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FEDERAL AID TO HIGHWAYS.

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ROAD construction and maintenance in the United States involve an annual outlay of over \$300,000,000, a sum which, if capitalized at 5 per cent, would represent an investment of \$6,000,000,000. Even in this day of amazing figures this sum is not unimpressive. There are to-day something over 4,000,000 motor vehicles and some 25,000,000 horses and mules making use of the public roads more or less, so that on a conservative estimate the motive power available for highway transport far exceeds 100,000,000 horsepower. The tonnage haul on the public roads is estimated at 1,500,000,000 to 2,000,000,000 ton-miles. That this latter figure is not excessive can easily be gathered from a study of the freight-traffic movement on railroads, which now amounts to upward of 1,000,000,000 tons annually. A six-mile haul for 250,000,000 tons would produce the minimum of the ton-mileage thus estimated for the public roads. It is well known that the railroads are unable to carry the enormous traffic now offered for transportation, and it is to be expected that the public roads will from now on have added to their present traffic burdens such freight as may be shifted to them to relieve railway congestion. It is beyond question that for passenger haul the public roads are used to a greater extent than the railroads. These impressive conditions have been created within the span of a single generation. As recently as 1906 there were only 100,000 motor vehicles in the United States, compared with the 4,983,000 of 1917, while in 1904 the total outlay in money and labor on the public roads aggregated only \$80,000,000, compared with some \$300,000,000 for 1917. Thus, the public

roads have been changed with bewildering rapidity from the status of the purely local utility to that of the utility of national importance and scope.

NEW PROBLEMS TO BE MET.

This astonishing development brought in its train many perplexing problems. The types of construction long standard were found wholly unable to sustain motor traffic; maintenance provisions, both as to amount of funds and methods, were pitifully inadequate; the local system of taxation was found to be not only inadequate, but wholly inequitable. In short, it has been necessary to relegate to the scrap heap in a measure the method of construction and maintenance and the systems of management which have prevailed since the days of MacAdam. Skilled engineers and other specialists were needed to devise new methods of construction and maintenance; classification was necessary to insure the construction of those main channels through which it was found that traffic tended to flow, and steps had to be taken to obtain more funds and effect a readjustment of the cost burdens. These necessities could not be provided by counties and townships, and it became essential that they pool their facilities and look to the State for direction.

STATE HIGHWAY MANAGEMENT.

As far back as the early nineties the State governments had begun in a small way to help the counties solve their highway problems. This State participation first took the form of small State appropriations to aid the counties in road construction and at the same time to provide them with engineering advice through the maintenance of State highway departments. In 1893 the Federal Government also began an educational work for road betterment by establishing the Office of Road Inquiry in the Department of Agriculture to investigate systems of road management and to give advice on the subject. The State governments soon found that the difficulties were multiplying too rapidly to be met by small measures, and gradually State highway departments have been strengthened and given supervisory in lieu

of merely advisory powers, while the trend has been toward the making of larger State appropriations, the designation of definite State highway systems, the control of such systems by the State, and, finally, the creation of State funds for the maintenance of State highway systems under State control. Most of this development has come within the past 10 years. Although the trend in all of the States is toward a policy of centralization in the handling of their road problems, at present, almost every stage of progress from extreme localization to a highly centralized control is represented in the 48 State systems of highway management.

FEDERAL COOPERATION.

The Federal Government, coincident with this development in the several States, gradually broadened its investigatory and educational field as indicated by the fact that, while the appropriation for the work amounted to only \$10,000 in 1893, the appropriation for the fiscal year 1918 is \$405,400, exclusive of amounts to be expended for irrigation, drainage, and rural engineering investigations, and an appropriation for a road laboratory building.

Soon after the general adoption of the State-aid policy became assured, the agitation for Federal aid to highway construction became more pronounced and led to the introduction at each session of Congress of hundreds of measures calling for Federal appropriations. In 1912 a joint committee of the Senate and House of Representatives was created for the purpose of investigating the subject of Federal participation in highway work, and that committee made an exhaustive report to Congress in the following year. In 1913 a standing committee on roads was established in the United States House of Representatives.

On July 11, 1916, President Wilson approved a measure generally known as the Federal Aid Road Act, which carried an appropriation of \$75,000,000 to aid the States in the construction of rural post roads and \$10,000,000 to be expended for the construction and maintenance of forest roads. The enactment of this measure rounds out the most comprehensive scheme of cooperation in road building ever put into effect by any nation.

PROVISIONS OF FEDERAL AID ROAD ACT.

The appropriation of \$75,000,000 for rural post-road construction was made available at the rate of \$5,000,000 for the fiscal year that began July 1, 1916, \$10,000,000 for the next year, \$15,000,000 for the third, and so on for five years, ending June 30, 1921. The \$10,000,000 for forest roads was made available at the rate of \$1,000,000 per year, beginning July 1, 1916. A sum not to exceed 3 per cent of the post-road appropriation may be used by the Secretary of Agriculture for administering the provisions of the act.

The apportionment of the post-road appropriations to the States, after deducting the administration fund, is based upon area, population, and the mileage of rural delivery and star routes, each of these factors having a weight of one-third.

The Federal funds may be expended only for construction, must not exceed 50 per cent of the total estimated cost of the road, and in no case be more than \$10,000 per mile, exclusive of bridges of more than 20-foot clear span.

In order that a State may receive the benefits of the post-road provisions of the Federal act, it must have a State highway department, and the construction on which Federal funds are expended must be done under the direct supervision of that department. An amount at least equal to the Federal funds must be made available by or on behalf of the State. The Federal act requires as a condition precedent to participation by any State that the legislature of that State shall assent to the terms of the Federal act. The respective States in their turn customarily require certain conditions to be met by the counties. These conditions usually involve raising of county funds, the establishment of certain guaranties as to road maintenance, and the taking of certain administrative steps contemplated by the State highway law. In most cases the State highway department deals directly with the counties, but in some States the highway department also cooperates with the township. The counties require certain action by the township as a result of the county cooperation with the State. Thus the Federal act directly or indirectly involves, in some degree at least, the exercise by each governmental unit from the township to the National

Government of some function in the general scheme of co-operation. The Secretary of Agriculture, however, who is charged with the administration of the Federal act, deals only with the State highway department, and thus the State, in meeting the Federal requirements, acts for the counties wherever their interests are involved.

A considerable amount of misunderstanding seems to prevail as to the means by which Federal aid may be secured. Many county officers and private citizens submit to the Department of Agriculture inquiries or applications looking to the obtaining of Federal aid for a local highway. To these inquiries and applications the answer is invariably made that under the terms of the Federal act itself the Secretary of Agriculture may deal only with the State highway department and that the initial power of selection of roads upon which Federal aid is to be expended rests with the State highway department.

OPERATION OF THE ACT.

That immediately following the passage of the Federal Aid Road Act money would begin to flow from the National Treasury into the States with a resultant widespread activity in the actual construction of roads seemed to be a somewhat general expectation. That such a result was not possible could easily have been ascertained by the most casual consideration of the terms of the act itself, which necessitated an immense amount of preliminary work. First, the Secretary of Agriculture was required to apportion the Federal funds for the first fiscal year to all of the States, and in doing this it was necessary that he ascertain from the Postmaster General the mileage of rural delivery and star routes, as these formed one of the factors of apportionment. Next the act required the establishment of rules and regulations. This task called for careful preparation in which the views of each of the State highway departments should be given due consideration. The act was approved July 11, 1916, and 10 days later, July 21, 1916, the certificate of apportionment was issued. The rules and regulations, prepared after a conference held in Washington with the State highway commissioners, were issued on September 1, 1916.

It was necessary to ascertain which of the States were equipped with highway departments within the meaning of the Federal act, as cooperation could be only with States so equipped. This necessitated a most exhaustive investigation of State highway laws and a great deal of correspondence with State officials. When the investigation was completed it was found that 11 States were not equipped with highway departments and that the status of 5 others was doubtful. It was thus evident that new basic legislation was necessary in probably 16 States, while in many of the other States cooperation was impracticable without the passage of enabling State laws, since in some States direct supervision could not be exercised by the highway departments, and in others the requisite funds were not available nor could adequate maintenance assurances be given. In all of the States assent by the legislature was essential, except that the governor might assent pending the adjournment of the first regular session of the legislature held after the passage of the Federal act. It is therefore apparent that actual road construction could hardly have begun under the most favorable conditions before the opening of the season of 1917.

INCENTIVE TO CONSTRUCTIVE STATE LEGISLATION.

Results of far-reaching importance and of even greater potential value than the appropriation of Federal funds have already been accomplished by the Federal act through its influence upon State legislation. During the past winter more constructive State highway legislation has been placed upon the statute books than has ever been enacted in any similar period since the Republic was founded. The very conditions laid down by the Federal act as necessary to participation in its benefits operated most powerfully to bring about the establishment and strengthening of State highway departments, the placing of a vast amount of road construction under skilled supervision, the systematizing and correlation of road work so as to provide the improvements most needed to meet the requirements of traffic, the creation of large funds for construction and for maintenance, and the establishment in many of the States of definite provisions

insuring maintenance of highways from the date of their completion.

It is impossible to set forth within the limits of this article the salient features of the State legislation enacted as a result of the passage of the Federal Aid Road Act, but among the impressive results obtained may be mentioned the establishment outright of State highway departments in the States of Delaware, South Carolina, Texas, Indiana, and Nevada, and the strengthening of other State highway departments so as to remove all question as to the 16 States which were not qualified at the time of the passage of the Federal act. To-day every State in the Union is in a position to cooperate with the Federal Government under the Federal Road Act.

ORGANIZATION AND PROCEDURE.

To administer the provisions of the Federal act 10 district offices, each directed by a district engineer, reporting to the Director of the Office of Public Roads, were established. The 10 districts with the location of the district offices, the apportionment of post-road and forest-road funds, and a list of the district engineers are shown in figure 1.

The headquarters office has been divided into two branches, known as the engineering branch and the management branch. All of the activities of the organization, including the Federal aid post-road work, the forest-road work, the investigatory and educational road-work conducted under the items forming part of the Agricultural appropriation act, and the irrigation, drainage, and rural engineering investigations are arranged under these two branches.

The procedure adopted calls for the submission of an application, known as a project statement, by the State highway department to the district engineer, who examines the road that it is proposed to improve and transmits the project statement with his recommendations to the Washington office. If the Secretary of Agriculture approves the project statement, the plans, specifications, and estimates are then submitted by the State highway department to the district engineer, who transmits them with his recommendation to the Washington office, and when they are found to be suit-

able for approval, a formal certificate to that effect is issued by the Secretary of Agriculture to the Secretary of the Treasury and the State highway department, and a formal project agreement is entered into between the Secretary of Agriculture and the State highway department. As the work progresses, or upon its completion, payment on a special voucher, approved by the Comptroller of the Treasury, is made of the Federal funds to the depository named in the project agreement.

Under the rules and regulations as adopted, a standard as to form and arrangement of plans, specifications, and estimates was required to be promulgated by the Secretary of Agriculture. This standard was prescribed and the date upon which it was to go into effect was set forward by several amendments, so that it applied only to projects for which project statements were submitted after September 30, 1917.

The testing engineers of the various State highway departments met with the representatives of the Office of Public Roads at Washington and tentatively agreed upon standard forms of specifications for materials, standard methods of sampling and testing materials, and reporting test results. A committee of the American Association of State Highway Officials, working in conjunction with the Federal representatives, prepared and submitted to the State highway departments standard specifications for the various types of highway, so that by voluntary cooperation marked progress has been made toward bringing about the adoption of efficient methods and the standardization of highway work so as to reduce the possibilities of inefficiency and of unproductive expenditure. This progress follows most logically the excellent and far-reaching results in the form of road legislation which has already been mentioned.

ACTUAL ROAD CONSTRUCTION.

The working season of 1917 marked the opening of the actual construction work under the terms of the post-road provision of the Federal act, as the necessary legislative and administrative work which has already been described made it impracticable to get construction projects under way at

an earlier date. At the close of January 31, 1918, there had been approved by the Secretary of Agriculture 253 individual projects, aggregating 2,849.48 miles and calling for an expenditure of Federal funds of \$7,324,721.72, and of State and local funds of \$9,917,143.70, making a total estimated cost of \$17,241,865.42. These projects represented applications from 44 of the States, so that up to that date only 4 States had not reached the stage of actual construction. Unquestionably the spring of 1918 will see Federal aid projects ready for construction in every State in the Union.

Every type of construction recognized by highway engineers as practicable is represented in the projects already approved. Of the total mileage of road involved in projects approved up to the close of January the percentages of the types of construction represented were approximately as follows: Brick, 2.62 per cent; cement concrete, 8.9; water-bound macadam, 2.95; bituminous macadam, 5.63; sand clay, 15.6; earth, 32.1; and gravel, 32.1 per cent. Somehow the impression prevailed in some sections of the country that the Secretary of Agriculture would only approve the higher types of road surfaces, such, for example, as brick, concrete, and bituminous macadam. The Secretary corrected this impression in a specific statement, issued to the public on February 17, 1917.

"There is not the slightest truth in such a report," said Secretary Houston. "This department, which is charged with the administration of the Federal Aid Road Act, has placed absolutely no restrictions, either direct or implied, upon the kinds of highways to be constructed. States may submit for approval any kind of road, even an earth road, and approval will be given if the construction be substantial in character, suitable for traffic needs, and meets the terms of the Federal act. To give State legislators and highway officials the impression that this department favors only costly types of road or discriminates in favor of any particular material, results not only in spreading misinformation, but in placing barriers in the way of States which wish to avail themselves of Federal aid in road construction."

DIFFICULTIES WHICH HAVE BEEN OVERCOME.

Many difficult questions have arisen from time to time in the administration of the Federal act. The question which has given most concern and has been most difficult of solution has been in connection with establishing the status of each project as a rural post road within the meaning of the Federal act. As a result of the consideration of a large number of typical cases it has been ascertained that the four following classes may safely be considered post roads within the meaning of the Federal act: (1) Where the mails are actually carried on the road comprised in the project; (2) where the mails are not actually carried, but a reasonable prospect exists that they will be carried on the road comprised in the project within a reasonable time after its completion; (3) where an entirely new road on a new location is proposed to be constructed and where there exists a reasonable prospect that it will be used for the carrying of the mails within a reasonable time after its completion; (4) where the portion of a road not used for carrying the mails is composed of several or a number of short stretches constituting an unsubstantial or relatively small portion of the whole, and where it is determined that it would be uneconomical to build the portion of the road used for carrying the mails without at the same time constructing these small stretches not so used even though there is no prospect that they will soon be used for transporting the mails.

One of the difficult questions involved a determination of what basis of payment could be adopted by which the States

Explanation of figure 1.—Small vertical numerals, Federal aid post-road allotment, 1917; small slanting numerals, forest-road allotment, 1917; medium vertical numerals, total Federal aid post-road allotment for 5 years; medium slanting numerals, total forest-road allotment for 10 years; large vertical numerals, Federal road district numbers; • Federal road district headquarters; — Federal road district boundary.

District engineers and addresses.—1.—L. I. Hewes, Broadway-Yamhill Building, Portland, Oreg. 2.—C. H. Sweetser, Mills Building, San Francisco, Cal. 3.—J. A. Whittaker, 301 Tramway Building, Denver, Colo. 4.—E. O. Hathaway, Post Office Building, Minneapolis, Minn. 5.—J. C. Wonders, Douglas County Court House, Omaha, Nebr. 6.—J. D. Fauntleroy, Wheat Building, Fort Worth, Tex. 7.—J. T. Voshell, Post Office Building, South Chicago, Ill. 8.—J. T. Bullen, Bell Building, Montgomery, Ala. 9.—G. H. Miller, Federal Building, Troy, N. Y. 10.—H. K. Bishop, 515 Fourteenth Street NW., Washington, D. C. (Office of Public Roads and Rural Engineering).

could receive the Federal aid not only on contract work, but also on force account, day labor, and convict labor work. It was realized that payment by way of reimbursement for amounts actually paid out by the States would involve an excessive examination of the accounts of the States and counties and burdensome requirements as to the showing of subvouchers and other evidence of payment, and would tend to embarrass the States in the making of final payments on projects if they were compelled to make the payments before the Federal aid could be secured. Furthermore, the reimbursement plan gave no assurance that actual results were being accomplished, but only that money had been paid out. It was finally determined to make payments on the basis of units of work performed at the unit prices set forth in the approved estimate. If the work should be awarded to contract, the contract prices would govern. This basis of settlement makes certain that the Federal Government will only pay for an actual showing of results accomplished and at the same time will avoid all necessity for passing upon State accounts and requiring supporting papers as evidence of payments.

On the whole, the Federal act now appears to be working smoothly, and cooperation with each of the 48 States along practical lines seems assured. Whether the application of the cooperative principle to this vast enterprise will produce the largest possible measure of benefit to the Nation can not yet be determined, but certainly if the difficulties of operation may be surmounted it should follow that the tremendous cumulative effort of all the forces of the Nation working to a common purpose should accomplish amazing results in the building of the Nation's highways.