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Highway Finance

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Highway Finance

*An Address Delivered at the Annual Meeting of
The International Chamber of Commerce
Amsterdam, July, 1929*

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*Vice President, Chamber of Commerce of
the United States*

WITHIN the past five years, the rapid increase in motor transportation in all parts of the world has made the question of improved highway facilities one of the largest internal problems now before public authorities.

There no longer exists any doubt among transportation economists, government officials, or business men, as to the necessity for roads. Socially and economically, events have demonstrated the efficiency of motor vehicles as an agency in transportation.

Modern business depends upon motor transport in a thousand ways. Modern life accepts it as an indispensable instrument.

We have only to pause for a moment to consider what would happen if every motor unit were suddenly taken away to realize how large a part it has come to play in our ordinary routine.

Highway Finance a Business Question

The issue, then, is one of obtaining funds to carry on the work of maintaining those roads which are already in existence and of developing new arteries which will be capable of sustaining the constantly growing volume of traffic.

Basically, highway finance is in no way different from the

financial problems which face any business man who has decided to embark upon the production of some manufacture.

The first question to be answered is that of what the market is.

The second, to plan a plant which will enable us to manufacture economically the kind of transportation which our customers—the public—desire.

The third, to determine upon a means of finance which will not make the cost of the article so high that the customer cannot afford it.

Selection of System First Step

The market for improved transportation facilities is universal so that we need not spend time discussing that phase here, but it is worth while to give some consideration to the character of the factory (our highway system) before getting into the matter of finance.

In every country, roads are so badly needed that from a sheer physical aspect it would be impossible to improve all of them at once. There must, then, be a selection of those which will serve the most uses and return the largest profits to the stockholders in our enterprise—again the public.

This can be readily accomplished through the medium of careful traffic surveys coupled with a consideration of the possible increases in traffic which would come from the development of well-located, economically constructed roads.

Once this information has been compiled, the problem resolves itself into one of obtaining the money with which to maintain roads already built, to construct or improve others, and finally to maintain them as well as those now in use. It is a prerequisite that this work be planned and directed by engineers well versed in the economies of highway transport. Otherwise money would be wasted either in under-development which would result in stagnation or unduly high operating costs, or in over-development which again would restrict the market.

In approaching the question of finance itself, the experience of the past is perhaps the best yardstick for the future.

Detailed Study Presented as Appendix

Through the courtesy of the United States Bureau of Public Roads and the cooperation of state highway department officials, a detailed study has been made for the purposes of this discussion which shows the historical development of highway finance in four widely divergent areas in the United States.

This material will not be read now but it will be presented to the International Chamber of Commerce as an appendix to my remarks and is recommended for study by those who must carry on the fiscal problems involved in highway finance.

My remarks will be largely pointed to the inescapable conclusions which this study of fact brings out, with the frank hope that other nations may find it possible to make use of the experience we have had during the period of rapid expansion of highway facilities to meet the demands of the motor vehicle and starting with conditions wholly different from some of the older nations of Europe. But these conditions were held in common with many nations—the almost entire lack of well surfaced highways, and the lack of adequate highway administrative organizations.

As these studies clearly show, the United States has gone through a long period of trial and error from which certain principles have emerged which are capable of world application.

Development in United States Not Anticipated

Speaking from the background of that experience, it may be pointed out first of all that it is extremely doubtful whether anyone in the United States had even the slightest sense of what highway work would finally develop into when the first crude beginnings of our present large building program were undertaken back in 1890.

At that time, we were just concluding a long era during which the ascendancy of the railroad had gradually brought into disuse those links of road which had first been constructed as toll roads or from forced labor, in the earlier days of the Republic.

The invention of the bicycle, followed by the appearance of curious looking horseless-vehicles, again focused attention on the roads and here and there local sub-divisions of government began to make tentative appropriations for minor improvement.

Roads Local Matter When Improvement Began

But everywhere the problem was purely local in character. The range of travel was extremely limited, there were no requirements for heavy type roads and there was no recognition of anything more than a local responsibility.

In the years from 1890 to 1916, motor vehicle use grew slowly but surely as the mechanical engineers perfected the vehicle. It was not until 1912 that there were 1,000,000 motor vehicles in the entire country and it was not until 1916 that production finally reached a point of 1,000,000 motor cars a year and motor transport finally came to be looked upon as a new agency of transportation which had come to stay.

During this period, the growing pressure of public demand for roads became so insistent that some of the states began to create state highway departments and the search began in earnest for funds with which to build roads. Even then, however, there was still no conception of a program of \$1,500,000,000 annually such as we have now and the man who proposed such a visionary project would have been laughed out of court.

Federal Government Began Cooperation in 1916

Finally in 1916 the national government recognized its responsibility to assist in the creation of a national system of roads by making a moderate, continuing appropriation to the several states. Steps were taken in the field of research to determine how and where roads should be built, the extent to which the country could afford to finance them, and to ascertain the best methods of distributing the cost burden. The organization of centralized highway departments with technically trained personnel was extended to include every state and the Federal Bureau of Public Roads was greatly enlarged and strengthened.

In the period that followed many and diverse methods were employed to obtain scientific methods of taxation but thus far no rigid formula has been developed and it does not now appear that any can be.

But as we have carried on, often at very large expense because of our lack of knowledge, gradually certain guiding principles have been developed.

Costs Less to Build Roads than to Go Without Them

Perhaps the first of these is the one so aptly stated by Thomas H. MacDonald, Chief, Bureau of Public Roads, when he said that "we pay for good roads whether we have them or not and we pay less if we have them than if we do not."

In other words, as our transportation needs increased, we have discovered that roads, good roads, are a fundamental necessity. Without them our communities cannot be developed, agricultural products cannot be moved. Consequently property valuations remain at a low ebb.

Almost the same statement applies to under-developed roads. Transportation costs remain abnormally high, the effective range of movement is cut down and not alone individuals but communities, even states, suffer economically and socially as a result.

Highway Bond Issues Essential

This brings us to a second cardinal principle which is that at the outset of its highway building program no locality or state can afford to pay for adequate road improvement out of current taxation.

Bonds cost more at the outset because they bring with them interest charges which at first sight seem to make the total charges excessive.

Yet it is a fact adequately demonstrated by repeated studies of methods of highway finance such as those contained in the appendix to these remarks that deferred charges are by far the less expensive when all factors are taken into consideration.

For one thing, it is evident that if there is only enough money available to build one mile a year, it will take ten

years to build ten miles of road. During virtually the entire period the community will be without transportation or will get it only through excessive operating costs.

Can a community afford to wait that long?

Roads Create Wealth as They Are Built

Again, roads create wealth and so pay for themselves. Many think that the United States has built roads because it was wealthy.

The reverse is true. The construction of roads so considerably enhances wealth as to far more than off-set the costs of expedited construction through the deferred payment plan.

From 40 to 60 per cent of the original cost of properly located roads is expended for permanent features. The salvage value of the surface is such that when reconstruction becomes necessary, it has been found that the total investment remains virtually unimpaired after a long period of service.

Finally, suppose that a community should agree to tax itself to the point where sufficient funds could be provided to build roads from current funds.

The first effect where this has been tried has been to build roads of a lower grade than the traffic justifies, with two immediate results. The state must pay unduly high maintenance costs because such roads deteriorate rapidly while the public pays unduly high operating costs. Even so, insofar as experience has gone in the United States, the results in the form of road mileage are inadequate.

Nation and State Should Share Costs

Another principle of major importance is recognition by the national and larger sub-divisions of governments of their financial responsibility in highway finance.

When the modern period of road building began, roads were regarded wholly as a matter of local importance only, and the responsibility for their administration and cost fell upon the local authorities and taxing units. To some degree local funds are still used but for the major roads in a constantly diminishing amount.

Yet, it requires no argument to show that motor transportation does not recognize political boundaries and that today it is far more than local in its operating aspect.

Every nation requires a main system of highways to connect its various centers of population and to act as a secondary system of transportation in times of emergency. Every state has a similar responsibility for those roads which are used largely by others than the owners of the land adjacent to the road.

Local Taxpayers Should Build Own Roads

It is both unfair and unsound to ask the local taxing unit to raise the funds for roads which are of general state-wide and nation-wide benefit.

These smaller taxing units soon reach a point where their financial credit is exhausted. They are then left without the means to build the secondary and tributary roads which are of local importance and necessary to connect the country side with the main arteries. The local funds should be reserved for these purposes and not exhausted in providing the main arteries.

Further, from a purely financial point of view the larger the taxing unit, the better its credit, the less the cost and the more likelihood there is of an efficient expenditure of the funds.

So that from every point of view, the nation and its principal sub-divisions should take over both the financial and administrative responsibility of those roads which have a national or state significance.

Roads Last When Properly Maintained

As for the type of deferred payments used, it is hardly necessary to add that serial maturities should be arranged so that the annual requirements of principal and interest will be as nearly uniform as possible.

With respect to the life of these issues, banking experience in the United States indicates that state highway bonds should not exceed 25 years with twenty year issues for localities.

Assuming proper maintenance of the road, which should be an absolute requirement at all times, there is no reason why the highway should not still be in service at the end of that period. Actually it is likely to be a much better road than when it was first built.

Tolls Not Acceptable Form of Finance

Turning then to the essential question of how these costs shall be distributed and what methods shall be employed to raise the funds; in the early experience of the United States the methods most generally followed were toll roads built by private corporations with or without public help and taxes in the form of day labor.

Neither method can successfully meet the demands of modern day needs.

The fundamental philosophy back of the road in the United States is to give service to the public at the lowest cost.

Toll roads add to the cost of transportation and create irritation among users. Unless the traffic is heavy they do not offer any great inducement to the investor. If the traffic is heavy it in itself is evidence of a sufficiently general public benefit to justify the expenditure of public funds for construction.

Further the existence of a toll road inevitably serves to retard the development of other roads from public expenditures, and frequently the company operating the road fails to keep it in any state of repair.

The result has been that virtually every toll road in the United States has been abolished and the whole trend of public opinion today is sharply opposed to these privately-owned barriers to transportation.

Taxes paid in the form of day labor on the road have always been wasteful and inefficient and could not be used in modern day development.

General Taxes Sound Basis for Improvement

The sources of revenue which are left then are taxes.

It was generally found in the United States in the beginning of the modern highway program, before there were many vehicles, that reasonable taxes assessed against general property and used to meet the costs of bond issues were the surest and most equitable means of providing revenue for roads of general use. This method was justified by the fact that such improvement benefited the entire public.

Discussion will be confined to these roads as against those which serve a purely local purpose because the latter obviously will require a lesser degree of improvement and since they serve only a local purpose their cost should be paid for by the local communities.

Motorist Has Accepted Moderate Special Taxes

As traffic has developed in the United States, the urge for better roads has been such that the motorist has been willing to waive the principle that since all benefit, all should pay alike for roads, and in order to secure roads has consented to special taxes levied against the motor vehicle.

Out of this, he has secured a more rapid improvement of the road than could have been had otherwise. This has resulted in an immediate and large saving in his operating cost which far more than offsets the tax. Perhaps more important, the range of travel has been materially extended.

Tax Has Been Held at Low Rate

From the outset, however, one of the basic principles adopted by the law makers was that of keeping this tax at a moderate figure, and a second was that since it was a special benefit tax, all of the funds so collected should be applied to the purpose of road improvement.

The net effect of these policies has been that while the tax per unit has been kept to a very low figure as the study which accompanies this statement will show, the constant growth in the number of cars has resulted in the motorist paying much of the cost of the roads which he uses.

Had the taxing policy at the outset been burdensome, necessarily it would have restricted the use of the vehicle and the country would not today have the advantage which it possesses of a large and mobile system of highway transportation.

Gasoline Tax Simplest and Most Effective

With respect to the types of taxes employed, there has been a wide variation, too wide in fact. At first a flat registration fee was used. Then as vehicles of different types, weights and speeds were developed for widely different uses,

efforts were made to discriminate between these types by various formula based on weight, horsepower, value and other factors.

In 1919, the State of Oregon developed a new tax in the form of a one cent per gallon levy on gasoline.

Almost immediately, other states took this proposal up and today every state in the United States levies a gasoline tax. The initial figure has been gradually raised until in some instances five cents is the figure, and there is even one state where six cents is collected.

The general opinion, however, is that five cents is the highest level which can be raised without making the burden one which will be felt by gasoline producers and the using public, and without resulting in a use of these funds for other purposes.

Gas Tax Fairest Measure of Road Use

From every point of view this levy has proved as little unpopular as a tax can be. It has the merit that the motorist pays it only as he uses the road. Consequently, it is not the deterrent to use that a flat tax imposed at one time may be. It measures fairly well the use made of the road since the heavier vehicle uses more gasoline than the lighter. It is easy of collection, inexpensive of administration, and while the amount per unit is not large the total has reached impressive figures.

Actually, it is a toll tax without the disagreeable features of that method and with the public receiving all the benefit.

In many states today, this fund is being used in part for the maintenance of roads already built and in part for the retirement of bond issues for construction purposes.

General Conclusions

Summing up this discussion, certain definite conclusions can be expressed as the experience of the United States in highway finance.

1. Highway transportation is an essential element in modern day life.

2. All benefit from road improvement directly or indirectly, consequently general taxes are justified for that

purpose, and should be the means of finance employed until motor transport develops to a point where supplementary vehicle taxes can be used.

3. The motorist receives a special benefit, hence supplementary special taxes on motor vehicles solely for road improvement are equitable so long as they do not constitute an undue burden on the individual.

4. The gasoline tax is the simplest and most equitable form of motor taxation but should not be relied upon wholly to support an adequate road program.

5. The benefits are so great that deferred methods of payment are actually less costly than an attempt to build from current taxes alone.

6. The nation and state have a direct responsibility in the financing of roads of more than local importance.

7. All road improvement should proceed under a rational plan of administration directed first toward the systematic development of the most important highways in each nation or sub-division.

8. The first step in any highway program should be to provide the public with communication. This can best be accomplished by adoption of a stage-construction policy by which the roads are improved to the extent necessary to allow traffic to use them and are raised to higher standards as the traffic develops.

9. Adequate maintenance is a pre-requisite to any successful highway program.

The adoption of these principles in full may not always be possible of immediate accomplishment.

Inertia, tradition, expediency, are always to be reckoned with. Local conditions may bring more practical alternatives to the fore in some cases.

The chief point is that insofar as experience in the United States may be of value, there is nothing in the whole range of highway improvement which finally is beyond the means of any nation. The fact is that actually none can afford to be without roads and motor transport under modern conditions.

Methods of Highway Finance in the United States

A study of the development of Highway Finance, prepared with the cooperation of the United States Bureau of Public Roads and State Highway Officials.

A RÉSUMÉ of the divisions of government and their scope of authority is essential to a thorough understanding of highway administration and finance in the United States.

There are five major political divisions:

1. *Federal*—The highest central authority comprised of the 48 states.
2. *State*—The largest independent unit under the Federal government. There are 48 states and the District of Columbia (Federal capital) in continental United States.
3. *County*—The largest unit within the state. Number more than 3,000.
4. *Township*—Largest unit within the county.
5. *Municipal*—Urban government.

The first four named groups participate in the improvement and maintenance of rural highways.

This interest has been a comparatively recent development on the part of the Federal and State governments due to the use of the motor vehicle.

History of Road Development

The recent major changes in rural highway development may be said to have occurred about 1890, 1916, and 1921.

At the earlier date the privately owned and operated toll road constituted the bulk of road improvement in the country. Traffic was light and composed of horse-drawn and other light vehicles.

The increasing popularity of the bicycle and dissatisfaction with the toll road led to a demand for more satisfactory road administration and thence to the creation of the first state highway department in 1891. Thus began the move-

ment toward centralization of road improvement and maintenance in public hands, accelerated by the introduction and increasing use of the motor vehicle.

Federal Government Aids in 1916

Lack of progress toward the building of a national connected system of roads at a time when the character of the traffic had changed completely and was making urgent demands for road service resulted in the passage of the Federal Aid Act of 1916. This action paralleled the action of the states in centralizing the important road-building functions in the larger unit.

Federal funds were now made available to aid the states in the construction of roads, contingent only upon the creation of a central state highway department to handle the funds.

Modern Road Building Only Since 1921

It was not until 1921, however, that really effective action was taken toward a correlated system of highways and their adequate supervision.

In this year an amendment to the Federal Aid Act was passed which required the state highway departments to designate not to exceed 7 per cent of their mileage as a system to be known as the Federal Aid 7% System.

Toll roads had practically all been abandoned or taken over by the states.

Road expenditures amounted to more than \$1,000,000,000 annually.

Development of Road Systems

The evolution in highway administration was accompanied by the classification of highways into two general groups:

(a) *State Highways:*

U. S. Highways
Federal 7% system
State system

Each of these is contained within the next larger system. The U. S. Highways are a limited mileage of the most impor-

tant roads in the nation on which the Federal and State Governments participate in uniform danger, direction, and information sign posting. Both groups participate in the construction of *Federal 7%* roads and the state constructs and maintains an additional mileage of roads completing the *state highway system*, which amounts to 10% of the total rural highway mileage.

(b) *County and Local Roads:*

These constitute the remaining 90% of the rural highways. The states cooperate to some extent in aiding the construction of county roads.

Administration

Federal

While the Federal Government does not build or maintain any highways, with the exception of forest roads and the maintenance of certain roads in the event of state failure to maintain them, nevertheless it exerts the greatest single influence toward high standards of construction, sound finance and adequate administration and engineering.

Limitation of Authority

By virtue of constitutional authority to participate in the improvement of "post roads" the Federal Government in 1916 agreed to assist the states in the improvement of roads that had been or might be used as post roads.

The states were required to create state highway departments.

Later amendments required the states to lay out a definite system mileage known as the Federal Aid system and to maintain these roads on which the Federal Government paid half the cost up to a limitation of \$15,000 a mile, except in public land states where the Federal Government may increase its share. The Federal aid plan is sometimes called the 50-50 plan, because of the supposed equal division of cost. In practice the Federal Government pays less than half due to the per mile limitation.

Procedure

To be eligible to receive Federal money, roads must be:

- (1) on the Federal aid system;
- (2) approved by the U. S. Bureau of Public Roads
 - (a) as to location;
 - (b) as to character of improvement;
- (3) satisfactory as to specifications after construction;
- (4) adequately maintained by the state after construction.

State

State highway construction and maintenance and co-operation with the Federal Government on the construction of the Federal Aid system is carried on through the State Highways Departments or their equivalent.

These departments are sometimes in the form of commissions with a varying number of members, or a division of a department of public works in charge of a single individual.

All state highways are under the complete control of these departments, which also assist to some extent in the building of secondary or state-aid roads.

County and Local

The board of county supervisors generally handles the building of county roads, sometimes under the supervision of an engineer employed for the purpose.

The township roads are usually in charge of a man elected for the purpose.

Source of Funds

Three general sources of funds are employed:

Taxation of real property,
Special taxes on the motor vehicle,
General revenues, such as income taxes, excises, business licenses, etc.

Bonds are a medium of financing; with the repayment of the principal and payments of interest, having their source in any one or a combination of the above revenues.

The following table shows the sources and amounts of money spent for rural highways from the period 1923 to 1927, inclusive: (See Appendix A for data by years.)

Bonds.....	\$1,293,789,939	19.5%	
Federal Aid.....	416,843,981	6.3%	
Motor Veh. Regis. Fees.....	1,228,087,272	18.5	}27.9%
Gas Taxes.....	625,185,302	9.4	
General Property Taxes.....	2,796,791,514	42.1	
All Other.....	278,117,599	4.2	
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	\$6,638,815,607	100.0%	

Less than half of these funds were expended on the state systems and the balance on the local roads.

The importance of the local expenditures may be seen from the figures for 1904, 1914, and 1927.

	1904	1914	1927
Expenditures by county and other local units.....	\$55,453,000	\$216,063,784	\$828,601,783
Expenditures under supervision state highway departments..	4,500,000	*24,220,850	699,875,182
	<hr/>	<hr/>	<hr/>
	\$59,953,000	\$240,263,784	\$1,528,476,965

* 11 States.

Thus, the states in 1904 controlled about 7 per cent of the rural road expenditures; in 1914 about 10 per cent and 1927 more than 45 per cent.

It will be noted that the states have assumed their importance but lately and that due very largely to the amount of motor vehicle tax receipts. *The bulk of the general property taxes for highways are raised and expended locally.*

Federal

Federal funds are appropriated from the general funds of the United States Treasury which are raised from internal revenue taxes, income taxes, customs duties and excises. There are no specific Federal tax levies for roads.

Annual appropriations have been at the rate of about \$75,000,000 a year with expenditures in excess of this, due to the fact that appropriations were greater than expenditures in earlier years and this surplus has not quite been exhausted.

There are no Federal bonds for highways.

State

The states derive the bulk of their funds from special taxes on the motor vehicle, from Federal aid funds and from bonds. A large part of the bonds are paid from the motor vehicle tax receipts, both as to principal and interest.

Less than 7 per cent of the state funds came either from direct state taxation for highways or from state appropriations in 1927.

State expenditures are now in excess of \$600,000,000 annually.

Some thirty-five states have issued highway bonds.

County and Local

Almost all of the county and local funds are raised by a tax on real property or by bonds which are paid from such taxes. Some funds, however, are derived from other general sources such as business licenses, there is some state-aid money, and in many states a share of the motor vehicle tax receipts is apportioned to the counties.

The counties and other local units early turned to bond issues as a means of financing their road improvement. More than \$3,500,000 of the funds expended in 1904 came from local bond issues. Today the counties of all but one state have used this means of financing road improvement.

The figures on bonds outstanding indicate the importance to the counties of this means of financing.

Bonds outstanding	1914	1922	1926
State.....	\$115,324,500 ¹	\$345,574,100 ²	\$681,145,795 ³
Local.....	229,438,582	876,738,200	1,386,338,683
	<u>\$344,763,082</u>	<u>\$1,222,312,300</u>	<u>\$2,067,484,478</u>

¹ 11 States.

² 21 States.

³ 35 States and counties of all states but North Dakota (47).

Taxation of the Road User

(See Appendix "F")

The motor vehicle—on the main roads at least—has become the sole user.

For this reason, two forms of special taxes are levied on the user for purposes of road improvement and maintenance:

- (1) The registration fee—originally levied as a regulatory rather than a revenue measure;
- (2) gasoline taxes, solely revenue producing. These range from 1¢ to 6¢ per gallon, with the average about 3¢.

These are levied by the state governments and may or may not be apportioned in varying degrees to the counties or other local units. In some instances a small portion of the gasoline taxes goes back to the cities.

The average registration fee for the United States is about \$13. This provides each vehicle with its state identification tags which entitle it to reciprocal use of all rural roads, subject only to payment of the gasoline taxes.

There has been a steady upward trend in the amount of the registration tax, but even today it is moderate in amount. The same applies to the gasoline tax, which, however, has increased much more rapidly and due to the ease of application and collection has led to some diversion for other than road purposes.

The average gasoline tax is approximately \$5 per year per penny of tax. The average for the country is about three cents; hence, the average gasoline tax payment per vehicle for the year amounts to \$15.

The rate has been raised to 6 cents in but one state and preliminary data indicates that 5 cents is about the maximum productive rate. During the present year three more states will levy this tax at which time all states will be levying such a tax.

Policy of Moderate Rate Effective

The levy of a moderate average special tax at a time when roads were only fair and registration small has proven most successful. It has resulted in a wide use of the vehicle and the use of the money on the roads has satisfied the user. The long time result has been a widespread use of the motor vehicle which has produced a tremendous amount of tax revenue in the aggregate.

The levy of these special taxes has been closely held by the states, although a few counties and cities levy special registration fees. They are greatly in the minority, however.

Thirty-six states classify the motor vehicle as personal property and tax it as such.

There are no Federal taxes on motor vehicles.

Policies of Highway Finance

As previously noted, rural highways prior to 1890 were financed either privately as toll roads, or by the counties and other local units.

With the creation of state highway departments, however, the taxing base was greatly enlarged and the policy of state responsibility for the main roads was established.

This was carried one step further with the participation of the Federal Government which has stepped in to help the states provide a national system.

Out of the various methods and practices of highway financing there have evolved two general policies:

- (1) the bond plan;
- (2) the "pay-as-you-go" plan.

(1) The former provides for the assumption of indebtedness for the immediate provision of highway facilities. The bonds are paid as to principal and interest from a tax on real property, from motor vehicle tax receipts, from the general revenues of the state or county or by a combination of these.

While the Federal Government has issued no bonds for highway purposes, the states, counties, townships, and a grouping of these units into districts have used bonds extensively, even as far back as Revolutionary days.

The bonds have been found to be of the greatest value where the traffic demand has become acute at a time when current revenues were entirely inadequate to meet the demand. The payment is then spread over the period of the road's earning power and is also more evenly divided.

General experience with bonds has demonstrated the wisdom of the serial bond which is now the most popular type, issued to mature within 20 to 30 years as a maximum.

To meet state constitutional requirements where the bonds are paid for from motor vehicle taxes, it has sometimes been necessary to guarantee the state real property tax levy to meet the interest and principal payments, due to the newness of the proposition of using only motor vehicle taxes for this purpose. The guarantee of the state tax resources also has aided the sale of the bonds to the extent that they seem to have a greater security should future legislatures revise the motor taxes, fuel substitutes be brought into use or the vehicle rendered obsolete.

The interest and principal payments are arranged to fall as equally as possible over the years of maturity, i. e., the interest payments will be larger in the earlier years, hence retirements are on an increasing scale.

Where the bonds are paid from real property taxes the use of the bonds to provide the roads immediately is reflected in increased property valuation and availability of

the land. Where the vehicle pays the bill the lowered operating costs made possible by the immediate use of the facilities represent the earnings on the investment. Both factors are, of course, present at the same time.

(2) The *pay-as-you-go* plan simply means the payment for all road facilities from current revenues.

In general, the pay-as-you-go plan may be said to have proven inadequate in the United States for two reasons :

- (1) The state either failed to recognize or to accept its responsibility for a central system of highways too late to make satisfactory progress with current revenues.
- (2) The time element in traffic demand. This arises from the fact that even in states where road building was begun early, the facilities were designed for an entirely different traffic than became evident about 1916 and 1917. In these states heavy reconstruction was as necessary as was the addition of new construction and current revenues here again were simply not adequate.

A third situation arises in instances where many states claim to be on a pay-as-you-go basis and are in the enviable position of having no state debt. A closer analysis invariably reveals that the state roads were built at county expense. The counties were faced with the actual traffic before the state took over responsibility for the roads and issued bonds to build the roads. These were later taken into the state system, but the counties were still left to pay the bonds and to provide new mileage as traffic continued to increase on the secondary roads.

There is evident a tendency of late, however, for the state to (a) reimburse the counties for moneys spent on roads taken into the state system or (b) to guarantee such reimbursement where the counties wish to advance the money and build more rapidly than the state can proceed.

Test of Adequacy of Systems

The traffic analysis has been widely used and accepted as the clue to road importance. Traffic volume now indicates the type of road needed and thus the expenditure justified. There is no need today either to over-improve or to under-improve any road.

The density of automobile registration also gives some indication of the volume of traffic which the roads of a state

as a whole are called on to carry. By the same token the volume on the state system indicates whether the system is properly balanced as to mileage and types of mileage. There may be roads on the systems as originally laid out that should be dropped and, conversely, there may be county and metropolitan area roads that should be assumed by the state.

Such analyses often result in stage construction or the development of the system under traffic. In this instance, as large a mileage as possible is put under maintenance. As traffic develops, the necessary grading and drainage for ultimate high type improvement is put in. The surfacing is advanced in type as the increase in traffic requires, thus utilizing all the previous investment.

Engineers have developed in practice that the types of surfaces required in general for initial construction, based on average daily traffic count, are as follows:

- 0 to 100 vehicles, earth.
- 100 to 300 vehicles, selected materials, sand-clay, topsoil, etc.
- 300 to 500 vehicles, gravel.
- 500 to 1,500 vehicles, surface treated gravel, macadam, bituminous macadam and other intermediate types.
- 1,500 and more vehicles, bituminous concrete, brick cement concrete and other pavement types.

These are not set up as rigid specifications, but are applied as indication of the investment justified.

Policy of Financing Varies with the State

The wide variations in conditions in the different states and localities, the varying status of road development or neglect, resources to be drawn upon, existing debt or tax burdens, political and highway engineering and administration, and the vision, experience and efficiency of public officials, and the citizenship back of them, combine to make the problem of highway financing one that may differ materially with each state or locality.

For this reason an analysis has been made of four typical states—Connecticut, Maryland, Illinois and Nevada.

Connecticut (Appendix B)

Connecticut was chosen as the most nearly representative of the pay-as-you-go states.

It is a state of dense population, largely urban (80 per cent city population) and industrial, in which highway improvement began early in the period of motor vehicle development and has progressed gradually and concurrently with the growth of traffic, financed entirely with current revenue. This was almost entirely derived from tax levies on real property until motor vehicle revenues developed. The counties were not called on at any time to provide more than a very small amount of funds, and lately for none at all.

The early traffic was light and the roads were built cheaply to meet the current demand. Although the state recognized its responsibility fairly early, there was no early planning of a definite system, with the result that the establishment of such a system about the time a heavy traffic demand set in resulted in a heavy program of reconstruction.

Current revenues were utilized to such an extent for the construction of roads that maintenance funds were limited. Since the establishment of the state system in 1913, the reconstruction demand has been practically equal to the new construction.

Such is the situation even today when the current revenues are three times what they were in 1913.

Thus the state has faced (1) high road maintenance costs, due to the need for keeping roads in service as long as possible; (2) an inadequate surfaced system of roads due to lack of funds; (3) high motor vehicle operating costs because of (2).

Maryland (Appendix C)

Maryland represents a somewhat similar condition but a different solution, in that its arterial system was financed entirely by bond issues based upon levies on real property with motor vehicle revenues reserved for maintenance.

A state system was laid out early—in 1908—and bond funds devoted to the completion of this system, which was

accomplished by 1918. Then a large additional mileage was added which has since been completely improved.

Due to the fact that motor vehicle revenues were reserved for maintenance, roads have been adequately kept up and a policy of heavy reconstruction adopted which has resulted in bringing such roads up to the standard of modern new construction. There has been practically 100 per cent salvage of the old roads with road service to meet the demand when the new traffic developed.

Illinois (Appendix D)

Illinois is a state in which the systematic improvement of the highways was deferred until traffic had reached an advanced state of development, necessitating an accelerated program of construction, and in which the need was met by the issuance of bonds financed by vehicle taxes.

All construction on the state system has been of high type, thus insuring low maintenance costs and low vehicle operating costs as the roads become available.

The first system laid out in 1917 was later enlarged and additional bonds issued.

While the bonds will probably not suffice to complete the system, yet construction has been advanced to a point where the motor vehicle tax receipts (with the addition of a three-cent gas tax August 1) will carry the principal and interest on the bonds, maintain the roads, and yield a surplus adequate to finish the system on a pay-as-you-go basis within a reasonable period.

Nevada (Appendix E)

Nevada is a state of large area and sparse population, where nearly 80 per cent of the area is in public lands, distances are great and the traffic is light.

The state did not create a state highway department and lay out a system until 1917 when the Federal Aid Act required such a department to receive Federal funds.

These Federal funds have averaged more than half the total revenue, supplemented by motor vehicle taxes and taxes on real property.

At the present time, Federal aid may amount to 87 percent of the expenditures on the Federal Aid System in the state, due to an amendment which makes allowance for the public land which is non-tax producing.

A large mileage of low type surface roads has been built, adequate to serve a traffic which is light, and a large portion of which is trans-continental.

Comparative Results of the Four Policies

A comparison of data for these four states shows the following:

	Connecticut	Maryland	Illinois	Nevada
Motor vehicle registration	310,000	285,000	1,504,000	27,376
Total highway mileage	14,000	14,800	97,000	22,000
State highway system mileage	1,970	2,520	9,800	3,552
Mileage state system surfaced	1,851	2,520	5,068	1,319
Percent of state system surfaced	94%	100%	51%	40%
Percent total roads in state system	14%	17%	10.2%	16%
High type mileage on state system	730	1,030	5,060	78
Percent of state mileage in high type surface	37%	41%	{ 51% }	2%
Motor vehicles per mile all roads	22	18	{ 32%* }	1.2
Motor vehicles per mile state system	157	113	{ 15 }	8
			{ 152 }	
			{ 100* }	

* Figures when adjustment is made to bring Illinois state system up to average of the other three states.

Thus, based on the number of vehicles per mile of all highways and per mile of state system, Connecticut does not appear to rank high enough in mileage of high type surface on the state system.

Another basis of comparison is on the investment per mile in present systems. Thus:

	Connecticut (1895-1927)	Maryland (1898-1927)	Illinois (1913-1927)	Nevada (1917-1927)
Total expenditures on state system to date!	\$93,142,031	\$89,861,566 ²	\$260,000,000 ²	\$19,516,000
Ave. investment per mile of surfaced state road. (See footnote)	36,000	25,300	26,000	14,000
Ave. maintenance charge per mile state roads and bridges. (1927)	2,200	1,568	360	93
Investment per motor vehicle	300	315	170	710

¹ All expenditures including construction, maintenance, administration, etc.

² Interest payments all bonds to maturity.

FOOTNOTE:

Correction is made for types by multiplying high type surface by two and adding the low type surface, thus putting all states on a basis of low type mileage. This figure represents all expenditures, including maintenance, etc.

Summary:

Experience in the United States points to the advisability of:

- (1) Centralization of responsibility for road improvement;

- (2) Creation of a system, based on traffic analysis;
- (3) Adoption of proper financial program considering;
 - (a) condition of roads,
 - (b) availability of funds,
 - (c) earning power of the roads to be built.
- (4) Sound engineering and administration.

APPENDICES

- A Rural highway income by sources 1904-1927**
- B Survey Connecticut highway financing**
- C Survey Maryland highway financing**
- D Survey Illinois highway financing**
- E Survey Nevada highway financing**
- F Motor vehicle registration fee and gasoline tax receipts
by years**
- G Sources state highway income 1927**
- H Sources county and local highway income 1927**

APPENDIX A

Rural Highway Income by Sources

Year	Bonds	% of Total	Federa Aid	% of Total	Motor Vehicles Fees	Gasoline Taxes	All Motor Taxes	Genera Property Taxes	% of Total	Miscellaneous	% of Total	Total
							% of Total					
1904..	\$3,530,470.93 ¹	.....	.....	.....	.....	.....	.....	\$56,422,710.64 ³	.....	.....	.....	\$59,953,000.00
1909..	.....	.....	.....	.....	\$938,860.00 ²	.....	.....	.....	.....	.....	.....	.....
1913..	.....	.....	.....	.....	8,192,253.00 ²	.....	.....	.....	.....	.....	.....	187,524,193.00
1914..	.....	.....	.....	.....	12,332,031.00 ²	.....	.....	.....	.....	.....	.....	240,263,784.00
1915..	40,000,000.00 ¹	.....	.....	.....	18,000,000.00 ²	.....	.....	208,976,399.00	.....	.....	.....	266,976,399.00
1916..	.....	.....	.....	.....	25,865,369.00 ²	.....	.....	.....	.....	.....	.....	.....
1917..	.....	.....	.....	.....	37,501,233.00 ²	.....	.....	.....	.....	.....	.....	.....
1918..	.....	.....	.....	.....	51,447,419.00 ²	.....	.....	.....	.....	.....	.....	.....
1919..	.....	.....	.....	.....	64,697,255.00 ²	.....	.....	.....	.....	.....	.....	64,697,255.00
1920..	.....	.....	.....	.....	102,546,212.00 ²	.....	.....	.....	.....	.....	.....	500,000,000.00
1921..	438,109,273.00	38.1	\$79,333,226	6.0	118,940,706.00 ^{2a}	\$3,635,460.00 ^{2a}	.....	415,680,010.00	36.2	93,689,221	8.2	1,149,437,896.00
1922..	.....	.....	.....	.....	117,028,824.75 ^{2a}	11,923,442.61 ^{2a}	.....	.....	.....	.....	.....	898,352,302.00 ⁴
1923..	216,969,157.00	20.9	72,343,401	6.9	182,793,998.00 ^{1a}	20,010,285.00 ^{2a}	19.5	482,790,793.00	46.5	63,782,852	6.2	1,038,690,396.00
1924..	259,190,271.00	22.4	91,400,832	8.0	201,673,149.00 ^{2a}	64,782,017.00 ^{2a}	23.0	503,153,549.00	.....	37,564,169	3.2	1,157,763,987.00
1925..	285,815,138.00	21.2	92,180,406	6.8	246,390,601.00 ^{2a}	114,162,319.00 ^{2a}	26.7	569,875,742.00	42.3	39,018,000	3.0	1,347,442,213.00
1926..	259,554,653.00	17.0	80,459,671	5.3	297,715,804.00 ^{2a}	209,551,700.00 ^{2a}	33.5	599,214,726.00	39.8	68,712,386	4.6	1,515,208,940.00
1927..	272,260,720.00	17.3	80,459,671	5.1	299,513,810.00 ^{2a}	216,678,981.00 ^{2a}	32.6	641,756,704.00	40.6	69,040,192	4.4	1,579,710,078.00

¹Local bond issues.

² Total gross receipts.

^{2a} Amount available for highway work.

³ Includes state funds on state aid roads.

⁴ Does not include bond interest and principal payments.

APPENDIX B

Connecticut

Area (sq. miles—46th in rank).....	4,965
Population (1925 est.).....	1,531,255
Population per square mile.....	306
Total highway mileage.....	14,000
State highway system mileage.....	1,970
Total motor vehicle registration.....	310,000
Average motor vehicle license fee.....	\$23.80
Average gasoline tax payment.....	\$11.20
Average investment per mile state surfacing.....	\$36,000 ¹
Average cost per mile for maintenance.....	\$2,200
Date establishment state highway department.....	1895
Date establishment state highway system.....	1913

Connecticut is a state of dense population, predominantly urban and industrial (more than 80 per cent of the population in cities). Highway improvement began early in the period of motor vehicle development and has progressed gradually and concurrently with the growth of traffic, financed entirely with current revenue. It is probably the most representative of the "pay-as-you-go" states.

While the state early began road improvement as a unit it was providing for a light, slow moving traffic. As a result the state in latter years has faced a very heavy program of reconstruction coincident with a very large demand for expansion of its main road system.

The location of the state between New York, Massachusetts and Rhode Island has at the same time resulted in a heavy movement of interstate traffic on Connecticut highways.

Created One of First State Highway Departments

Connecticut first created a State Highway Department in 1895 which undertook the improvement of the main roads, known as state-aid roads, in cooperation with towns and counties until 1913, when a trunk line system of roads was established.

Road improvement was largely in the hands of the counties and local units and financed from local property taxation until about 1913.

Private toll roads were rather extensive but as the state

¹ Converted to low type.

assumed more and more responsibility these were absorbed in the state system.

State-Aid Principle Adopted

State participation in road financing began with the paying of one-third of the cost of roads approved by the state for construction under such assistance; the towns paid one-third and the counties one-third. The towns maintained the roads.

In 1897 the counties were eliminated and the towns and the state shared equally in the cost of improvement. In the same year there was recommended the creation of a definite system of highways.

In 1899 the town share for construction was further reduced.

In 1907 the movement toward a trunk-line system began with agitation for the joining together of the state-aid roads.

In 1911 the state took over the cost of repairs to trunk-line roads, but the trunk-line *system* was not established until 1913.

Trunk-line System Constructed and Maintained by State

While the state undertook the responsibility for the construction and maintenance of a trunk-line system of roads in 1913 the policy of state-aid roads was also kept in force. In 1923 the state agreed to maintain and reconstruct state-aid roads on an equal basis with the trunk-line roads.

Motor Taxation

(Table 1)

Motor vehicle registration did not begin until 1903 and then was not considered as a revenue measure.

Since then, however, the registration fees have been consistently raised in an effort to produce more revenue for highway purposes. This was particularly true of the trucks which were steadily increased by every session of the general assembly from 1911 to 1917.

The gasoline tax was added in 1921, but used for the General Fund until 1923.

The average payment is considerably above the U. S. average, amounting to about \$35.00 per vehicle to the U. S. average of \$25.00.

Motor tax receipts were turned into the general fund of the state until 1908, and did not apply specifically to road work.

1913 Turning Point in State Obligation

The establishment of the trunk-line system in 1913 meant the immediate expenditure of more funds.

At that time less than 6 miles of state roads were improved with the more modern types of surfacing. The total length of improved roads was 924 miles of which 272 miles were merely graded and the balance surfaced with macadam or gravel.

The total state expenditures for state-aid roads and trunk-line roads from 1895 to 1913 had been \$7,302,000. Nearly half as much as this was spent in the one year 1913, largely derived from the taxation of real property.

General Tax Funds Used for Highways

While the state expenditures for road construction were limited to very small amounts annually during the years before 1913, the funds were entirely derived from general taxes. Total expenditures did not reach \$1,000,000 annually until 1910. Motor taxes in that year amounted to \$160,000.

Three Sources of Revenue

The state has drawn on general taxation for a considerable portion of the highway funds, supplemented after 1916 by Federal Aid, and from 1913 on by an increasing amount of motor vehicle taxes.

State Shifted Burden to Road User

The state policy has been one of shifting more and more of the burden to the road user. This is borne out by the fact that since 1913 the maintenance and reconstruction of

trunk-line highways has been financed from motor vehicle receipts. From 1907 to 1923 the maintenance of state-aid roads was financed from general appropriations, but since the latter date has been provided for from motor vehicle tax receipts.

The taxes on the motor vehicle have been consistently increased as noted above.

A comparison of the annual state highway department expenditures with the motor vehicle tax receipts indicates how close these receipts come to the total of highway expenditures.

Limited Funds Increased Costs

It is apparent that high road maintenance costs are a direct charge upon the road user in that his taxes are required to meet such charges. In addition high vehicle operating costs resulting from inadequate facilities constitute another direct cost.

A transport survey conducted jointly by the U. S. Bureau of Public Roads and the Connecticut State Highway Department in 1922-23 sets out these two points rather sharply:

"The old roads have been widened and strengthened, maintained to the limit of their serviceable life, and replaced as rapidly as possible with more adequate surfaces. The earlier investment has been salvaged to the fullest degree possible, and there are few, if any, instances in which it appears that the type of road constructed has been superior to the need. On the contrary, it may be said that an effort has been made to prolong the service of the old roads beyond their economic life with consequent heavy expense. Yet the limited funds at the disposal of the department at all times have doubtless permitted no other course. The same limitation is responsible for the fact that there remain on some of the most important roads sections of considerable length in the aggregate which are entirely inadequate for the present traffic . . ."

Later on in the same report:

"As a result of the imposition of the gasoline tax in 1921 and the increase in license fees in the same year, the revenues obtained from those sources now constitute a fund sufficient to cover more than 70 per cent of the current gross highway expenditures of the state and over 90 per cent of the net expenditure after deduction of the refunds paid by the towns. There are few states in which the tax payment per vehicle is as great and few, therefore, in which the motor vehicle owners may more justly lay claim to adequate highway service.

"To supply such service the highway commissioner estimates that it will be necessary to rebuild nearly 1,300 miles of the state

system by 1930. As only 563 miles have been reconstructed during the entire period since 1913, it is evident that the state highway budget must be greatly increased to do the work planned.

"The state is now confronted with a situation in which it is necessary to augment the funds at its disposal in order to provide for essential reconstruction of existing roads, and it is a question whether they can be further increased without encountering serious resistance. Certainly the motorists can not be counted upon to raise more than a small portion of the additional funds required. Yet, unless funds are made available from some source to complete the program outlined by the highway commissioner, the maintenance of the existing roads will quickly become an even greater burden."

System Constantly Expanded

In 1913 there was a net mileage of 924 miles of state highways, of which 605 miles were trunk-line highways and 319 miles state-aid roads.

This mileage has now grown to a total of 1,966 miles, both trunk-line and state-aid which have now almost entirely lost their identity.

These additions have also been a factor in the added burden upon the resources available to the state for its construction and maintenance program.

Reconstruction and High Maintenance

In 1928 the total highway mileage of the state was 13,987 of which 1,966 miles were trunk-line and state-aid. Of this latter total, 1,851 miles was surfaced, but only 723 miles or 36% was of the modern types.

While the state spent about \$13,000,000 in 1927 (motor taxes were \$10,500,000) 34% of these funds went for maintenance, or an average of \$2,200 per mile.

New Traffic Requires Reconstruction

The heavy increase in motor vehicle traffic from 1913 on has brought with it the need for change in highway surfacing types. This has necessitated a heavy reconstruction program at the same time that additional mileage was greatly needed.

Thus, from 1913 on, the state has been obliged to devote as much effort to reconstruction as to new construction, with the former work assuming a dominating position from 1925 on.

For the period from 1913 to 1923 approximately one-third of the work was reconstruction, while from 1923 on, it has been more than 65% of the total of all construction. (See Table 3.)

This has been taking place while the state system high type surfaced mileage is less than 40% of the total state system.

Funds Too Limited for Adequate Work

The pay-as-you-go plan in Connecticut has resulted in no state bonded debt for highways, and no interest payments for such account. There is to be considered on the other hand such items as the present condition of the system and whether even today the funds available will bring the surfacing requirements up to the proper standard without undue costs in delay, high maintenance, congestion and vehicle operating costs. Maintenance in the past appears to have been high, although there has been considerable work of a reconstruction nature included.

The motor vehicle registration fees and gasoline taxes have gone far in the provision of the funds much needed, but do not seem to have been adequate to accomplish the desired result shortly, although the average tax has been fairly heavy.

The offsets to the interest payments on bonds may thus be indicated from the experience of Connecticut as:

- (a) High road maintenance costs, due to desire to keep roads in service as long as possible.
- (b) Inadequately surfaced system of highways due to necessity for reconstruction when a heavy motor traffic developed.
- (c) High motor vehicle operating costs resulting from inadequate surfacing, both types and mileage.
- (d) High motor vehicle taxes.

TABLE 1

Motor Vehicle Taxation by Years

Year	Automobile Receipts	Gasoline Tax
1907-1908.....	\$61,747.50	.....
1908-1909.....	58,534.65	.....
1909-1910.....	162,275.10	.....
1910-1911.....	230,120.89	.....
1911-1912.....	255,124.06	.....
1912-1913.....	324,963.45	.....

TABLE 1—(Continued)
Motor Vehicle Taxation by Years

Year	Automobile Receipts	Gasoline Tax
1913-1914.....	\$406,623.34	.....
1914-1915.....	536,970.09	.....
1915-1916.....	768,727.91	.....
1916-1917.....	1,059,066.10	.....
1917-1918.....	1,306,686.84	.....
1918-1919.....	1,361,898.44	.....
1919-1920.....	1,816,809.93	.....
1920-1921.....	2,126,772.88	.....
1921-1922.....	3,405,084.75	.....
1922-1923.....	4,227,767.23	.....
1923-1924.....	5,058,908.73	\$962,479.44
1924-1925.....	5,582,071.25	1,130,255.54
1925-1926.....	6,110,728.74	2,404,725.59
1926-1927.....	6,837,584.78	2,886,648.54
1927-1928.....	7,360,782.87	3,106,932.49
Total.....	\$49,059,249.53	\$10,491,041.60

TABLE 2
State Highway Expenditures by Years

Year	Total
1895.....	\$1,984
1896.....	43,546
1897.....	122,343
1898.....	78,722
1899.....	117,974
1900.....	99,159
1901.....	183,924
1902.....	129,429
1903.....	202,809
1904.....	181,589
1905.....	250,404
1906.....	167,886
1907.....	272,892
1908.....	346,470
1909.....	863,524
1910.....	1,200,946
1911.....	1,585,730
1912.....	1,453,512
1913.....	3,483,575
1914.....	3,423,218
1915.....	2,235,361
1916.....	1,950,948
1917.....	2,528,222
1918.....	3,569,306

TABLE 2—(Continued)
State Highway Expenditures by Years

Year	Total
1919.....	\$2,385,934
1920.....	5,634,366
1921.....	7,127,961
1922.....	5,997,849
1923.....	6,912,856
1924.....	8,689,959
1925.....	8,611,936
1926.....	10,503,716
1927.....	12,783,981
Total 1895-1927.....	\$93,142,031

TABLE 3
New Construction and Reconstruction by Years

Year	Total Constructed	Total Reconstructed	Total Miles Built
1911-12.....	923.77	54.85	978.62
1912-14.....	330.90	66.20	397.10
1914-16.....	136.78	75.73	212.51
1916-17.....	28.26	31.27	59.53
1917-18.....	20.50	34.47	54.97
1918-19.....	27.81	21.78	49.59
1919-20.....	42.66	20.57	63.23
1920-21.....	54.29	14.21	68.50
1921-22.....	77.45	60.74	138.19
1922-23.....	81.69	35.37	117.06
1923-24.....	41.93	89.78	131.71
1924-25.....	52.10	61.47	113.57
1925-26.....	95.63	104.97	200.60
1926-27.....	17.20	103.27	120.47
1927-28.....	51.05	129.38	180.43

APPENDIX C

Maryland

Area (sq. miles—41st in rank)	12,327
Population (1928 est.)	1,537,085
Population per square mile	124.7
Total highway mileage	14,701
Miles in state system	2,519
Total motor vehicle registration	285,000
Average motor vehicle license fee	\$10.64
Average gasoline tax payment	\$19.02
Average investment per mile state surfacing ¹	\$25,300
Average cost per mile of maintenance state system	\$1,600
Date establishment state highway department	1898
Date establishment state highway system	1908

¹ Converted to low type.

Maryland represents a state of dense population, both agricultural and industrial. The arterial highway system has been financed from bond issues based upon levies on real property with motor vehicle revenues reserved for maintenance. Latterly part of the gasoline tax funds have been devoted to secondary road improvement under State Control.

Total road mileage of the state is 14,701, of which 2,519 miles is on the state system—17%.

The entire system has been improved; 1,029 miles or 40% is of the higher type surface.

Maryland roads date from Colonial days, many of them being developed as private toll roads. Prior to state participation in road building the counties built and maintained roads from local revenues, largely taxes on real property.

State Early Recognized Responsibility

The state entered road building as a unit in 1898 with the establishment of an advisory commission.

The next step was the establishment of state-aid in 1904 with an annual appropriation of \$200,000 from state funds for cooperative expenditure on the more important roads.

In 1906 the main road between Baltimore and Washington was taken over for state construction and maintenance.

First State Bond Issue 1908

By 1908 the whole state was awake to the need for an adequate highway system. The highway division made a special report recommending:

1. Improvement of a system of main roads and feeders.
2. Main arteries to be improved and maintained by the state.
3. Balance of this system to be built and maintained jointly by state and county.
4. The enactment of permissive legislation to acquire turnpikes.

The legislature agreed, established the State Roads Commission and authorized a bond issue of \$5,000,000 to begin the state system.

System Immediately Selected

After careful survey and extensive hearings the State Roads Commission selected a road system of 1,300 miles, estimating that it could be improved for \$15,000,000.

It was recognized that two alternatives faced the State:

1. To increase property taxes very materially to improve the roads, or
2. To issue bonds, secured by the property, and pay for the roads as they were used.

The latter course was chosen with the authorization of the \$5,000,000 bond issue, followed by others until a total of \$38,000,000 had been issued to 1928; of which \$20,000,000 had been retired, with \$17,000,000 outstanding.

Was Fourth State to Bond for State Roads

Maryland was the fourth state to issue bonds for state highway improvement—Massachusetts being first in 1894, New York and Rhode Island following in 1906 and Maryland in 1908.

Serial Plan Followed

The first three bond issues were sold on the sinking fund basis, but this was abandoned in 1914 in favor of the straight serial bond. None were issued for more than a 15-year term.

By 1928 the state had issued a total of \$38,000,000 in bonds, of which \$20,000,000 had been retired.

The interest and principal payments on the \$20,000,000 of bonds retired has totaled \$33,000,000, so that the extra cost of early improvement of the roads was about \$13,000,000 over a 20-year period. (See A attached.)

Early System Completed in 1918

The system of 1,300 miles selected in 1908 and 1910 was initially improved by 1918. Maryland was thus the first state to select a definite system of roads and complete that job.

Since that time the system has been nearly doubled by the addition of 1,200 miles from time to time, which in turn have been constructed from bond funds.

Today the state is fast approaching the time when it will be able to change from the bond plan to a "pay-as-you-go" basis, financing both new construction, reconstruction and maintenance from the current revenues.

In 1927 the State Road Commission expended more than \$10,000,000 on construction, maintenance, administration, and interest and principal on bonds.

During the same year, the motor vehicle and gasoline taxes were more than \$7,000,000.

Counties Spared Heavy Burden

To 1927 the counties had issued about \$7,000,000 in bonds—less than a fifth of the state total—and then largely for the building of lateral and county roads not on the main state system.

Service Value State System—\$9,000,000

The annual service value of the state system at one cent per vehicle mile amounts to more than \$9,000,000. (University of Maryland engineering survey shows in excess of average of 1,000 vehicles per day on state system in 1928.)

Motor Taxes Moderate

Motor vehicles were not registered and taxed until 1910 when it was foreseen that they might be a source of future revenue, possibly reaching "\$100,000 a year."

The average registration tax was \$9.70 in 1913, but is today about \$7.50 plus a four-cent gasoline tax. The registration tax was reduced when the gasoline tax was first levied.

Registrations increased from 14,000 in 1913 to 285,311 in 1928.

All motor vehicles are also taxed as personal property.

User Required to Maintain Roads

While the roads were built by the general taxpayer, the state required the user to maintain them. Thus all reconstruction, maintenance and betterments have been made from the motor tax receipts.

In 1926 the legislature authorized the use of 1½ cents of the gasoline tax for lateral road construction and ½c for grade crossing elimination.

This clearly indicates that the state policy has been to shift more and more of the burden to the user as he has increased in number and ability to pay.

Burden Light on Farmer

Taxes on farm lands in the state have increased but 70% as an average from 1913-14 to 1921-22 as compared with an average increase of 126% for the United States as a whole.

Rural free delivery postal mileage amounts to 11,152 miles or almost the entire highway mileage of the state.

Gained Five Years on Main System Improvement

Based on using for main road development only the funds as they would have been available from motor taxes and from the state tax used for interest and principal payments on the bonds, the state would probably have taken at least five years longer to complete the original state highway system of 1,300 miles. Under the bond plan they completed the original system in 1918 and have since doubled the original mileage and improved it.

The state is now raising the road types under the heading of maintenance chargeable to the vehicle.

The lateral roads are now being improved, some of them at present financed from bonds, but more and more of the

burden being shifted to the road user as the volume of funds available from the gasoline tax grows with road use.

Briefly the accomplishments under the bond plan have been:

- a. Saving of five years in improvement initial 1,300 miles state system. (1918.)
- b. Ability to proceed with improvement additional 1,200 miles from 1918 on.
- c. Vehicle operating cost savings on (a) and (b).
- d. Enhanced real property values.
- e. Social and economic advantage to farmers.
- f. Uniting of state by an improved main highway system at an early date. (Maryland being first to complete improvement of definitely laid out system.)
- g. Possibility of immediate action at present time on meeting traffic demands for widening, strengthening main roads, and improvement of lateral or secondary roads.

TABLE 1
State of Maryland—Loans Issued for Road Building
 September 30, 1928

Title of Loan	Total Amount	Amount Redeemed	Balance Outstanding	Rate	Interest Charges*
State Roads Loan.....	\$5,000,000.00	\$5,000,000.00	.....	3½%	\$2,625,000.00
Public Highways Loan.....	1,000,000.00	750,000.00	\$250,000.00	4%	595,000.00
State Loan of 1912.....	3,170,000.00	3,170,000.00	.....	4%	1,902,000.00
State Roads Loan of 1914.....	6,600,000.00	5,631,000.00	969,000.00	4%	2,491,440.00
Consolidated Loan of 1913.....	40,000.00	40,000.00	.....	4%	24,000.00
Three Million Dollar Loan.....	2,700,000.00	1,738,000.00	962,000.00	4%	960,318.00
Road Loan of 1918.....	3,000,000.00	1,519,000.00	1,481,000.00	4½%	1,091,250.00
Bridge Loan of 1920.....	250,000.00	69,000.00	181,000.00	4½%	66,825.00
Lateral and Post Road Loan, 1920.....	3,000,000.00	1,063,000.00	1,937,000.00	4½%	932,242.50
Lateral Post Road and Bridge Loan, 1922.....	3,150,000.00	675,000.00	2,475,000.00	4½%	738,900.00
Balto.-Sou. Md. Trunk Line Road Loan.....	1,000,000.00	149,000.00	851,000.00	4½%	417,240.00
Lateral and Post Road Loan, 1924.....	4,500,000.00	264,000.00	4,236,000.00	4½%	794,340.00
Bridge and Grade Crossing Loan, 1924.....	900,000.00	54,000.00	846,000.00	4½%	158,760.00
Lateral and Post Road Loan, 1927.....	2,125,000.00	.....	2,125,000.00	4½-4¾%	61,875.00
Bridge Loan of 1927.....	1,000,000.00	.....	1,000,000.00	4½-4¾%	22,500.00
	<u>\$37,435,000.00</u>	<u>\$20,122,000.00</u>	<u>\$17,313,000.00</u>		<u>\$12,881,690.50</u>

* Total cost of interest on each loan from the date of issue to the last semi-annual interest date prior to September 30th, 1928.

NOTE: The term "Roads" or "Road Building" is intended to include all improved highways, bridges and streets which are a part of the State Highway System. The proceeds of the above loans represent practically all the money spent by the state for the construction of new roads. The counties of the state have, until recently, contributed an equal amount. The money to carry these loans and redeem them at maturity is raised by direct taxes on Real and Personal Property. All special taxes such as Motor Vehicle registration and license fees, and two cents of the Gasoline Tax, are used for maintenance and upkeep. The remaining two cents of the present Gasoline Tax, recently inaugurated, is being used for new construction, and is intended to relieve the Counties of the contributions formerly furnished by them. The general conclusion is, then, that the taxpayer built the roads and the motorist maintained them until the Gas Tax was raised from two to four cents in April, 1927, since which time the motorist has also had a share in the building.

TABLE 2

Motor Vehicle Registration and Taxes by Years

Year	Registration Total	Registration Fees	Gasoline Tax	Total
1907.....		\$ 2,719.00		
1908.....		4,860.00		
1909.....		3,016.00		
1910.....		9,301.00		
1911.....		75,000.00		
1912.....		60,000.00		
1913.....	14,217	138,845.91		
1914.....	20,213	190,653.10		
1915.....	31,047	285,859.27		
1916.....	44,245	565,302.00		
1917.....	60,943	807,395.00		
1918.....	74,666	1,189,984.00		
1919.....	95,634	1,776,410.22		
1920.....	102,841	2,124,924.84		
1921.....	136,249	2,460,162.04		
1922.....	165,624	2,824,843.91	\$ 395,545.53	\$3,220,389.44
1923.....	169,351	3,536,955.20	737,896.00	4,274,851.20
1924.....	198,398	2,332,953.00	1,641,994.00	3,975,947.00
1925.....	234,247	2,576,301.00	2,003,632.00	4,579,933.00
1926.....	252,852	2,928,268.00	2,357,577.00	5,285,845.00
1927.....	270,935	2,987,912.00	4,314,297.00	7,302,209.00
1928.....	285,311	3,034,621.00	5,425,873.00	8,745,805.00

TABLE 3

Steps in Progress Highway Legislation in Maryland

- 1666 Enactment first road law of 1666, establishing county road overseers.
1787 Experiment with publicly owned toll roads.
1804 Experiment with privately owned toll roads.
1870 Joint public and private roads.
1898 State advisory agency created, looking to uniformity among counties.
1904 State financial aid in road construction— $\left\{ \begin{array}{l} \$10,000 \\ \$20,000 \end{array} \right\}$ Annual appropriation
1906 State assumption of responsibility for construction and maintenance a main road 9W—\$30,000 each of first three years.
1908 Recognition of responsibility of State for system of main roads and authorization of bonds to build and maintain same. First bond issue \$5,000,000.
1916 Cooperation with Federal Government on a national system, practically co-extensive with State system.
1922 Levy gasoline tax.
1918-1928 Extension State highway system mileage, addition special services such as snow removal, grade crossing elimination, State camps.
1924 Increase gasoline tax.
1926 Increase gasoline tax.

Maryland State Highway Department Expenditures

1898-1927

1898-1907.....	\$1,517,823
1908-1919.....	28,055,959 ¹
1920.....	3,000,000
1921.....	7,616,427
1922.....	5,181,125
1923.....	7,762,372
1924.....	12,727,535
1925.....	12,024,781
1926.....	10,597,544
1927.....	10,500,000 ¹
	<hr/>
Deduct bond retirements.....	\$98,983,566
	20,122,000
	<hr/>
Add interest on bonds still outstanding.....	\$78,861,566
	11,000,000 ¹
	<hr/>
	\$89,861,566

¹ Estimated.

APPENDIX D

Illinois

Area (sq. miles—23rd in rank).....	56,665
Population (1925 estimate).....	6,964,950
Population per square mile.....	122.8
Total highway mileage.....	97,000
State highway system mileage.....	9,800
Total motor vehicle registration.....	1,504,000
Average motor vehicle license fee (gross).....	\$10.32
Average gasoline tax payment.....(3c tax effective August 1, 1929, will amount to about \$15 per vehicle per year.)	
Average investment per mile state surfacing.....	\$26,000*
Average cost per mile of maintenance.....	\$360
Date establishment state highway department.....	1913
Date establishment state highway system.....	1917

* Converted to low type.

Illinois is a state in which the systematic improvement of the highways was deferred until traffic had reached an advanced state of development, necessitating an accelerated program of construction, and in which the need was met by the issuance of bonds financed by vehicle taxes.

It is largely an agricultural state, large in area, and heavily populated. The northern part of the state is almost entirely industrial and urban. About two-thirds of the population is urban, i. e., located in towns of 10,000 population or more.

The present total rural highway mileage is 97,287, divided into:

State system.....	9,890
State aid or secondary system.....	23,011
Local roads.....	64,386

The state system is built and maintained by the Division of Highways, the state aid system constructed by the counties under supervision of the state and paid for by funds allotted by the state. Where they wish to build roads faster than such funds are available they may finance the whole project subject to approval of plan by the Division of Highways. Where such roads are taken into the state system and are of suitable design, the entire cost may be refunded to the counties. The roads are then maintained by the counties.

No State Action Until 1913

Prior to 1913 all rural road construction and maintenance was in the hands of the counties, townships and local political sub-divisions.

Road work was financed by poll taxes, (payable in cash or labor) by tax levies on real property and some miscellaneous revenues, all raised and expended locally.

There was a considerable mileage of light-surfaced roads completely under local control, but no connected system of any kind and no uniform or concerted effort toward the creation of such a system.

State Aid in 1913

This condition and the growing demand for better roads led to the enactment of the State Aid Law in 1913, which created the State Highway Department. This law also specified that there should be a connected system of county trunk roads, approximately 17,000 miles in length.

It further provided for the appointment of a county superintendent of highways of each county.

Motor Tax Receipts Allotted to Counties

While motor vehicles were taxed in 1911 the revenues were but \$75,000, increasing, however, to more than \$500,000 in 1913, with the registration of nearly 95,000 vehicles.

The Act of 1913 provided for an allotment of these motor license fee receipts to each county of the state which was met on the part of the county with an equal amount raised by general taxation.

Limited State Control Unsatisfactory

The county boards were permitted to select the type of construction which required the approval of the State Highway Department. The cost was borne jointly—the state share coming from motor tax receipts. High type construction was maintained entirely by the state, intermediate types jointly, and the low types by the counties.

It was very soon found that this method of construction, while furnishing a very good object lesson as to the value of good roads, resulted in a "patch-work" of various types.

The revenues allotted to the counties by the state, as well as the revenues raised by the counties from taxation, were also found to be inadequate to build a connected system.

The traffic demand had now reached such a point that unusual action was required, both as to financing and administration.

Bonds Authorized in 1917

A general reorganization of the State Departments was effected in 1917, whereby the State Highway Department became the Division of Highways under the Department of Public Works and Buildings. At the same session of the legislature, an Act providing for a bond issue of \$60,000,000 was passed for the financing of a connected system of state highways, totaling approximately 4,800 miles. The Act provided that the principal and interest on the bonds should be paid from motor vehicle tax receipts, any surplus after these payments to be devoted to road construction.

The proposition was submitted to a referendum vote of the people in November 1918, and passed by a three to one majority.

Highway Officials Plan System

The system of highways provided for in this Act was planned by the Superintendent of Highways and the Chief Highway Engineer and approved by the Director of the Department of Public Works and Buildings and the Governor.

As the total road mileage of the state is about 97,000 this proposed system was about 5% of the total.

Federal Government Began Cooperation

It was about this time that the Federal Government began financial assistance to the states.

The main sources of funds available for the state highway system at this time were:

1. Proceeds of bond sales (Interest and Principal paid by motor taxes).
2. Federal Aid.
3. Surplus motor vehicle taxes.
4. Small miscellaneous receipts.

The state did not draw on the taxation of real property for road improvement or maintenance, either directly as such, or for payment of the bonds. The construction and maintenance of township and roads of local use was, however, left to general local taxation to finance.

Motor Fees Reserved by State

Since the principal and interest payments on the \$60,000,000 bond issue constituted a prior lien on the motor vehicle tax receipts, the state reserved all of these funds to itself. Even maintenance of the state highway system and other roads for which the state was responsible was second in importance.

Later, however, (1929) in common with a great many other states, with the imposition of a gasoline tax the state made provision for the return of part of these revenues to the counties.

Additional Funds Needed With Increasing Traffic

It was quickly found that the \$60,000,000 bond issue would not complete the 4,800-mile system first selected and that the system needed enlarging as traffic continued to increase.

The Legislature passed an Act in 1923 adding 5,000 miles to the system and authorizing an additional bond issue of \$100,000,000 for its construction.

More Funds Will be Needed

The present state road system comprises 9,800 miles or about 10% of the total road mileage of the state. While only some 5,900 miles of the system had been surfaced to the end of 1928, the work done was all of high type surfaces.

There remains about \$23,000,000 of the last bond issue and some 3,900 miles of road to surface. Table 1 gives the indicated surplus from motor vehicle fees after meeting the interest and principal payments on the road bonds. Table 2 shows annual expenditures averaging \$27,000,000 a year.

With the present surplus of motor fees in excess of \$10,000,000 a year, Federal funds of \$3,000,000 a year and gasoline tax revenues from the new tax amounting to \$20,000,000 a year, it is evident that the remaining mileage of the state system can be completed in three or four years on a pay-as-you-go basis and maintaining the current rate of construction. (State receives two-thirds; counties one-third under new gas tax law.)

Maintenance will, of course, be a constantly increasing charge as the total mileage mounts, but is at a very low figure per mile due to the high type of construction.

Gasoline Tax to Finish the Job

Realizing that the \$100,000,000 bond issue would not suffice to complete the system the state levied a two-cent gasoline tax in 1927—one cent to be allotted to the state for construction on the State Highway system and one cent to the counties in proportion to motor registration fees, to be used in the construction on the state-aid system on secondary highways.

The bill was declared unconstitutional in 1928, however, and a new bill providing for a three cent tax was introduced and passed at the 1929 session of the Legislature. As indicated above this will be the means of providing enough surplus revenue to continue construction at the present rate of progress on current revenues and reaching early completion of the present system.

The state will then be enabled to proceed with the building of secondary roads, enlarging and strengthening the present system in metropolitan areas, grade separation, and parallel routes.

Bond Plan Obtained Results for Road User

The average motor vehicle registration tax is about \$10. The addition of the gasoline tax will increase this annual payment to about \$25, which is the present average for the United States. This will apparently complete the surfacing of the present state system, amortize the bond issues, main-

tain the roads and provide a residue for the development of secondary roads and the further improvement of the state system as just outlined.

Tables are appended showing—

- (1) The principal and interest payments on the bonds and surplus of motor vehicle fees;
- (2) State highway department expenditures;
- (3) Mileage of state highways constructed by years;
- (4) The bond sale receipts by years;
- (5) Motor vehicle registration and tax receipts;
- (6) Local expenditures.

TABLE 1
Illinois Highway Bond Data

Year	Bond funds available for construction each year	Principal payments, \$60,000,000 issue	Principal payments \$100,000 issue	Interest payments, \$60,000,000 issue	Interest payments, \$100,000,000 issue	Total principal and interest payments, both issues	MOTOR VEHICLE TAX RECEIPTS			Surplus over interest and principal requirement
							Registration	Gas Tax	Total	
1921	\$4,709,477.78						\$6,862,125.83		\$6,862,125.83	\$6,862,126
1922	12,023,966.76			\$96,120.00		\$96,120.00	7,904,219.71		7,904,219.71	7,808,100
1923	24,100,867.70			661,340.00		661,340.00	9,689,702.77		9,689,702.77	9,028,363
1924	17,704,000.00			1,388,813.35		1,388,813.35	11,557,838.94		11,557,838.94	10,169,026
1925	23,452,600.00			2,156,823.72	\$536,480.00	2,678,303.72	13,050,977.39		13,050,977.39	10,363,673
1926	4,953,100.00	2,000,000.00		2,403,143.18	1,107,700.00	5,510,843.18	13,937,579.64		13,937,579.64	8,426,737
1927	12,157,100.00	2,000,000.00		2,326,149.75	1,279,860.00	5,606,009.75	15,589,365.19	3,953,047.72	19,542,412.91	13,936,403
1928	35,048,600.00	1,999,000.00*		2,235,480.00	1,914,536.11	6,149,016.11	15,069,830.33	2,439,728.14	17,509,558.47	11,360,542
Totals	\$134,149,712.24**	\$5,999,000.00	\$	\$11,267,870.00	\$4,832,576.11	\$22,099,446.11	\$93,661,639.80	\$6,392,775.86	\$100,054,415.66	\$

* A \$1,000.00 coupon was not presented for payment until January, 1929.

** The amount shown in the first column represents the amount derived from the sale of \$137,000,000.00 in bonds.

TABLE 2
Illinois State Highway Expenditures

Year	State expenditures for					Total
	Road and bridge construction	Road and bridge maintenance	Principal payments on bonds	Interest payments on bonds	Miscellaneous	
1921	\$15,236,635.03	\$358,658.85			\$4,000.00	\$15,599,293.88
1922	21,727,088.97	640,503.01		\$96,120.00		22,463,711.98
1923	29,883,810.06	1,110,034.41		661,340.00		31,655,184.47
1924	37,417,474.90	2,044,860.69		1,388,813.35		40,851,148.94
1925	31,554,041.51	1,834,637.74		2,687,303.72		36,075,982.97
1926	16,495,059.03	2,264,770.58	\$2,000,000.00	3,510,843.18		24,270,672.79
1927	21,961,462.82	2,721,444.45	2,000,000.00	3,606,009.75		30,288,917.02
1928	44,462,809.00	2,859,756.51	1,999,000.00	4,150,016.11		53,471,581.62
Total	\$218,738,381.32	\$13,834,666.24	\$5,999,000.00	\$16,100,446.11	\$4,000.00	\$254,676,393.67

TABLE 3
Illinois State Highway Mileage Built by Years

Year	State Highway or Primary System	State Aid or Secondary System	Total
1914.....		53.58	53.58
1915.....		100.27	100.27
1916.....		135.41	135.41
1917.....		184.38	184.38
1918.....	6.77	93.36	100.13
1919.....	152.54	102.06	254.60
1920.....	270.60	94.92	365.52
1921.....	285.62	128.32	413.94
1922.....	546.95	194.15	741.10
1923.....	858.31	226.71	1,085.02
1924.....	1,018.21	211.27	2,229.48
1925.....	786.86	119.54	906.40
1926.....	361.79	101.95	463.74
1927.....	522.98	145.46	668.44
1928.....	1,075.27	229.48	1,304.75
	5,885.90	2,120.86	8,006.76
Less widened and replaced mileage.....	11.03	277.47	288.50
Total.....	5,874.87	1,843.39	7,718.26

The following table shows the type or character of roads which have been built in the State of Illinois during the years 1913 to 1928 inclusive:

Type	Mileage
Concrete.....	7,260.78
Brick.....	153.63
Asphalt.....	34.21
Bit. Concrete.....	6.87
Bit. Macadam.....	58.85
Gravel.....	186.61
Total.....	7,718.26

TABLE 4
Illinois Motor Vehicle Registration by Years

Year	Number of Vehicles
1913.....	94,646
1914.....	131,140
1915.....	180,832
1916.....	248,429
1917.....	340,252
1918.....	389,761
1919.....	478,438
1920.....	568,759
1921.....	670,452
1922.....	785,378
1923.....	969,092
1924.....	1,132,641
1925.....	1,627,734
1926.....	1,375,191
1927.....	1,443,579
1928.....	1,508,907

TABLE 5

Year	Motor License Fees	Gasoline Tax	Total
1913.....	\$507,134.77	.....	\$507,134.77
1914.....	703,403.70	.....	703,403.70
1915.....	924,905.74	.....	924,905.74
1916.....	1,242,509.65	.....	1,242,509.65
1917.....	1,587,772.69	.....	1,587,772.69
1918.....	2,762,567.53	.....	2,762,567.53
1919.....	3,262,176.57	.....	3,262,176.57
1920.....	5,893,586.02	.....	5,893,586.02
1921.....	6,663,910.22	.....	6,663,910.22
1922.....	7,861,211.21	.....	7,861,211.21
1923.....	9,630,367.77	.....	9,630,367.77
1924.....	11,513,957.05	.....	11,513,957.05
1925.....	12,936,882.13	.....	12,936,882.13
1926.....	14,047,207.86	.....	14,047,207.86
1927.....	14,839,593.29	\$3,904,547.87	18,722,141.16
1928.....	15,521,582.88	2,391,202.84	17,912,785.72
Total.....	\$109,898,769.08	\$6,295,750.71	\$116,194,519.79

TABLE 6

Local Highway Expenditures in Illinois by Years

Year	Amount
1913.....	\$7,102,976.00
1914.....	7,634,422.00
1915.....	9,089,455.00
1916.....	9,564,701.00
1917.....	9,646,273.00
1918.....	9,939,660.00
1919.....	13,149,672.00
1920.....	14,206,308.00
1921.....	15,920,082.00
1922.....	14,216,503.00
1923.....	12,363,607.00
1924.....	12,221,928.00
1925.....	12,340,755.00
1926.....	11,805,397.00
1927.....	11,526,188.00

APPENDIX E

Nevada

Area (sq. miles—6th in rank)	110,690
Population	80,000
Population per square mile . . . . .	.....
Total highway mileage	23,659
Miles in state system	3,552
Total motor vehicle registration	27,376
Average motor vehicle license fee	\$9.10
Average gasoline tax payment	\$19.40
Average investment per mile state surfacing ¹	\$14,000
Average cost per mile of maintenance	\$93
Date establishment state highway department	1917
Date establishment state highway system	1917

¹ Converted to low type.

Nevada is a state of large area and sparse population. Nearly 80% of the state's area is in public land (Federal Government owned) and is exempt from state taxation, thereby placing the burden of financing highway construction and maintenance on the small remainder of privately owned land.

There are but few important towns and these are situated far apart. Reno is the principal city with a population of 20,000 and is located at the extreme northwestern portion of the state. Next is Las Vegas with 6,000 inhabitants situated in the southern end of the state. Ely and McGill, mining towns, located 15 miles apart are in the eastern section and have a combined population of approximately 7,000. Elko in the northern part of the state has a population of 3,500. These centers of population average nearly 500 miles distant from each other.

The climate of the major portion of the state is quite arid, mining ranks as the principal industry, with cattle and sheep raising next, and lastly farming, depending entirely on irrigation.

The road mileage of the state is 23,700 of which 3,554 miles are on the state system—16% of the total.

Real Road Work Began in 1917

The State Highway Department was created in 1917 to comply with the Federal Aid Road Act in the cooperative construction of post roads.

Upon the creation of the Department a log of all roads was made, resulting in the fact that the total mileage was 22,000, mostly one way, or single track roads and trails.

The construction and maintenance of these roads had been carried on by the counties and financed entirely by them. Their work, however, consisted of little more than general maintenance.

There were only a few more than a thousand vehicles registered in the whole state at the time of the creation of the State Highway Department.

The present results in construction and maintenance have been accomplished through the State Highway Department. The counties cooperate with the Department in the construction of roads on the state system in the county, paying for these roads from the County State Highway Fund referred to later.

Financial Policies

With the establishment of the Department of Highways the Legislature appropriated \$40,000 to which was added a state tax on real property, the motor license fees, and part of the Racing Commission fees.

In addition the Legislature directed the counties to levy a tax on real property for a County State Highway Fund from which fund money was to be spent on the State Highway System in the county under the direction of the State Highway Engineer.

State highway bonds were issued in 1920, 1921, 1925, 1927 and 1928, totaling \$1,100,000, retired as to principal and interest from the motor vehicle tax receipts.

A review of the state highway income for 1928 indicates that the state tax levy for highways has been reduced to a negligible amount (reinstated as noted below under property taxation). The counties still provide a considerable portion of the revenue. The motor vehicle license fees and gasoline taxes, together with the Federal Aid funds constitute the bulk of the state highway income. The surplus of motor license taxes is available after meeting the interest and principal on the highway bonds.

Property Tax Burden Reduced

In 1917 a tax of 7 cents for highways was levied on each \$100 of taxable property within the state. This was increased to 10 cents for 1918, 1919 and 1920. Reduced to 6 cents for 1921, 1922, 1923 and 1924. Reduced to 2 cents for 1925 and 1926, and eliminated for 1927 and 1928. The 1928 legislature, however, placed a rate of 5 cents for highway maintenance.

Federal Aid Pays Half Total State Road Cost

Later amendments to the Federal Aid Road Act have made it possible for the Federal Government to pay up to 87% of the total cost of roads on the Federal Aid System, because of the public lands within the state. From 1917 to 1928 half of the state highway income was Federal Aid money.

Vehicles First Taxed in 1913

The first year's registration of vehicles in 1913 disclosed a list of 1,093 vehicles which paid \$3,322 in fees. The law provided that the proceeds of this registration tax were to be placed in an automobile road fund to be distributed to the counties after it had reached \$25,000, then to be used for road betterments.

The Act was amended in 1915 by fixing definite fees by horsepower; in 1917 by placing the proceeds in the State Highway Fund (apparently before the counties were given any money). The basis of the license fee was changed in 1919 and the proceeds placed in the Nevada highway bond redemption fund.

The Amendment of 1923 provided for the placing of the balance of the proceeds from the fee, after cost of collections, bond interest and redemption had been cared for, in the State Highway Fund.

This fee was reduced in 1926. The average fee today is \$9.00, while the gasoline tax produces an average of \$19.00 per vehicle.

Gasoline Tax Levied in 1923

A tax of 2 cents per gallon was levied on gasoline in 1923 and the proceeds divided \$60,000 to the State Highway Fund and the balance pro-rated to the counties.

In 1925 the tax was increased to 4 cents and the net revenue apportioned equally to the State Highway Fund and the County State Highway Fund.

Most of Mileage Low Type Surfacing

From these taxes have come the funds with which 1,561 miles of the state system of 3,554 miles have been surfaced. But 73 miles or 5% is of a high type surfacing.

While the state is so located that there is a heavy volume of transcontinental and interstate traffic, there are very few routes with volume sufficiently heavy to justify any greater investment.

The motor vehicle registration of the state now amounts to 27,376 vehicles—both passenger cars and trucks or nearly one for every three persons. This registration averages but 8 vehicles per mile of state highway, again indicating both the need and ability to pay for a low investment per mile for improvement.

The annual traffic counts have shown a growth in the traffic but the 1928 count showed but one route on which traffic amounted to as much as 3,000 vehicles a day; one on which traffic was over 2,000 vehicles; and four on which the traffic was over 1,000 vehicles. These figures were based on counts at 45 stations on the state system.

Expenditures Uniform

Expenditures have remained fairly constant except for 1924 and 1925 when more Federal funds were used. While the gasoline tax has been producing more available funds, the state tax levy has been reduced offsetting this increase.

Maintenance has increased with the increased mileage of roads constructed, but the average for the system is but \$93 per mile.

Based on the volume of traffic on the state system the present method of financing seems to be proceeding satisfactorily, while the annual traffic counts check the performance of road service.

TABLE 1
Automobile Registration and License Fees 1913-1928

Year	Numbered Registered	Fee
1913.....	1,093	\$3,322.94
1914.....	1,683	4,331.08
1915.....	2,000	7,298.01
1916.....	4,655	17,721.85
1917.....	6,725	31,717.50
1918.....	8,151	31,082.75
1919.....	9,305	37,550.75
1920.....	10,464	103,318.33
1921.....	10,821	125,410.32
1922.....	12,647	120,944.38
1923.....	15,698	153,481.10
1924.....	18,892	181,969.85
1925.....	21,681	209,231.02
1926.....	24,222	209,919.71
1927.....	25,815	229,839.32
1928.....	27,376	249,110.62

TABLE 2
*Mileage of Existing Highways Constructed by the State Highway Department
Classified as to Types of Surfacing*

	Miles
Graded and Drained.....	125.28
Gravel Surfaced.....	1,241.25
Asphalt Concrete.....	1.96
Asphalt Macadam.....	20.56
Cement Concrete.....	50.99
Bituminous Treated Surface.....	121.66
Total.....	1,561.70

TABLE 3
Nevada State Highway Income and Expenditures

	INCOME											
	1917-1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Total
Legislative Appropriation.....	\$40,000.00											\$40,000.00
State Tax Levy.....	181,050.33	206,570.68	\$113,000.86	\$203,961.89	\$121,980.72	\$117,625.14	\$119,466.65	\$120,154.54	\$40,541.67	\$42,290.80	\$1,131.85	1,267,775.13
Auto License Fees.....	63,851.10	30,738.25	329.75				96,877.15	239,995.85	71,357.72	97,797.58	109,749.02	710,696.42
Gas Tax.....							60,000.00	156,149.03	230,389.73	233,501.30	259,731.32	939,771.38
Racing Commission Fees.....	17,024.99	7,451.92	20,055.18	11,998.61	20,866.97	23,624.57		9,669.00		11,145.91	7,515.03	129,352.18
Miscellaneous Refunds.....	195.16	181.88		39.81	609.19	6,730.16	1,156.07	26.00	90.97	10,040.81	4,988.24	24,058.30
Sales and Service (Inter-Department) ..	13,680.14	94,750.62	76,926.10	69,454.38	124,495.63	110,993.06	124,238.44	86,255.82	98,329.34	236,743.80		1,035,867.33
Right of Way Refunds.....	6,076.78											6,076.78
State Highway Bonds.....		475,000.00	325,000.00					100,000.00		100,000.00	100,000.00	1,100,000.00
Federal Construction Refunds.....	125,570.65	385,906.73	566,590.63	754,815.47	1,287,060.51	2,146,590.15	1,735,853.73	930,747.40	995,545.02	1,040,934.23		9,969,614.52
County Construction Refunds.....	88,982.23	225,211.33	439,976.51	354,533.08	415,395.30	548,504.67	420,680.97	390,591.84	343,629.21	243,287.44		3,470,792.58
County Refunds on State Maintenance.....										42,000.00	17,000.00	59,000.00
County Maintenance Refunds.....								15,742.65	23,644.27	20,885.56	13,172.26	73,444.74
Lincoln Hwy. Assn. Const. Refunds.....		16,380.00	10,000.00	12,152.99	18,021.14	14,872.47						71,426.60
Utah-Nev.-Cal. Assn. Const. Refunds.....								7,200.00	16,631.47			23,831.47
San Francisco-Bay City Const. Refunds.....										25,000.00		25,000.00
City Construction Refunds.....				25,205.79	15,678.64	42,335.31	39,798.62	13,472.71	180.15	8,822.50		145,493.72
Railway Crossing Const. Refunds.....						41,505.52	17,710.48	38,982.55	36,153.53	18,874.57		153,226.65
Special Maintenance Deposits.....					2,000.00							2,000.00
Accounts Receivable.....	7,730.56	45,496.18	80,192.07	37,019.61	68,751.67	78,092.07	28,951.88	28,299.26	33,773.10	33,991.50		442,297.90
Lahontan Plant Depreciation.....				24,397.90								24,397.90
GRAND TOTALS.....	\$302,121.58	\$486,983.10	\$1,376,130.65	\$1,739,083.52	\$1,398,638.20	\$2,077,382.76	\$3,260,393.12	\$3,016,171.19	\$1,871,005.41	\$2,090,272.31	\$2,095,941.76	\$19,714,123.60

	EXPENDITURES											
	1917-1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Total
Highway Construction.....	\$392,885.57	\$1,160,384.07	\$1,099,020.91	\$1,207,692.59	\$1,905,394.98	\$2,711,020.37	\$2,411,359.98	\$983,329.90	\$1,480,659.77	\$1,262,723.82		\$14,614,471.96
Surveys, P-E R-W.....	\$36,074.62	45,249.36	60,001.76	43,018.03	98,959.03	114,561.55	64,194.80	61,197.20	55,367.50	53,586.22	61,177.04	693,387.11
Plant Inventories.....	1,415.05	98,908.52										100,323.57
Equipment Inventory Accts.....	24,662.09	83,826.90	72,212.83	37,924.28	47,323.35	30,845.47	12,414.82	11,476.21	11,200.18	310.99	33,796.43	365,993.60
Reno Plant.....				51,613.09	45,287.54	74,538.34	100,921.08	111,686.99	75,132.18	84,663.47	201,001.91	744,844.60
Lahontan Plant.....				3,547.67	16,250.62	538.06	1,015.00 Cr.		350.00		1,534.03 Cr.	18,137.32
Vista Plant.....								27,955.70	1,110.91 Cr.	9,068.51 Cr.	458.79 Cr.	17,317.49
Hafed Plant.....	1,088.53			317.50	154.83							1,560.86
Accounts Receivable.....	16,115.58	48,204.69	125,301.47	1,645.65	83,088.96	35,207.72	23,511.30	26,335.82	32,875.67	34,303.47		426,590.33
Section 31—Refunds.....	2,500.00	19,129.46	10,000.00	6,946.89	1,530.82							40,107.17
General Administration.....	34,979.40	38,323.07	60,153.72	59,088.39	69,221.61	74,851.86	96,852.27	98,736.21	95,756.81	79,258.06	58,313.41	765,534.81
Maintenance.....	16,596.54	29,330.21	44,121.16	33,601.26	61,997.55	110,724.87	122,788.60	216,714.62	306,899.52	343,399.28	359,262.08	1,645,435.69
County Maintenance.....								23,355.84	13,864.62	25,593.62	19,422.92	82,237.00
GRAND TOTALS.....	\$114,812.65	\$627,363.73	\$1,553,986.75	\$1,460,379.49	\$1,550,063.59	\$2,394,544.09	\$3,142,384.66	\$2,985,994.05	\$1,567,125.62	\$2,091,278.57	\$2,028,008.31	\$19,515,941.51