State Aid for Public Highways

Civil Engineering

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STATE AID FOR PUBLIC HIGHWAYS

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I recommend that the thesis prepared under my supervision by JAMES GORDON WHITEM entitled State Aid for Public Highways be approved as fulfilling this part of the requirements for the degree of Bachelor of Science in Civil Engineering.

[Signature]

Instructor in Civil Engineering.

Recommendation approved

[Signature]

Head of Department of Civil Eng'g.
State Aid for Public Highways.

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I.

State Aid for Public Highways.

Introduction.

The purpose of this thesis is to classify and analyze the systems by which the various states give aid in the construction and maintenance of public roads.

There are five distinct methods of State Aid. (1) State Reward system, that is, a system of giving rewards to counties and townships for the completion of roads according to the State Highway Commission's specifications. This method is practiced in Michigan. (2) A system of giving free stone from state quarries and furnishing superintendence, specifications and plans for road work. This system also includes the building of experimental or object roads. This method is practiced in Illinois. (3) The payment of a specified part of the cost of road construction together with superintendence, specifications and design of road work. This method is practiced in Alabama, Arizona, Colorado, Delaware, Maryland, Minnesota, New Jersey, Utah, Virginia, Missouri, Connecticut, Louisiana, Maine, New Hampshire, Ohio, Wisconsin and Pennsylvania. (4) The total payment of the cost of some road work. This method is practiced in New York, Massachusetts, Washington, Idaho, and Rhode Island. (5) A system of paying an arbitrary amount on the cost of construction. This method is practiced in New Mexico, California and Vermont.
II.

State Reward.

The Michigan State Highway Department, by virtue of a law enacted in 1905, and amended in 1909, is under the charge of a State Highway Commissioner appointed for a term of four years by the Governor, with the advice and consent of the Senate. A recent change in the state law has made the office of State Highway Commissioner elective and in the year 1913 and every four years thereafter, the Commissioner shall be nominated and elected by the people at the same time and in the same manner as the justice of the Supreme Court.

The State Highway Commissioner receives an annual salary of $2,500. He may appoint a deputy at $1,800, who shall be a competent civil engineer, and also appoint such clerical force as his office may require.

The Highway Department compiles records of road building materials as to quality and location, prepares plans and specifications for roads and bridges, superintends the inspection of State Reward roads and keeps a record of highways built under the State Reward system. The department also holds road institutes for the purpose of discussing road improvement.

When the highways are completed for which the townships or counties wish to receive State Reward, they
are inspected by the commissioner or a deputy and if approved, the Rewards are given as follows:

Class A. For a clay gravel road, two courses each five inches deep; $250 per mile.

Class B. For a two course gravel road, eight inches in all; $500 per mile.

Class C. For a gravel base and macadam surface, seven inches in all; $750 per mile.

Class D. For a macadam bottom and gravel top, seven inches in all; $750 per mile.

Class E. For a two course macadam road, six inches deep; $1000 per mile.

All of these roads must be graded to a width of at least eighteen feet between side ditches, must be properly drained and crowned, and the metaling must be at least nine feet wide. No grades are permitted over six per cent.

In counties which adopt the county road system, the county levies a tax on all taxable property which is paid in cash. The expenditures are on such main lines of roads as have previously been adopted as county roads and are under the direction of county road commissioners. These commissioners are three in number, one being elected every two years for a term of six years.
All roads in counties which have not adopted the county road system, together with such roads as have not been adopted as county roads in counties under county organization, are under the supervision of township highway commissioners, who are elected for a term of one year. The township commissioners are assisted in their work by overseers, one of whom is elected in each road district.

Any township may apply for aid and build State Reward roads, whether the county has adopted the county system or not. All highway taxes are paid in cash.

All work done upon roads, except repair work, has in view the permanent improvement of the road. Before beginning any permanent improvement on a highway, the commissioner causes a survey to be made by a competent surveyor for the purpose of establishing both grade and alignment.

Table showing Annual Appropriations to the Department.

<table>
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<td>150,000</td>
</tr>
<tr>
<td>1911</td>
<td>150,000</td>
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The current expenses of the department have remained practically constant at about $10,000 and are included in the above amounts.
Table One.


<table>
<thead>
<tr>
<th>Class</th>
<th>Miles applied for</th>
<th>Miles built</th>
<th>Miles rejected</th>
<th>Miles pending</th>
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<th>Reward paid</th>
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<td>391,453</td>
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Free Stone and Superintendence.

Illinois. By provision of a law enacted in 1905, Illinois has a state highway commission, composed of three members appointed by the Governor. These three commissioners employ a State Engineer. The State Engineer employs an office and field force with an annual appropriation by the legislature. The annual appropriation was $100,000 in 1912.

Illinois has an original method of giving State Aid in the construction of roads. Material is furnished by the state under two general plans of co-operation between the Highway Commission and the township commissioners; (1) where only general supervision and advice is furnished and; (2) where machinery and constant supervision is provided. The latter is in the case of experimental or object roads. In the Highway Commission's report, an itemized estimate of the cost of construction of macadam roads under different conditions and specifications, is given. This estimate is based on work on experimental roads for four years, including 34 separate pieces of construction, involving about 40 miles of roads. The accuracy of the estimate is insured by means of careful daily reports of inspectors. These daily reports include the following:
Superintendence— The time of Highway Commissioners or other men employed by them to act as foremen.

Excavation— All labor, both men and teams, used to move material for roadway in wheel scrapers, slips or wagons, including plowing to loosen such material.

Shaping Road Bed— The cost of shaping the bed for the stone after it has been put roughly to shape, including all work done with a plow or road machine for this purpose, hand labor in truing up the road bed and shoulders and cutting laterals. Any work done on shoulders in connection with getting out subgrade should be reported under shaping road bed.

Unloading Stone— The cost of unloading stone, either from cars to wagons or cars to storage pile, for all sizes of stone.

Hauling Stone— With teams: The cost of team and driver engaged in hauling stone of any size, either from cars or from storage piles. With engine: The cost of operator for engine at $3.00 per day and stoker at actual rate of pay and cost of hauling water for engine. Coal, oil and miscellaneous supplies for hauling engine must be separately recorded but not reported under hauling stone with engine.

Spreading Stone— Work done with grader, harrowing and
hand spreading for all sizes of stone and for screenings, filling laterals and taking out depressions.

Trimming Shoulders and Side Roads—After lower course of stone is spread, shoulders are trued up for second course of stone. After second course of stone is placed, shoulders are again trimmed, ditches opened out, etc. All this work reported under this heading.

Rolling—Actual hours the roller works. If roller is equipped with odometer, reading of it must be reported also.

Loading Stone from Storage—Cost of loading stone of any size from storage pile.

On roads where a bituminous binder is used, the following items must also be reported:

Hauling Tar or Oil—Cost of teams and men used to manipulate the distributing wagon.

Spreading Tar or Oil—If material is spread by hand, report is made of the cost of such spreading. If a distributing wagon is used for spreading, this item is included with hauling tar or oil.

Cars Received—A table of the cars received is carefully kept. An allowance of two cubic yards is made for cars filled with a break.

Hauled—A report is kept of the yardage hauled, including
excavated material. Engine-hauled material is listed separately from team-hauled. This information is used to check the quantity of stone that the inspector is using per 100 ft.

The following bill was passed and approved by the legislature on June 3rd, 1907.

Section 1. Be it enacted by the People of the State of Illinois, represented in the General Assembly: That section 2 of an Act entitled, "An Act authorizing and empowering the employment of convicts and prisoners in the penal and reformatory institutions of the State of Illinois in the manufacture of tile and culvert pipe for road drainage purposes, and in the manufacture of machinery, tools and appliances for the building, maintaining and repairing of the wagon roads of the State, and for preparing road building and ballasting material, upon the requisition of the State Highway Commission," approved May 5, 1905, in force July 1, 1905, be and the same is hereby amended so as to read as follows:

Section 2. The commissioners of highways in any township in counties under township organization, or the commissioners of highways or boards of county commissioners in counties not under township organization, may make application to the said State Highway Commission for such road building material, tile, culvert pipe, road making machinery, tools and other appliances as may be needed or required by them for the construction, im-
provement or repairing of the wagon roads in their respective townships or road districts, and where by the
agreement of the commissioners of highways in counties under township organization, or the commissioners of
highways or boards of county commissioners not under township organization, as the case may be, with the city
council of any city, or the board of trustees of any village within the limits of such town, any gravel, rock,
macadam or other hard road is extended within or through the corporate limits of such city or village, then for the
construction, improvement or repairing of so much of said road as lies within the corporate limits of such city or
village, provided such extension within such city or village shall be of the same cost and kind of material
as the road outside such city or village, obligating themselves to use such material according to the rules and
regulations formulated and approved by the State Highway Commission.

Thus the law which formerly simply provided for the free distribution of stone by the State Highway Commission
to townships on application, has been amended by the above bill, so that this stone may be used within the corporate
limits of villages and cities; provided it is used in extending a road from the township into the corporation
and that the township officials give their consent for the material to be used.

There have been many towns applying in previous years
which have received no materials. The demand has always been in excess of the supply. Without doubt if the present plan is to be carried to a suitable conclusion and give all sections of the state an equal chance, additional quarries must be established. To this end a bill was introduced into the Forty-Sixth General Assembly which provided for additional quarry sites. The bill passed the House but failed in the Senate. On the present plan, quarries are run at no extra expense to the taxpayers, and the counties receiving the material do so at no extra expense in proportion to those who are not so fortunate.

Applications were received for crushed stone from 41 townships in 26 counties in 1908 and from 65 townships in 1909. The demand in 1908 was for 100,680 cubic yards and the supply in the same year was 120,240 cubic yards. The demand in 1909 was for 227,690 cubic yards and the supply was 136,789 cubic yards. Part of the output is used in the building of experimental roads. This supply is not considered in the above data as demand supplied.
IV.
Part Payment.

The most common solution of the problem of State Aid in road construction is the payment by the state of a certain part of the cost of construction. In general, we think of State Aid as financial aid, but we find that many states do not furnish financial assistance, but do supply designs, advice, supervision, etc., on road matters.

Under this form of aid, three subdivisions of this general method may be made; namely where the transaction is (1) between the State and County, (2) between the State and Township, (3) between the State and the County and Township.

I. Aid to Counties.

Under the general division of aid to counties, there are the following states which give financial aid: Alabama, Arizona, Colorado, Delaware, Maryland, Minnesota, New Jersey, New Mexico, Utah, Virginia and Missouri. These will be discussed in the order given above.

A. Financial Aid.

In Alabama the State Highway Commission was created by an act of the legislature in 1911. The Commission consists of five members: the professor of geology at the University of Alabama, the professor of engineering at Alabama Polytechnic Institute, and three men appointed by the Governor. The fund for State Aid amounts to $154,000 annually and is taken from the convict fund. $10,000 of this is used in expenses for the salaries of the engineers appointed by the commission.
and the expenses of the commission. The balance of
the appropriation is divided equally among the counties
of the state. The law provides that each county shall
have appropriated an amount equal to its allotment, before
it is eligible for State Aid. Plans for highway work
on which State money is to be applied, must be approved
by the State Engineer, and all State Aid work is super-
vised by him. The annual appropriation to each county
may be increased to $4,000 by the Governor if the con-
dition of the State Treasury permits it. In some
counties, the work is in charge of county commissioners,
and in others it is controlled by boards of revenue.
In both cases the officials are elected for terms of
two years.

A law enacted by the Arizona legislature in 1912
places the administration of state highway affairs in
the hands of the State Engineer who is appointed by the
Governor for a term of two years at an annual salary of
$3,000 and an annual expense account of not more than
$2,500. His duties are to assist the county commission-
ers in the selection and design of roads and bridges.
A State Road Fund is raised by a general tax and amounts
to $125,000 annually. 25% of the first year's fund is to
be expended in paying all claims approved by the State
Engineer and the Board of Control for work done under
the authority of the territorial government of Arizona
previous to July 1st, 1912.
The remaining 75% is apportioned among the several counties on a basis of the amount of taxes collected by each county for the road fund. The roads and bridges, after they are constructed, are maintained at the expense of the counties in which they are located, out of that county's share of the Road Fund.

Colorado.

State Highway work in Colorado, according to the law enacted in 1909, is under the charge of the State Highway Commission, composed of three members appointed by the Governor. They represent the eastern, central and western portions of the state.

The county is the unit in road work. Three county commissioners in each county, elected by the people, have charge of the road work. Upon petition of 35% of the voters of any county, that county may be divided into organized road maintenance districts, in which case the county commissioners may appoint county superintendents of roads to have charge of such road construction as the commissioners may direct.

The law of 1909 created a fund of $50,000 for use in the construction of State Aid roads and also to cover the expense of the commission. Under this law, one third of the cost of State Road construction is paid by the State. The work is done by contract under the direction of county supervisors, subject to the supervision of State Highway Commission.
Delaware. Under the laws governing highway work in Delaware, the counties may secure state aid to the amount of $10,000 per annum by appropriating a similar amount. Two of the three counties of Delaware have a State Highway Commissioner, and one of these two also has a County Road Engineer. The third county has a County Road Engineer alone. The Levy Court of each county has charge of all road matter, and may issue bonds or levy taxes to defray all road expenses.

Maryland. By virtue of a law passed by the Maryland legislature in 1910, the administration of state highway work is in the hands of a State Roads Commission which consists of the Governor, ex-officio, three citizens appointed by him, and two men designated by him from the State Geological and Economic Survey. The preparation of plans, specifications, etc., is in the hands of a chief engineer, employed by the commission. Under an act of the legislature of 1904, the sum of $300,000 is appropriated annually to be distributed among the counties in proportion to their road mileage. The county pays for the construction of all State Aid roads and collects a refund of one half the cost of construction from the state, after the completion of the work. An appropriation of $9,000,000 has been passed to pay for the construction of State Roads as distinguished from State Aid roads. The law provides for an annual expenditure of not more than $1,000,000, and also provides that
the work is to be completed, according to the present plan, on 1,200 miles of roads, by July 1st, 1918. $1,500,000 of this appropriation is to be used within the limits of the city of Baltimore.

Local road work is in charge of county commissioners elected by the people. The number in each county varies from three to seven.

An act passed in 1905 by the Minnesota legislature, and amended in 1911, established a State Highway Commission and authorized State Aid to counties. The commission consists of three members appointed by the Governor for terms of three years. They serve without pay. The active work is done by a secretary employed by the commission. The secretary must be a civil engineer experienced in road work, and is known as the State Engineer. His duties are to give advice and assistance in matters pertaining to highway and bridge construction, and to supervise state highway work. The annual appropriation for the State Highway Commission is $150,000. No county can receive more than three per cent, or less than one half of one per cent, of the total amount available for State Aid work. Boards of county commissioners are elected by popular vote in each county. Each board consists of five members and has control of road work, except in the plans, specifications and survey for State Aid roads, which work is done by the State Engineer.
New Jersey.

The state laws of New Jersey provide for a State Highway Commission, composed of the Governor, the Speaker of the House of Representatives, the President of the Senate, the State Treasurer, and a Commissioner of Public Roads appointed by the Governor. The Commission is authorized to employ a state highway engineer, four division highway engineers, and ten regular inspectors. Additional inspectors are appointed as their services are required in construction. The division engineers and the regular inspectors hold office under civil service tenure. State aid in road construction is extended to the counties under an act passed in 1891 and amended at various times since. County Commissioners must apply to the State Commission for permission to survey a road on which they wish State Aid. If the permission is granted, the County Engineer draws up plans and specifications which are subject to the approval of the County Board of Chosen Freeholders, and submits them to the State Commissioner. After the Commissioner's approval the contract is let by the County Board. Under a legislative act of 1912, the state pays 40% of the cost of construction, and the county the balance.

Each county elects a Board of Freeholders or County Commissioners who appoint a county engineer and a county supervisor of roads. The former has charge of construction work, and the latter has charge of maintenance work on roads.
A law passed by the legislature of Utah in 1909 provided for a State Highway Commission, to consist of the Governor, the State Engineer, the State Treasurer, and one member each of the faculty of the Agricultural College of Utah and the University of Utah. The duties of the commission are to select the roads to receive State Aid and to draw up plans and specifications for them as well as for local roads. The annual fund for State Aid is $97,000, and it is divided equally among the counties to pay a varying proportion of the cost of construction of roads. In counties having an assessed valuation of less than $2,000,000, the state pays 80% of the cost; in counties having between $2,000,000 and $4,000,000, the state pays 66.7% of the cost; and in counties of over $4,000,000, the state pays 50% of the cost.

A standard system of road construction is prescribed by law and applies to all roads in the state outside of incorporated cities and towns with reference to the relative width of side walks, tree space, curb lines, etc. The law authorized the use of convict labor on public roads. The use of county prisoners is subject to the regulations of the county commissioners, and that of state prisoners is subject to regulations established by the State Board of Correction.

The direct supervision of all construction work
is by the County Road Commissioner, who is appointed by the County Commissioners.

By virtue of an act passed by the Virginia legislature in 1906, a State Highway Commission was established. The commission consists of a state highway commissioner, appointed by the Governor, and the professors of civil engineering of the University of Virginia, Virginia Military Institute and the Virginia Agricultural and Mechanical and Polytechnical Institute, each designated by the board of visitors of their respective institutions. The state highway commissioner is appointed for a term of six years at an annual salary of $3,000.

By an act of 1908 and amended in 1910, an annual sum of $250,000 is appropriated for distribution among the counties as State Aid in highway improvement. The money is apportioned according to the respective amounts of state taxes paid by the counties. The cost of roads for which state aid money is provided is divided equally between the state and the county in which the work is done.

State convicts may be employed on roads as a form of state aid, but counties can not obtain both money aid and convict labor in the same year.

County road superintendents, appointed by the board of supervisors of each county, have charge of all highway improvement work. The superintendent is appointed for a two-year term in January of even years.
Under the provision of a law passed in March 1913, the administration of state highway work is in the hands of a state highway engineer who is appointed by the Governor. His term of office is four years and his annual salary is $2,400. His duties are to exercise a general supervision over the roads of his state, and to give advice wherever needed.

State aid in road work was authorized in 1907. A State Aid Fund is raised by general and special tax levy, and by a motor vehicle tax. The proceeds of the tax levies are distributed among the counties in proportion to the school attendance and those of the vehicle tax, according to the assessed property valuation. No county, district or city can receive more than three per cent of the total amount available for state road work in the state. The counties or districts pay one fourth of the cost of road construction, the citizens of the county or district pay one fourth, and the state pays one half up to the amount of the apportionment. Plans for all roads built by state aid and costing more than $1,000 per mile, must be approved by the state highway engineer.

Road administration in ninety-two of the counties is conducted by the county courts. The county courts are boards of three officials elected by the people. One member, the chairman, is elected for a term of four years, and the other two are elected for terms of two years.
This board appoints a county engineer whose term is two years. The county engineer has general supervision over all road and bridge work in his county. The county Court divides the county into road districts of not less than nine square miles nor more than one municipal township in area, and appoints a road overseer in each district. These overseers are responsible to the county engineer.

B. Aid by advice and supervision
Under the general division of aid to counties there are the following states which give aid in the form of advice and sometimes superintendence: Georgia, Kansas, Tennessee, West Virginia, and Wyoming. These will be discussed in the order given above.

A law creating a State Highway Commission was passed by the last session of the Georgia Legislature (1913). The law provides that the commission shall consist of the chairman of the State Prison Commission, the state Geologist, the Professors of Civil Engineering of the University of Georgia and the Georgia School of Technology, and one citizen appointed by the Governor. The commission is authorized to appoint a State Highway engineer to hold office for four years. His duties are to consist of giving advice and instruction in materials and methods to be used in road building throughout the state. The members of the State Highway Commission are to serve without extra compensation other than reimbursement for traveling and other expenses incidental
to attending of the meetings.. The annual salary of the State Highway Engineer is not to exceed $3,000.

Kansas.

The state laws of Kansas authorize the appointment, by the State Agricultural College, of a state highway engineer. This official is virtually in charge of a highway department established by the college, the functions of which are purely of an advisory character.

Tennessee.

A statute enacted in 1909 by the Tennessee Legislature created a State Commission of Public Roads, consisting of three members appointed by the Governor. The term of service is three years and the members serve without compensation. The commission investigates the work of the United States Government in the matter of public roads, and reports at each session of the legislature, making such recommendations as may seem proper.

One fourth of the entire assessment of each county for county purposes, is set aside by the county court and apportioned to the several districts in proportion to their road mileage.

West Virginia.

A law passed by the legislature in February, 1913, established a State Road Bureau, consisting of the professor in charge of the railway and highway department of the State University, who shall be the Chief Road Engineer and Chairman of the Road Bureau:
the director of the experimental station at the State University; and three members appointed by the Governor. This bureau is authorized to have supervision over all public roads as far as may be consistent with the authority over the roads already conferred on county courts by the state constitution.

The principal function of this bureau is to compile statistics, to aid county officials, and to advise them as to construction, improvements and maintenance of public roads. The bureau is also required to cause plans, specifications and estimates to be prepared when requested to do so by county officials.

A system of public highways to be built by convict labor under the authority and control of the state commission of public labor, was established by a legislative measure enacted in 1911. The State Engineer, appointed by the Governor for a term of six years, is charged with the direction of surveying and providing plans and specifications for these roads.

2. Aid to Townships.

The next division of State Aid to be considered is aid given by the State to the Township. The following states give financial aid to townships: Connecticut, Louisiana, Maine, and New Hampshire. These will be discussed in the order given above.

Connecticut.

By provision of a law passed in 1897 and subsequently amended, state road work is in charge of a State
Highway Commissioner, appointed by the Governor, with the consent of the State Senate. The commissioner is assisted in his duties by a deputy commissioner, a chief engineer, a superintendent of repairs, eight division engineers, and a corps of supervisors of repairs. A grand assessed value standard of $1,250,000 is the basis upon which State Aid funds are distributed among the townships. If a township has a value of more than this amount, the state pays 75% of the cost of construction and the township 25%. If the valuation is less than this amount, the state pays 87.5% and the township 12.5%.

Township boards of selectmen, elected by the people in October of each year, have charge of all road work. Plans and specifications and surveys are made by the division engineer in whose territory the proposed road is located, and the State Highway Commissioner determines the materials to be used as well as the location of the roads to be built.

A legislative act of 1910 established State Aid and placed the administration of state road work in the hands of the State Board of Engineers. A State highway engineer appointed by the State Board of Engineers at a maximum annual salary of $5,000 has active charge of the work. The State Aid fund is raised from a ¼-mill tax and a vehicle tax. It amounts to over $130,000 annually and is distributed among the townships as application is made with the limitation that no township shall receive
over $50,000 in any one calendar year... The total cost of all road work done under the State Aid act is paid by the State Treasurer from the State Aid Fund, and a refund of one half is made by the township in which the work is done. Convicts may be worked upon public roads without cost other than their maintenance.

The laws of Louisiana provide that the work of improving and maintaining roads shall be directed by township officials known as police juries, with the cooperation of the state highway department. The members of these juries are elected for a term of four years.

By virtue of a measure passed by the Maine Legislature in 1907, and amended in 1907 and 1909, a state highway commission and State Aid were established. The chief officer of the commission is the State Commissioner of Highways. He must be a civil engineer and is appointed by the Governor for a term of four years, at an annual salary of $2,500.

State Aid is granted on a sliding scale, determined by the assessed valuation of the property in the townships. Towns having a low valuation are favored in this arrangement. For instance, in a town having a valuation of $200,000 or less, the state pays 66.7%, but in a town having a valuation of $1,600,000, the state pays 42.8% of the cost of construction. The appropriations which may be made to towns are limited by law, the amounts varying from $200 for a town valued at less than $200,000...
to $1,000 for a town valued at $4,000,000, with an additional $100 for each $1,000,000 or fraction above this amount. The sum of $250,000 is appropriated annually for State Aid. State Aid is secured by petition of a majority of voters. If granted, the town board of selectmen advertises for bids, lets contracts, and purchases materials and supplies, and makes application for the allotment.

New Hampshire.

The road laws authorize the Governor and Council to exercise control over state road work. A law passed in 1905 established a state highway commission, the chief officer of which is now designated as the State Superintendent of Highways. He is appointed by the Governor and acts under the Governor and the Council.

State Aid is authorized by an act passed in 1905 and amended in 1909. Apportionment of State Aid funds is made among the towns on a basis of assessed valuation. Towns having a valuation of less than $100,000 receive 75% of the cost of construction, towns having a valuation of $100,000 to $250,000 receive 55.5%, towns having a valuation of $250,000 to $500,000 receive 37.5%, towns having a valuation of $500,000 to $1,000,000 receive 28.6%, towns of between $1,000,000 and $3,000,000 receive 20%, and towns of a valuation over this receive 16.7%. A limitation is set on the amount that each town can appropriate. This amount varies from $1.
on each $1,000 of valuation in towns of less than $2,000,000 valuation, to $0.25 on each $1,000 in towns of $15,000,000 and upwards.

The township is the unit in highway work. A road agent, elected by the people for a term of one year, has charge of all road work. The law provides that work may be done either by contract or by the town themselves, subject to the discretion of the Governor and the Council.

3. Aid to Counties and Townships.

The next general division is co-operation between the State, County and the Town. The States giving financial aid under this plan are Ohio, Wisconsin and Pennsylvania. These will be discussed in the order listed above.

Ohio.

A state highway department, divided into three parts, known as the bureau of construction, maintenance and repair, and bridges, respectively, was established by a law passed in 1911. The functions of the department are to afford instruction, assistance and co-operation in the construction and maintenance of highways and bridges in the state. The chief officer of the department is the State Highway Commissioner appointed by the Governor for a term of four years at an annual salary of $4,000 with an allowance of $1,200 for traveling expenses. Three deputy commissioners are appointed by the commissioner having charge of the actual work, one in each bureau. Their salary is $3,000 per year with $1,200 for traveling.
expenses. The State Highway Commissioner is authorized to appoint four division engineers in the construction department and two each in the bureaus of maintenance and repair, and of bridges.

County highway work is in charge of the county commissioners, three in each county. The executive highway officer of the county is the county surveyor. All county officials are elected for terms of two years.

Township trustees, three in a town, are in charge of township work. The trustees are elected by the people for terms of two years.

By the provisions of the 1911 law, State Aid is extended to counties, or to townships if the county of which they are a part, has not availed itself of the apportionment for the preceding year. If neither the county nor the township has applied for State Aid by a stated time, the state Highway Commissioner may make such improvements in the intercounty roads as may seem to him to be to the best interests of the public.

The fund for State Aid work is secured by a direct appropriation by the legislature and is divided equally among the counties. A tax levy of not exceeding $1 \frac{1}{2}$ mills on the dollar is authorized to pay for the county's share of the cost of road construction, and a levy not to exceed 5 mills for the township's share.

When State Aid is granted in conjunction with a county, the state pays 50% of the cost up to the amount of the county's portion of the appropriation.
of the county's 50%, 25% is paid by the county and 25% by the township in which the work is done. Of the township's 25%, the township as a whole pays 15% and the abutting property owners pay 10%. When State Aid is granted to townships, the state pays 50%, the township pays 35%, and the abutting property owners pay 15%.

Material is selected by the county commissioners, subject to the approval of the State Highway Commissioners. State Aid highways are maintained under the supervision of the State Highway Commissioner. The state pays 25% of the cost, the county 50% and the township 25%.

Wisconsin.

By virtue of a law passed in 1911, state highway administration is in the hands of a commission of five members consisting of the Dean of the Engineering College at the State University, the State Geologist, and three commissioners appointed by the Governor with the advice and consent of the Senate. The three appointed commissioners serve for six years. The commission appoints a state highway engineer. The commission has charge of the disposal of the state aid fund and acts in an advisory capacity as to local road work.

In order to obtain State Aid for roads, the county boards may either submit petitions, at the same time furnishing plans and specifications of the roads to be improved, or they may improve any road in such a way that it receives the approval of the commission, and then receive its share of the cost.
No county can submit plans for the improvement of over 15% of the county road mileage. Counties may set aside 10% of their allotments for maintenance. The state's share in the construction of bridges is 20% and of highways 33 1/3%. The county must pay at least 40% of the cost of bridges and 33 1/3% of the cost of highways, and may pay more if the county board so determines. The remainder of the cost is borne by the township in which the work is done. A tax of not more than 3 mills on the dollar may be voted to pay the county's share of the cost of state aid road work, or bonds may be issued for the purpose. A tax of not more than 5 mills on the dollar may be voted to pay for the township's share of the cost or bonds may be issued which must be for less than $400 per mile of road improved.

The State Aid Road Fund, amounting to $350,000 annually is appropriated. The portion each county receives is based upon the amount of state taxes the county paid in the preceding year.

County highways are in charge of county Boards of Supervisors in each county, elected for a term of one year. In order to receive funds under the State Aid Act of 1911, the Board of Supervisors must choose a county highway commissioner to supervise state aid construction and maintenance. His salary is at the discretion of the county supervisors, but must not exceed $600 per year. If the county board fails to elect a county highway commissioner,
the Board must by resolution request the state highway commissioner to take charge of the work, the county paying for the supervision.

Pennsylvania.

A law enacted by the legislature in 1911, authorizes the establishment of a state highway department, at the head of which is the State Highway Commissioner, appointed by the Governor for a term of four years, at an annual salary of $8,000. Two deputy commissioners are appointed by the Governor at a salary of $6,000. The Governor is also authorized to appoint a chief engineer at an annual salary of $7,000. The commissioner appoints an engineer of bridges, 15 assistant engineers, 50 superintendents of highways, and a staff of clerks and draftsmen.

The state appropriates $1,000,000 annually for state aid work. State Aid is extended to counties or townships upon petition by the county commissioners or township supervisors. The state pays 50% of the cost of construction of roads. Apportionment of the state aid fund is made among the counties and townships on a basis of road mileage. State aid roads are maintained under the supervision of the State Highway Department, and the state pays 50% of the cost.

The boards of county commissioners consisting of three members, elected for four year terms, are in charge of county work. Township supervisors, three in a township, elected for four year terms, have supervision
over township work. Township supervisors purchase machinery and materials, levy taxes and improve township roads either by contract or force account.

B. Aid by Advice and Supervision.

Three states employ the General plan of co-operation between State, Town and County, but do not give financial aid. These states are North Dakota, Kentucky and Iowa.

North Dakota.

By virtue of a law passed in 1913, a highway commission was created, consisting of the Governor, the State Engineer, and one member to be appointed by the Governor. All the members serve without compensation and the chief function is to furnish plans and specifications for the construction of road when requested by any board of officials. They also issue bulletins concerning highway construction and maintenance.

County commissioners, three in number, have charge of county highway work. Each county elects three commissioners to serve for four years.

Townships may also do their work by contract. All township work is in charge of the three township supervisors who are elected for three year terms.

Kentucky.

A measure providing for a State Commissioner of Public Roads to be appointed for a four year term was passed by the legislature in March 1912. The law provides for the employment of expert road engineers and appropriates $25,000 for the maintenance of the department.

The State Commissioner acts in the capacity of adviser
to the county and township authorities. Local highway work is under the general supervision of the county fiscal courts, consisting of county judge and justices of the peace from different sections of the county.

County road engineers are employed by the county courts after having passed a creditable examination before the state commission of roads. Highway improvements are ordered by the courts on the petition of the people residing along the line of the proposed improvements.

Money aid was formerly granted in Kentucky, and a considerable mileage of stone and gravel road was constructed under its provisions; but changes made in the constitution a few years ago prevented a continuance of the system under which it was conducted. Since that time there have been two attempts to restore money aid, but they have failed.

Iowa.

The State College of Iowa acts as a State Highway Commission. Devising plans and systems of highway construction and maintenance suited to the needs of the various counties and townships, and holding demonstrations at least once each year for the benefit of county and township road officials, constitute the province of the Commission. The work is in charge of a highway commissioner, two directors, and a consulting bridge engineer.

County work is supervised by the county supervisors and is in charge of the township trustees. All county
and town officials are elected by popular vote. The township officials may employ road superintendents to have charge of the work.
V.

Total Payment.

In the fourth division of the general subject of State Aid, we have classed the states that pay completely for the cost of construction of some of their roads. In this general class there are the states of New York, Massachusetts, Washington, Idaho, and Rhode Island.

New York.

By virtue of a law approved by the Governor, March 14th, 1913, state highway administration in New York is in the hands of a Commissioner of Highways, appointed by the Governor with the approval of the Senate for a term of five years at an annual salary not to exceed $10,000 a year.

He is authorized to appoint an auditor of the department and three deputies, known as the First, Second and Third deputy, respectively. Each of the deputies shall be an experienced road builder. The First Deputy is required to be a civil engineer, and his duties relate to the plans and specifications and the execution of all contracts pertaining to state and county highways. The duties of the Second Deputy relate to the maintenance of State and County highways; and those of the Third Deputy to the repair, improvement and maintenance of town highways and bridges, and county roads and bridges on the Indian reservations. The annual salary of the First Deputy shall be $6,000, and of the Second, and Third $5,000.
The Auditor receives a salary of $5,000 a year. The duties of the Auditor are to determine the authority for and the accuracy of all expenditures of the state highway funds. His report is referred to the State Comptroller for final audit.

The Commissioner of Highways has general supervision over all highways and bridges which are constructed or maintained in whole or in part by the use of state money. He determines the method of construction and maintenance of all public highways and bridges, and assists the county or town officials in establishing grades, systems of roads etc. He is also directed to determine upon the various methods of road construction; best adapted to various sections of the state. The Commissioner of Highways is authorized to divide the state into not more than nine divisions and to appoint a division engineer over each division. These divisions are not to divide counties. The Division Engineers must be practical civil engineers in highway and bridge construction. Each of these offices carries a salary of $4,000 per year. The duties of the office are to have general supervision of the construction and maintenance of the state and county roads in each division under the authority of the Deputy in whose jurisdiction the work lies.

The State Commissioner of Highways appoints resident engineers, district superintendents, clerks, officers, and other employees under civil service regulations.
The highways of the State are divided into three classes: (1) State, (2) County, (3) Town. State highways are constructed wholly at the expense of the state. County highways are constructed at the expense of the state, county and town jointly, the state paying 50%, the county 35% and the town 15%. Town highways are constructed at the expense of the state and town; the state's share of the cost being regulated by the amount of taxes raised for highway purposes by the town. The construction of town highways is in charge of town superintendents elected by the people every two years. They are subject to the supervision of the county superintendent.

A measure was carried by popular election in 1907 which provided for an issue of $50,000,000 in bonds for state highway purposes, $5,000,000 of the money thus secured is to be available each year for the expenses of the department. Another issue for a similar amount and purpose was authorized in 1912.

The repair and maintenance of improved state and county highways in towns, incorporated villages and cities of the third class are under the direct supervision of the State Commissioner of Highways. The work of maintenance or repair may be done by the Department of Highways either directly or by contract as the State Commissioner may decide.

The use of any material or article in the construction or repair of state or county highways is prohibited by law, except under circumstances making possible fair
competition.

Massachusetts.

Laws passed by the legislature in 1893 place the supervision of state highway work in the hands of a state highway commission consisting of three members appointed by the Governor, with the advice of the council, to serve for a term of three years. One of the members is designated as chairman. He receives an annual salary of $5,000, and the other commissioners receive $4,000. A chief engineer is appointed by the commission.

The duties of the Commission with relation to highways are to collect statistics as to road materials, to make maps, name highways, give advice to local road authorities, and to lay out and construct state highways and certain town roads.

In addition to its highway duties, the commission controls the registration of motor vehicles and the licensing of operators, and exercises supervision over telegraph and telephone companies, making recommendations upon schedules of rates and other matters relating to the business of the companies.

The highways of Massachusetts are divided into three classes: (1) State, (2) County, (3) City or Town highways. County and city or town highways are cared for by municipal authorities, street superintendents and highway surveyors, one to each town or municipality. These officers are elected at the annual town meeting. Purchasing power outside of cities is in charge of the selectmen of each
town, three in each town, elected annually by the people. Appropriations for construction and maintenance are made by the city government or at town meeting. County commissioners acting upon petition, may lay out new roads or make specific improvements upon existing highways. They have authority to direct a town or city to make specific improvements or to make the repairs themselves and determine what part of cost shall be paid by the municipality or town benefited.

Since 1894, state highways have been built at the expense of the state from the proceeds of bond issues. The roads are built upon the petition of town, city or county authorities. The state maintains such roads and has complete jurisdiction over them. The state highway commission may expend 15½% of the amount appropriated for state highway construction on town roads as follows: 5½% in towns less than $1,000,000 valuation, upon petition, the town contributing an equal amount; 5½% in towns of more than $1,000,000 valuation, upon petition, the town contributing an equal amount. The town maintains these roads.

The net proceeds of automobile licenses and fines go towards the maintenance and repair of roads, 80% for state roads and 20% for roads connecting towns and cities.

Rhode Island.

A legislative measure enacted in 1902 established a State Board of Public Roads, and authorized the laying
out of a system of state roads to be built and main-
tained at the expense of the state. The board consists
of five members, one from each county in the state,
appointed by the governor every year to serve for
five years. The members of the board serve without pay
other than a reimbursement of their traveling expenses.
The sum of $5,000 is annually appropriated for engi-
neering assistance and clerk hire. Surveys and maps,
together with recommendation for state road work, are
submitted by the board to the general assembly and that
body authorizes any work that it may approve and makes
appropriations to defray the estimated cost thereof.
The law provides that all roads built at the expense
of the state shall have a width of from 14 to 18 feet
and wider at corners, if the Board of Public Roads so
decides. Work is done by contract. Bids may be sub-
mitted by towns or cities for work done within their
limits, and preference is given such towns or cities if
their bids are no higher than those of individuals or
contracting firms. Towns are required to keep state
roads free from snow and ice.

The town is the unit in road work. Each town
maintains its own system of administration. Some towns
elect highway commissioners, while in others they are
appointed by the town councils. Appropriations for
town road improvements are made in town meetings and
each town decides whether road taxes shall be paid in
cash or statute labor.

Washington. State laws enacted in 1907 created a state department known as the State Highway Board, composed of the Governor, the State Treasurer, a state highway commissioner; and a member of the State Railroad Commission designated by the Governor.

The State Highway Commissioner is the chief executive officer of the board. He is appointed by the Governor for a term of four years at an annual salary of $5,000. His duties are to compile statistics relative to the public highways throughout the state, assist and advise local authorities and furnish them with the plans for the improvement of roads and bridges.

Two classes of roads come under the direct supervision of the State Highway Board: (1) State roads, which are built and maintained entirely at the expense of the state; and (2) State Aid roads, the cost of which is divided equally between the state and the county in which it is constructed.

A system of county government is established by law. A provision is made for township organization upon a majority vote of all the citizens of the county. The governing officials of the county are the county commissioners, of which there are three serving for two years. Unless the county is under township organization, the county commissioners divide the county into districts and
appoint a road supervisor in each district. The duties of the road supervisors are to keep the roads and bridges in their respective districts in repair, and supervise the highways generally under the direction of the county commissioners. A county engineer is elected by the people of each county for a term of two years. His duties are to make plans and profiles of all roads to be improved and to make recommendation as to the character of the improvement proposed.

A law enacted by the legislature in March, 1913, created a State Highway Commission consisting of the State Engineer, Secretary of State, and three other members appointed by the Governor. One member is to be appointed every year to hold office for three years. The function of the State Highway Commission is to have general charge of the improvement of state highways throughout the state. It is authorized to make requisition upon the Warden of the State Penitentiary for the services of convicts on the state highways.

The Commission plans a system of state highways comprising main trunk lines connecting the important trade centers and opening up connections between the large cities and the remote sections of the state. All state highways are constructed, improved and maintained at the expense of the state except where the highway is a thoroughfare of a city or incorporated village, in which case the construction and maintainance work is to
be done by the city or village.

The law provides that the counties are to be divided into districts which are the units in highway work. Highway commissioners are elected by the people in each district for terms of four years. These commissioners appoint a director of highways, who must be an experienced road builder. He inspects and oversees all work of construction, repair or maintenance in his district.

Bonds may be issued by county commissioners upon a vote of two thirds of the voters of a district. The amount of the bonds must not exceed 25% of the assessed valuation of the property of the district.
VI.

Arbitrary Payment.

The fifth solution of the problem of state aid is contribution by the state of arbitrary amounts for certain road construction. This practice is followed in California, Vermont and New Mexico.

California.

A law enacted in 1911 created a State Department of Engineering. All matters of road construction come under the control of this department. The Advisory Board of this department is composed of the Governor, the State Engineer, the General Superintendent of the State Hospital, the Chairman of the State Board of Harbor Commissioners of San Francisco, and three members appointed by the Governor. This board has the power to appoint a highway commissioner and superintendent. It has charge of all funds appropriated by the state for highway work and of all construction work on state aid roads. The payment for construction work varies and is decided by the Advisory Board.

Local road work is controlled by county supervisors, five in each county, elected by vote of the people, for a term of four years. The supervisors appoint a county surveyor, who prepares plans and profiles after location. Roads are located upon the recommendation of viewers who are appointed by the county supervisors.
Vermont.

By authority of a law passed in 1906, state highway work is in the hands of a State Highway Commissioner appointed by the Governor. Plans for road improvement are prepared by the State Highway Commissioner and the work is supervised and approved by him. State Aid in highway improvement was established by law in 1906. An annual appropriation of $200,000 is made for distribution among the towns.

The State Highway Commissioner has power to appoint a supervisor of roads in each county, who acts as his representative in that county.

Three selectmen and a road commissioner are elected every year in each town. The selectmen purchase road material and locate and establish roads. The town road commissioner supervises the work of maintenance on local roads.

New Mexico.

A law passed by the legislature in 1912 provides for a State Highway that shall have supervision over state road work. The commission consists of the Governor, the Commissioner of Public Lands, and the State Engineer. It is the duty of the commission to have general supervision over all roads and bridges constructed wholly or in part at the expense of the state.

State Aid is extended to the counties, and convict labor is authorized on the roads. The character of the construction work by the convicts is left entirely to
the State Engineer. Counties may co-operate financially in state aid work to whatever extent may be agreed upon by the County Road Boards and the State Highway Commission. Counties which contribute one half of the expense of state aid roads are given preference. The state provides for a State Aid Fund by an issue of $500,000 in bonds annually.

Local Road work is in charge of County Road Boards appointed by the State Highway Commission for three year terms. The duties of the County Road Board are to have general supervision over all county roads and collect the road tax which is payable in cash or labor. By provision of the 1912 law, counties are permitted to issue bonds for the construction and repair of roads within their limits. These bonds must not bring the existing indebtedness of the counties to more than four per cent of the value of taxable property within the county.
VII.

Conclusion.

Although we have discussed State Aid under only five classifications, there are in reality no two states with identically the same methods or organization. This is to be expected from semi-independent states differing in topography, population and politics.

Interest in road work is increasing everywhere. Probably the greatest cause of this is the growth of the automobile industry. Public interest in road work is a forerunner of state aid, and we now find State Aid, though sometimes only advisory, practiced in nearly every state. It is interesting to notice the anomalous development in state aid. The oldest or eastern states have done quite a little along this line, probably due to dense population, large trade, and short distances between cities. The very new states have begun with well organized methods of state aid, having been able to observe progress in other states. Intermediate states are either conservative or negligent, and have not done much in helping to build roads. Another noticeable feature is the tendency towards unity in method and greater liberality in state aid.

Primitive man improved the way for his own use. As civilization increased the community took charge of the highway construction. At present the states are bearing a share of the expense, and in all probability it will not be a long step into the future till we shall see federal aid on public roads.