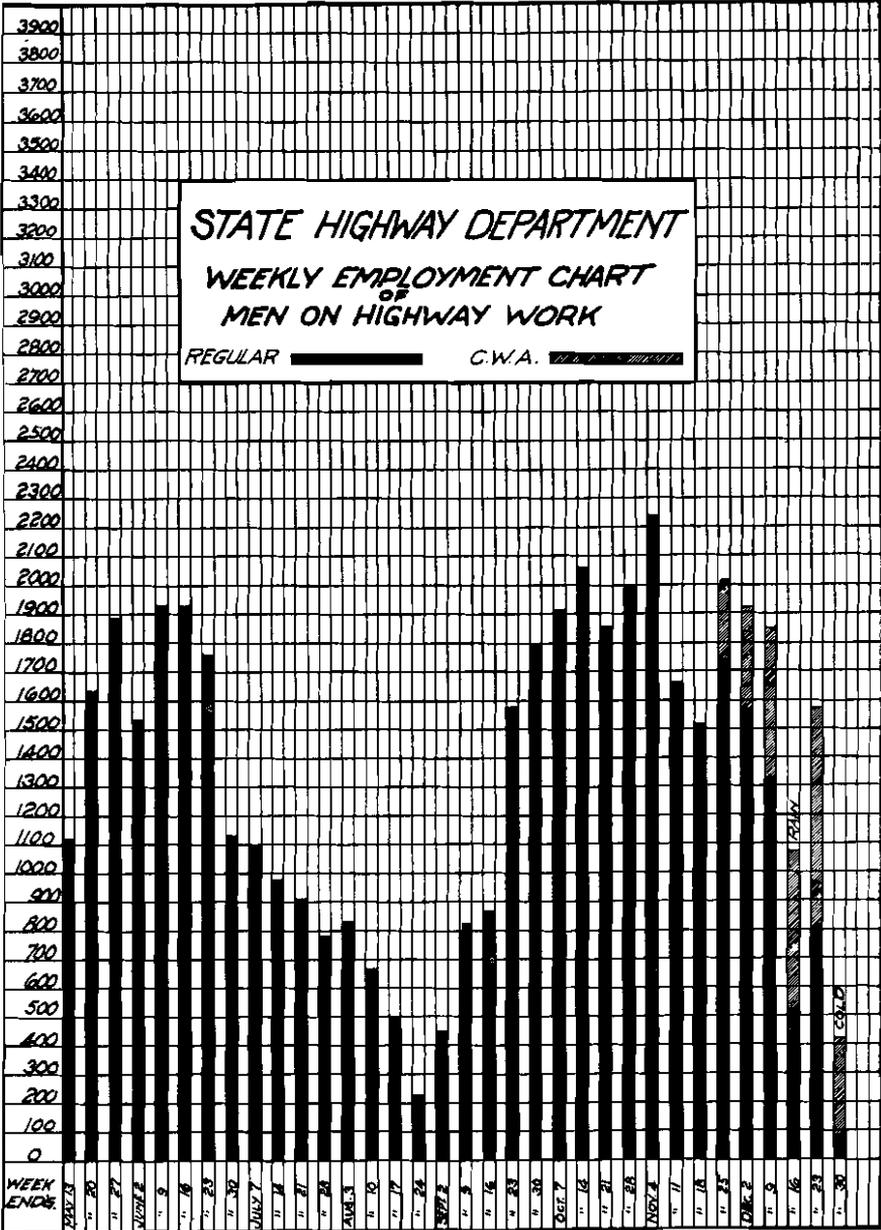
Contractors have been required in all cases to secure their men from lists furnished by the State Emergency Relief Commission or in the case of work under the National Industrial Recovery Act from the offices of the Federal Reemployment Service.

A graph showing the number of men employed during the summer and fall of 1933 is attached.

A fine spirit of cooperation between the State Engineers, the Contractors, the State Emergency Relief Commission and the Federal Reemployment Service has existed with but few exceptions

STATE HIGHWAY DEPARTMENT WEEKLY EMPLOYMENT CHART OF MEN ON HIGHWAY WORK

REGULAR C.W.A.



throughout the entire period, but in a time when it has been impossible to give work to but a small portion of those needing employment, dissatisfaction and disappointment with accompanying criticism is inevitable. The Department and its engineers have been subjected to a great deal of unjust and unwarranted criticism in connection with the employment of the men. I wish, however, to express my appreciation of faithful work of our engineers who have carried the burden of those criticisms without complaint in their sincere efforts to render a helpful service.

I also wish to here extend my thanks and appreciation for the courtesy and friendly spirit which has, almost without exception, been evident in the relations with the cooperating agencies.

INDIAN RIVER As indicated in previous reports the Indian
INLET River Inlet will continue to require dredging at approximately two-year intervals if it is to remain open.

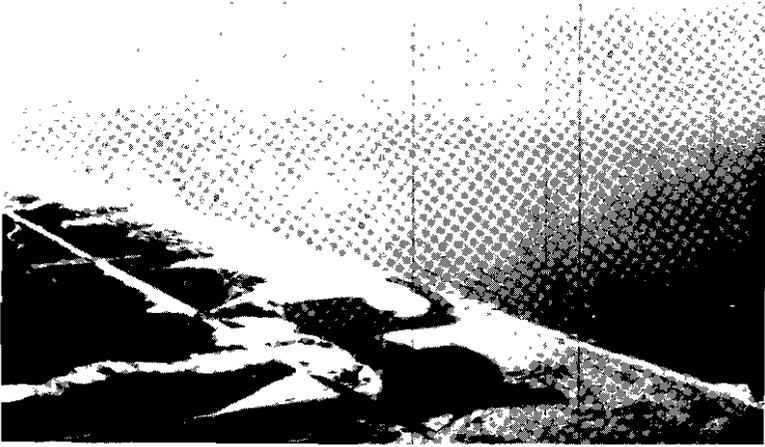
It has been hoped that the Federal Government might take over the work and construct a permanent Inlet protected by suitable jetties, but as yet no definite action has been taken.

Inasmuch as the closing of the Inlet was imminent with the probability of its causing serious damage to the Ocean Highway if allowed to continue in its present course, the Department placed a contract during November for the clearing of the established channel.

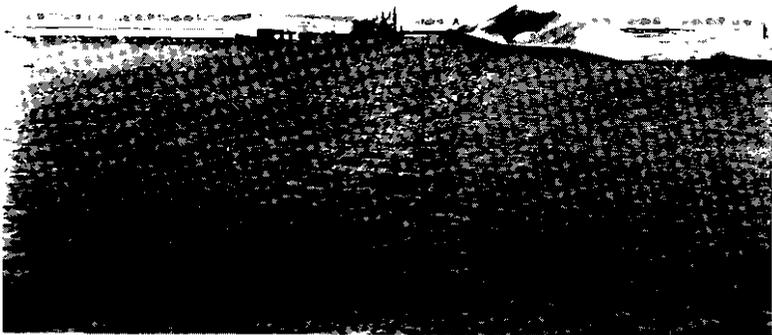
The importance, of preserving this Inlet, to the fishing and other interests adjacent to the Indian River and Rehoboth Bays and their tributaries suggest that some form of permanent protection should be provided.

STATE June of this year marked the tenth anniversary of
POLICE the organization of the State Police. Starting with a force consisting of a superintendent, three corporals, ten privates and one mechanic it has grown until the roster now includes a superintendent, one captain, three lieutenants, four sergeants, four corporals, forty-two privates and two mechanics. This personnel is detailed at five stations strategically located throughout the State.

Twenty-four hour service is maintained at all stations, and is available at all times for the protection of life and property as well



Indian River Inlet, Sussex County, showing movement of opening at Ocean, to North, from its original position.



Indian River Inlet, Sussex County, showing suction dredge at work clearing our opening on original line.

as for traffic duty. The number of calls received at the different stations as well as the letters of commendation and appreciation received testify to the high value, which the citizens of the State, especially in the rural districts, place on the protection afforded them.

In order to improve this service, there has been inaugurated during the past year a system by which all officers on patrol are required to report to their respective stations, by telephone, every half hour. This not only enables the officers in command of the stations to keep in almost constant touch with their men, but has also proved effective in enabling officers to more promptly reach the scene of accidents, or other points where their services are needed.

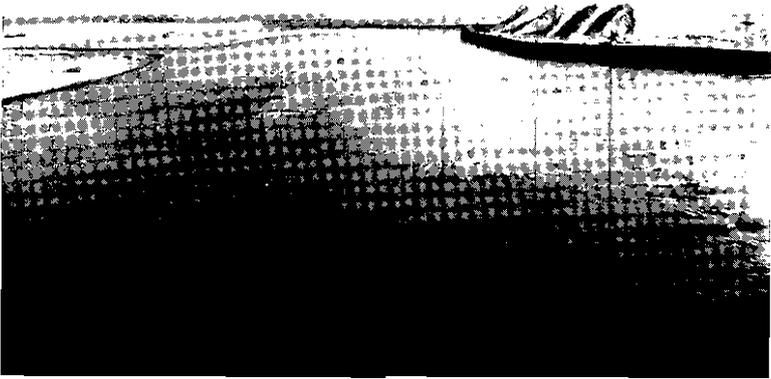
This system has certain advantages and some disadvantages in comparison with a radio broadcasting system. Satisfactory radio communication has not as yet been developed for use with motor-cycles, except under limiting conditions.

A special night patrol was also maintained during the fall and early winter which was successful in materially reducing the number of reported cases of poultry stealing and petty thievery.

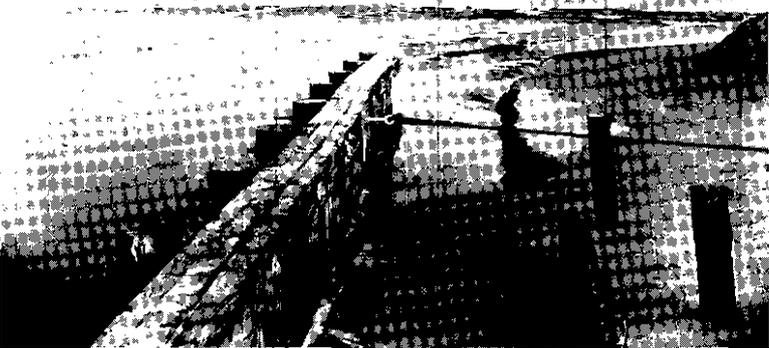
While 80 per cent of all arrests made by the State Police are for violations of the motor vehicle laws over 900 arrests were made during the year for other offenses among which were 8 for murder, 176 for assault and battery, 46 for breaking and entering and 177 for larceny. The largest number of arrests for any charge was 1414 for reckless driving.

One of the valuable services rendered by the State Police is the protection of the State Highway System from the damage caused by the overloading of motor trucks by careless or unscrupulous operators. From a monetary point of view this is probably the most important service rendered the State. In the carrying out of this duty 41,649 trucks were weighed and 414 operators were arrested for overloading.

During the year 1933 the officers of the force covered 871,835 miles on patrol duty, inspected 14,633 vehicles for defective lights and brakes, recovered 57 stolen cars, spent 151,688 hours on duty,



Indian River Inlet, Sussex County, showing opening cleared out on original line.



Indian River Inlet, Sussex County, showing end of bulkhead constructed on South side of opening.

3,957 hours on investigation and 7,228 hours on special duty, made 4,833 arrests for 118 different offenses, issued 34,710 reprimands and secured convictions resulting in fines totaling \$42,917.00. One arrest was made for breaking the Aeronautical Laws of the State.

A complete tabulation of arrests and of accidents with their causes is appended.

A perusal of the lists of arrests will indicate the wide range of the activities of the force.

There were four resignations from the force during the year.

SAFETY There has been a slight improvement in the safety record over the preceding year. As previously noted there has been a reduction in pedestrian deaths of 12 or 41.4%. However, an increase of 12 or 75% in the deaths reported for automobile collisions has prevented a more favorable record and is a serious reflection on the driving skill of the motoring public.

Accidents declined from 922 in 1932 to 830 in 1933 or 10%.

Personal injuries declined from 821 in 1932 to 775 in 1933 or 5.6%.

There has not been a corresponding reduction in fatalities, however, the decline being from 72 to 70 or 2.8%.

The explanation for the less favorable reduction in the fatality rate is undoubtedly the constantly advancing operating speeds with the consequent increased severity of accidents.

It is very doubtful if any progress in safety measures can secure a permanent decrease in fatalities until the rising tide of speed reaches its height.

ARRESTS MADE FOR THE YEAR 1933

Accessory	1
Aiding and abetting	1
Allowing automobile to be driven recklessly	1
Allowing body to protrude over side	6
Allowing illegal use of tags	3
Allowing livestock to run at large	4
Allowing minor to operate	5
Allowing an unlicensed person to operate	82
Allowing an unregistered car to be operated	7
Altering engine number	2



View of Blackbird hill, New Castle County, taken in 1908 before improvement of highway.



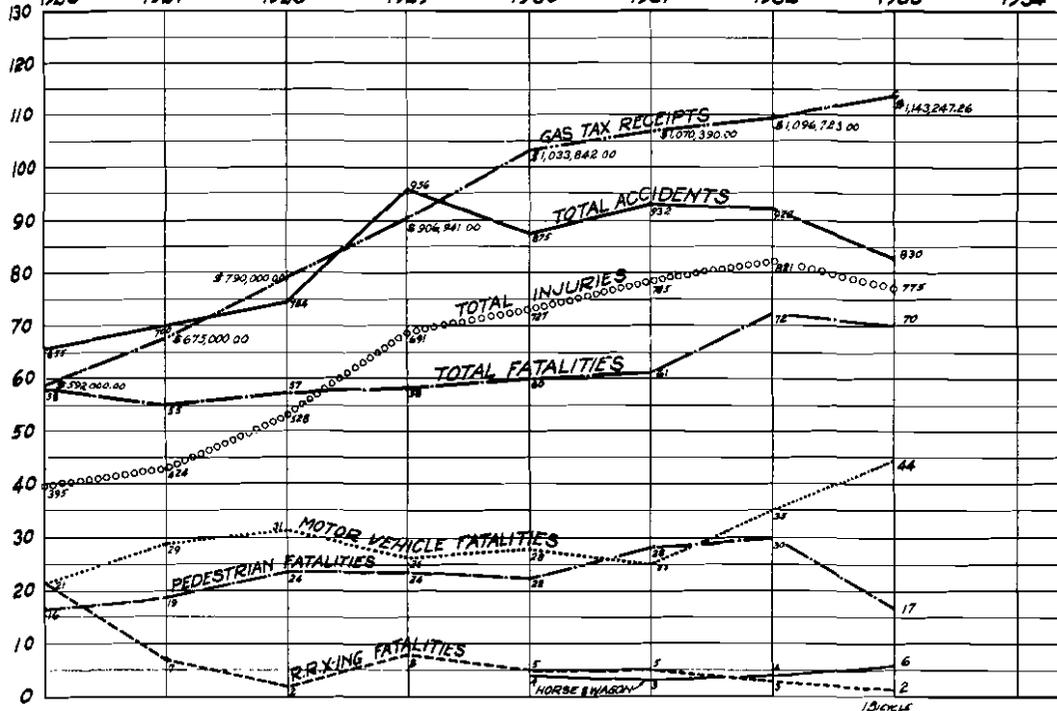
Blackbird hill, New Castle County, Coleman duPont Road, U. S. Route 13. View after construction of dual highway.

Altering license plates	1
Assault	7
Assault and battery	176
Assault, felonious	5
Assault to murder	8
Attempted arson	2
Attempted kidnapping	2
Bigamy	1
Breach of peace	1
Breaking and entering	46
Breaking jail	3
Carrying concealed a deadly weapon	20
Cruelty to dumb animals	1
Defective brakes	119
Defrauding the government	1
Desertion (wife)	1
Discharging fire arm	1
Disorderly conduct	92
Displaying another's license	11
Disturbing the peace	9
Drunk	15
Drunk and disorderly	195
Exceeding legal height	4
Exceeding legal length	1
Exceeding registered weight	102
Failing to display red lantern (truck)	12
Failing to give right of way	2
Failing to report accident	2
Failing to stop at railroad crossing	1
Failing to stop upon request of officer	4
Failing to signal	10
Failing to stop at main highway	116
Following fire engine too closely	5
Forgery	3
Fraudently obtaining license plates	7
Fugitive from justice	5
Gambling	2
Held as witness	60
Hitch hiking	2
Horse drawn vehicle, no light	4
Highway robbery	4
Illegal use of truck	1
Improper lights	39
Improper tags	28
Insane	3
Interfering with officer	1
Interfering with operator	17
Juvenile delinquent	6
Larceny	177
Larceny as bailee	3
Leaving accident	29

Lending license plates	5
Lending operator's license	12
Making false statement	7
Making threats	28
Malicious mischief	4
Manslaughter	41
Moving building without permit	1
Murder	8
No chauffeur's license	62
No clearance lights	25
No fuel permit	2
No horn	14
No mirror	89
No muffler	4
No operator's license	453
No photo on chauffeur's license	4
No windshield wiper	1
Nomads no license	3
Non-support	10
Obtaining goods under false pretenses	3
Obtaining money under false pretenses	4
Operating after revocation	6
Operating tractor with improper cleats	3
Operating while intoxicated	209
Overloaded center axle	4
Overloaded rear axle	130
Overloaded semi-trailer	72
Overloaded trailer	9
Overloaded truck	199
Parking on concrete	6
Parking, no lights	15
Passing on right	7
Passing traffic (red) light	22
Passing worthless check	19
Pointing fire arm	4
Possession of stolen car	3
Possession of whiskey	21
Practicing medicine without license	1
Receiving stolen goods	6
Reckless driving	1414
Resisting arrest	7
Riding without owner's consent	3
Robbery	2
Selling car without title	14
Selling goods after levy had been made	1
Selling liquor	2
Selling without license	13
Soliciting on highway	1
Stunting with airplane over city	1
Selling car without first satisfying lien	1
Selling hides out of season	1
Taking car without owner's consent	21
Tampering with automobile	10
Throwing rubbish from automobile	1

STATE OF DELAWARE STATE HIGHWAY DEPARTMENT ACCIDENT CHART

NUMBER OF ACCIDENTS PER FATALITY	11.3	12.7	13.1	16.5	14.9	15.2	12.8	11.8
MILES DRIVEN PER FATALITY (10M/REAL)	3,402,300	4,090,909	4,619,884	5,212,304	5,741,500	3,815,633	3,635,745	3,444,403
	1926	1927	1928	1929	1930	1931	1932	1933



Transporting liquor	21
Transporting unmarked apples	4
Trespassing	12
Unregistered motor vehicle	175
Using female child for immoral purposes	3
Vagrancy	5
Violating age of consent law	1
Violating Coal Act	1
Violating Dyer Act	3
Violating learner's permit	15
Violating parole	2
Violating sabbath	1
Violating trailer permit	1
Wife beating	1
Total number of arrests	4,733
Total number reprimands	34,710
Total number trucks weighed	41,649
Total number miles patrolled	871,835
Total number cars inspected for lights and brakes	14,633
Total number hours spent on investigation	3,957
Total number hours spent on Special Duty	7,228
Total number hours on duty	151,688
Total number stolen cars recovered	57
Total number school buses inspected	12

REPORT OF ACCIDENTS FOR YEAR 1933

Total number accidents	830
Total number killed	70
Total number injured	775
Estimated Property Damage	\$177,241.00

Type of Collision

In Collision with:—

	Total	Fatal	Non-fatal
Pedestrian	84	17	67
Automobile	468	28	440
Animal or horse drawn vehicle	29	6	23
Railroad train	10	2	8
Street car	3	0	3
Motorcycle	3	0	3
Fixed object	114	8	106
Bicycle	5	1	4
Non-collision accident	124	7	117
Miscellaneous	1	1	0
Totals	841	70	771

Cause:

Reckless driving	109
Operator had been drinking	71
Inattention	63
Skidding	61
Drove or crowded off roadway	45
Failed to signal	43
Loss of control	42

Driving on wrong side of road	41
Passing without proper clearance	33
Operating while asleep	33
Failed to stop at main highway	31
Children playing in roadway	22
Glaring headlights	21
Tire (blow out)	19
Cutting in	18
Animal on highway	17
Jay walking	15
Defective brakes	14
Obstructed view	14
Jumped or fell from motor vehicle	13
Coming from behind parked vehicle	12
Pedestrian confused	11
Operator confused	10
Parked no lights	10
Automobile no lights	9
Pedestrian intoxicated	7
Inexperienced operator	7
Driving too close	5
Wagon no lights	5
Defective wheel	3
Obstruction in road	3
Pedestrian getting on or off vehicle	3
No tail light	3
Defective windshield wiper	3
Interfering with operator	2
Not stated	12

Light Conditions	Number of accidents		
	Total	Fatal	Non-Fatal
Daylight	388	21	367
Dusk	39	4	35
Artificial light—good	51	6	45
Artificial light—poor	63	2	61
Darkness	286	25	261
Not stated	3	1	2
Totals	830	59	771

Day of Occurrence	Total	Fatal	Non-Fatal
Sunday	183	14	169
Monday	108	8	100
Tuesday	81	7	74
Wednesday	92	5	87
Thursday	91	6	85
Friday	109	9	100
Saturday	165	9	156
Totals	830	59	771

Weather Conditions	Total	Fatal	Non-Fatal
Clear	557	43	514
Cloudy	82	5	77
Fog or mist	42	3	39



Dual State Highway at Roger's Corner, New Castle County, Coleman duPont Road, U. S. Route 13.

	Number of accidents		
	Total	Fatal	Non-Fatal
Rain	124	7	117
Snow	22	0	22
Not stated	3	1	2
Totals	830	59	771

Type of vehicle involved in accident

Passenger car	1023	48	975
Light delivery car	14	2	12
Bus	12	0	12
Motorcycle	9	1	8
School bus	2	1	1
Wagons	21	4	17
Truck	260	24	236
Not stated	3	2	1
Totals	1344	82	1262

Road Location

Between intersections	21	2	19
Rural intersections	143	4	139
Straight road	485	43	442
Driveway	29	1	28
Curve	87	5	82
Street intersection	44	2	42
Railroad Crossing	10	2	8
Bridge	7	0	7
Street Car Crossing	3	0	3
Not stated	1	0	1
Totals	830	59	771

Action of Pedesrian Contributing to Accident	No. of Pedestrians Involved		
	Total	Fatal	Non-fatal
Getting on or off street car	1	0	1
Getting on or off vehicle	5	4	1
Crossing intersection	5	0	5
In street not at intersection	27	2	25
Children playing in roadway	17	2	15
Coming from behind parked vehicle	2	0	2
Walking on or along highway	26	8	18
Not stated	1	1	0
Totals	84	17	67

Road Surface

Dry surface	595	47	548
Wet surface	181	10	171
Muddy surface	5	0	5
Snowy surface	37	1	36
Icy surface	9	0	9
Not stated	3	1	2
Totals	830	59	771

Hour of Occurrence	Number of Accidents		
	Total	Fatal	Non-fatal
12 to 1 A. M.	44	3	41
1 to 2 A. M.	23	2	21
2 to 3 A. M.	20	3	17
3 to 4 A. M.	19	4	15
4 to 5 A. M.	13	0	13
5 to 6 A. M.	26	0	26
6 to 7 A. M.	15	2	13
7 to 8 A. M.	21	1	20
8 to 9 A. M.	24	0	24
9 to 10 A. M.	16	1	15
10 to 11 A. M.	30	4	26
11 to 12 A. M.	21	1	20
12 to 1 P. M.	27	0	27
1 to 2 P. M.	31	2	29
2 to 3 P. M.	43	1	42
3 to 4 P. M.	49	6	43
4 to 5 P. M.	59	3	56
5 to 6 P. M.	58	2	56
6 to 7 P. M.	51	9	42
7 to 8 P. M.	50	0	50
8 to 9 P. M.	60	5	55
9 to 10 P. M.	44	4	40
10 to 11 P. M.	38	2	36
11 to 12 P. M.	39	2	37
Not stated	9	2	7
Totals	830	59	771
Driver's Sex			
Male	1199	68	1131
Female	119	10	109
Totals	1318	78	1240
Driver's Age			
Under 18 years	19	1	18
18 to 24 years	332	18	314
25 to 54 years	828	51	777
55 and over	121	6	115
Not stated	18	2	16
Totals	1318	78	1240
Driving Experience			
Less than 3 months	13	2	11
3 to 6 months	13	1	12
6 to 12 months	7	0	7
1 year or more	1237	59	1178
Not stated	48	16	32
Totals	1318	78	1240

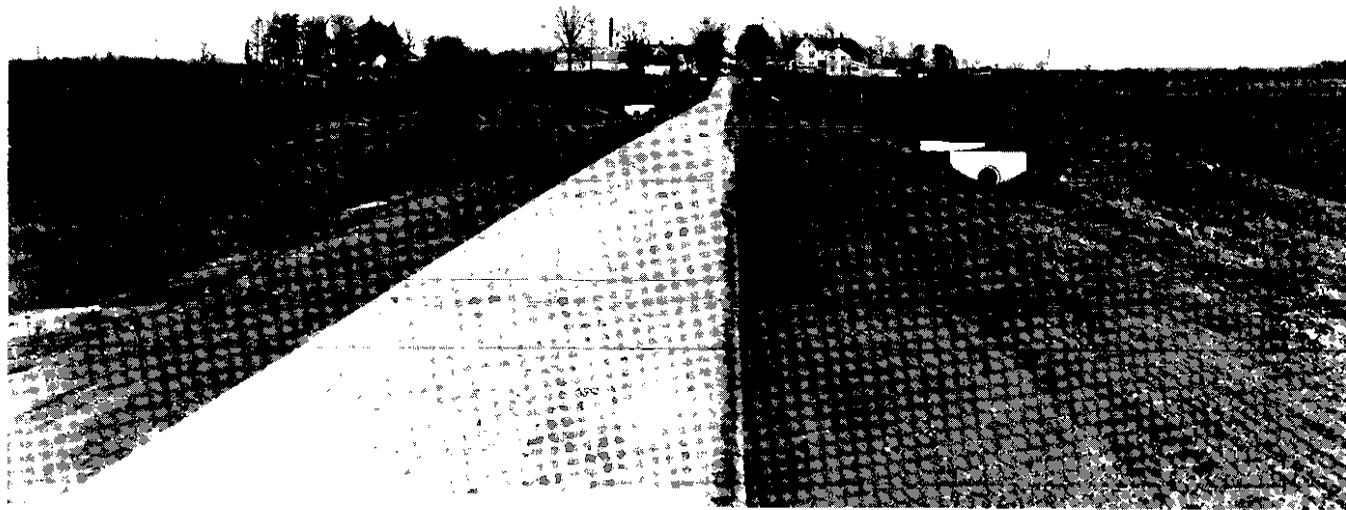
RECOMMENDED I recommend that the roads chosen for
ROADS improvement during the coming year be selected from the following list, which includes those for which petitions have been received by the Department:

New Castle County

Port Penn-Thomas Corner	3.5 miles
Odessa-Armstrong Corner-Bohemia	7.0 "
Townsend-St. Ann's-The Levels	4.5 "
Blackbird-Armstrong Corner	4.0 "
Blackbird-Conways Corner	3.5 "
St. Andrews School-Fieldsboro	2.0 "
Boyd's Corner-Shallcross Pond-Shallcross Corner	4.5 "
Kirkwood-Howell's School	3.0 "
Wrangle Hill-Moss Garage	4.5 "
Pine Tree-McCoy's Corner	2.8 "
Creek Road, Newark-Pennsylvania Line	4.5 "
New London-Newark	2.5 "
Rockland-Thompson Bridge	3.0 "
Brandywine Sanatorium-Lincoln Highway	2.0 "
Milltown-Lincoln Highway	1.8 "
Summit Bridge-Newark	10.5 "
Carr Road-Naaman's Road	2.5 "
Completion dual highway Glasgow-Maryland Line	7.7 "
Completion Industrial Highway to Claymont	6.0 "
Widening Washington St., Front to Eleventh .....	.6 "
Dual Road, Prices Cor. to Fourth St. Extended	2.5 "
Sidewalk: Marshallton west of Red Clay Creek .....	.5 "
Marshallton School Street .....	.15 "
New Castle: Widening of Bridge over P. R. R.....	
Augustine Cutoff thru Alapocas Woods Park to New Bridge Road	
Widening of Kennett Pike from City Line to northerly State Line	6.0 "
Pine Tree to Naylor's Cor. to Taylor's Bridge-Odessa Road	3.0 "
Jamisons Cor. north to St. Georges-Summit Bridge Road; thence west to Lorewood Grove-Mt. Pleasant Road;	
thence south to Mt. Pleasant-Boyd's Corner Road....	4.0 "
S. Chapel Street, Newark, to Coochs-Christiana Road....	3.0 "
Port Penn-Bay View	2.5 "
Sidewalk: Baldton to New Castle .....	.5 "

Kent County

Blackiston to Delaney	3.33 "
Big Oak to Mt. Zion Church	3.55 "
Clayton to Blanco (via Underwood Cor.)	7.05 "
White House to State Welfare Home	3.08 "
Friendship Church Road	2.10 "
Hastings Cor. to Moore's Cor.	4.89 "
Wright's X Rds. to Hazletville (via Bethesda)	6.27 "
Mahons Ditch Road	3.21 "
South Little Creek Road	3.95 "
Postles Corner Road	3.00 "
Wyoming to Ridgley's Corner	1.90 "
Oak Point School Road	4.80 "
Guy Town to Woodside	3.30 "
Star Hill to Magnolia-Canterbury Road	4.67 "
Plymouth to Barretts Chapel	6.00 "



Brenford-Seven Hickories State Highway, Kent County, nine-foot concrete road.

Tub Mill to Big Stone Beach	7.82	"
Thompsonville to Bennett's Pier	3.20	"
Rices Cor. to Milford (via McCaulleys Pond)	7.09	"
Williamsville-Milford	3.65	"
Maryland Line-Flemings Corner	6.68	"
Mastens Corner-Burnet's Mill	2.30	"
Sugar Stick Road	3.80	"
Vernon to Brownsville	2.20	"
Harrington to Hughs X Roads	7.50	"
Andrewsville to Vernon	2.61	"
Andrewsville to Sussex Line	2.00	"
Sidewalk: Camden-Odd Fellows Cemetery	0.20	"
Marydel, Tilghman's Corner Road to Westville-Henderson Road		
Vernon-Mastens Corner-Harrington Road via White's Chapel		
State College Driveway		
Barker's Landing northwest to duPont Road at Barnard Farm	2.0	"
Rothwell's Cross Roads to Smyrna Landing	1.8	"
Cedar Grove School to Loper's Corner	2.5	"

Sussex County

Northwest Fork Hundred: St. Johnstown Church towards Smith's Store	5.0	"
Seaford Hundred: Seaford-Woodland	6.0	"
Seaford Hundred: Wesley Church-Hearn's Pond	1.5	"
Gumboro Hundred: Lowe's X Roads-Ward's Store	5.0	"
Gumboro Hundred: Lowe's X Roads-Ross' Point	4.0	"
Baltimore Hundred: Fenwick's Island to Bethany Beach	7.0	"
Baltimore Hundred: Bishopville-Roxana	5.0	"
Indian River Hundred: State Highway at Hindle's resi- dence to Millsboro-Rehoboth Highway	5.0	"
Indian River Hundred: Goslee's Mill via Conley's Chapel to Millsboro-Rehoboth Highway	4.0	"
Georgetown Hundred: Georgetown via Peter Short's to Jones' Store X Roads	6.0	"
Broadkiln Hundred: Milton-West Hill School	4.0	"
Lewes and Rehoboth Hundred: Lewes thru Pilot Town to Monument	2.0	"
Millsboro-Laurel State Highway to Dagsboro-Shaftox State Highway via Hickory Hill and Indian Town.....		
Fisher's School to Big Pine to Woodenhawk School.....		
Milford to Lincoln via Old State Road		
Concord to Middleford	2.0	"
Prince George thru Omar to Roxana	5.5	"
Concord to Old Furnace-Middleford Road	2.5	"
Cedar Neck School-Cedar Beach	2.75	"
Pepper-Jones X Roads	5.60	"
Laurel-Woodland	5.00	"
Owens-Sunnyside School	4.30	"
Ward's Store-Maryland Line	3.00	"
Whitesville-Maryland Line .....	.40	"
Vines Creek-Sandy Landing	1.60	"
Millsboro-Hickory Hill	5.00	"
Phillips Hill-Pepper	7.70	"
Frankford-Dagsboro Shaftox Road	2.50	"
Lowe's X Roads to Newfound	6.80	"
Cokesbury Church to Old Furnace	3.00	"

Sandy Forks-Bryan's Store	7.30 "
Milford-Rehoboth Road-Broadkill	4.03 "
Stockley to Millsboro-Bryan's Store Road and to George- town-Shortley Road	4.10 "
Independence School-Bethesda School	4.00 "
Jacobs X Roads-Atlanta	2.50 "
Springfield X Roads-Hollyville	3.60 "
Ellendale-No. 6 School	2.54 "
Cokesbury to Robbins	5.25 "
County Farm to Stockley	2.80 "
Bayard to Ocean View	4.25 "
Bayard Ocean View Road-Irons Lane Landing	5.75 "
Lincoln to Shawnee-Staytonville Rd.	2.21 "
Redden-Georgetown Milton Road	4.40 "
Hearns X Roads-Maryland Line	3.50 "
Long Neck Road	3.50 "
Jacobs X Roads-Maryland Line	2.00 "
Laurel-Lowes X Road Highway to Millsboro-Concord Road east of Jones X Roads	
West of Lowe's X Roads along division road between Gumboro Hundred and Broad Creek Hundred to Workman's Store	
Sidewalk: Blades	
Ellendale via Union Church to Shawnee	6.5 "
Road intersecting Ellendale-Shawnee Road from west of Union Church	
Laurel-Seaford and Laurel-Georgetown intersection to in- tersection at Market St. and Delaware Ave., Laurel....	
Millsboro: From Highway into North State St. via old State Road over Betts' Pond	
King's Highway-Milford	
Sidewalk: Seaford toward Bridgeville	1.1 "
M. E. Church at Roxana to Selbyville-Roxana State High- way at junction of Frankford Road .....	.7 "

FINANCIAL STATEMENT The Secretary presented a detailed report of the financial transactions of the Department at the end of the fiscal year. I am attaching a summarized statement of Income and Expenditures for the period beginning December 1, 1932, and ending November 30, 1933.

INCOME

Balance November 30, 1932	\$548,255.43
Motor Vehicle Fees	970,605.25
Titling Fees	27,881.90
Gasoline Tax	1,127,413.42
Police Fines	43,363.84
Federal Aid	963,337.79
Miscellaneous Rentals and Reimbursements	17,213.13
Total Income	\$3,698,070.76

EXPENDITURES

Administration	\$41,083.43
Fixed Charges	
Sinking Fund on Highway Bonds	72,625.00
Interest State Highway Bonds	116,200.00
Interest New Castle County Bonds	118,705.00
Interest Kent County Bonds	84,812.50
Interest Sussex County Bonds	122,249.50
Town of Georgetown Bond Retirement	12,000.00
Maintenance	291,438.25
Plant and Equipment	43,267.83
State Police	145,339.99
Construction	2,128,833.22
	\$3,176,554.72
Total Expenditures	\$3,176,554.72
Balance December 31, 1933	\$521,516.04

In conclusion I wish to express my heartiest thanks to His Excellency, the Governor, the Chairman, and each Member of the Department for the many courtesies they have extended to me throughout the year.

I wish also to acknowledge the loyalty and faithful services of each of my assistants and those employees of the Department who have contributed so largely to making the work of the year a success.

Respectfully submitted,
W. W. MACK,
Chief Engineer.

DELAWARE STATE HIGHWAY SYSTEM
HARD SURFACE ROADS
Year Constructed or Acquired

Type of Roadway	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924
Conc. 14' to 20'	10.00	12.46	4.04	6.82	28.67	43.72	55.05	74.86	90.32	67.16
Concrete 9' .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brick .....	.....	.....	.....	3.05	2.95	0.14	.....	.....	.....	.....
Bit. Macadam	1.14	.....	.....	.....	.....	16.19	1.11	0.12	0.76	.....
Sand Asphalt .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Traffic Bound .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gravel .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sand Clay .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yearly Total	11.14	12.46	4.04	9.87	31.62	60.05	56.16	74.98	91.08	67.16
Total Miles to Date	11.14	23.60	27.64	37.51	69.13	129.18	185.34	260.32	351.40	418.56
Widening & Resurfacing .....	.....	.....	.....	.....	.....	.....	.....	0.34	0.52	.....
Dual Highway .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Surface Treatment of Secondary Roads .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sidewalks .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

DELAWARE STATE HIGHWAY SYSTEM
HARD SURFACE ROADS
Year Constructed or Acquired

89

Type of Roadway	1925	1926	1927	1928	1929	1930	1931	1932	1933	Total
Conc. 14' to 20'	72.56	70.85	22.76	20.63	13.99	20.55	21.49	10.35	8.30	654.58
Concrete 9' .....	.....	.....	7.30	20.35	19.72	21.48	44.49	11.57	12.38	137.29
Brick .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.14
Bit. Macadam	1.00	19.37	3.49	1.10	.....	1.20	.....	.....	.....	45.48
Sand Asphalt .....	.....	5.85	5.13	15.99	.....	.....	.....	.....	.....	26.97
Traffic Bound .....	.....	.....	.....	.....	14.67	18.32	15.70	34.93	116.80	200.42
Gravel .....	.....	.....	.....	.....	4.81	4.60	5.10	2.72	6.20	23.43
Sand Clay .....	.....	.....	1.20	.....	15.20	5.30	13.20	7.50	5.70	48.10
Yearly Total	73.56	96.07	39.88	58.07	68.39	71.45	99.98	67.07	149.38	.....
Total Miles to Date	492.12	588.19	628.07	686.14	754.53	825.98	925.96	993.03	1,142.41	1,142.41
Widening & Resurfacing .....	.....	10.67	16.95	6.04	0.20	18.90	18.00	11.07	56.90	139.59
Dual Highway .....	.....	.....	.....	.....	7.66	.....	4.91	10.94	7.35	30.86
Surface Treatment of Secondary Roads .....	.....	.....	.....	.....	.....	.....	.....	1.50	12.75	14.25
Sidewalks .....	.....	.....	.....	.....	0.05	1.04	14.44	6.91	3.12	25.56