

BUREAU OF PUBLIC ROADS CONDUCTS LARGE
ROAD CONSTRUCTION AND RESEARCH PROGRAMS

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From 1893 when it was organized as a branch of the Department of Agriculture under the name of the Office of Road Inquiry, the Bureau of Public Roads has been one of the most active forces working for the improvement of the rural roads of the United States.

Prior to 1912 its activities were purely educational in character. By the construction of object-lesson roads it was instrumental in spreading among local road officials a knowledge of the principles of road construction and maintenance; and through its publications it contributed largely to the awakening of public interest in road improvement.

In 1912 it was commissioned to supervise the construction of post roads provided for by the Post Office Appropriation of that year, and thus for the first time engaged in road construction for other than experimental or educational purposes. This phase of its activities was greatly expanded in 1916 by the passage of the Federal aid road act, and the work of administering that act and its

subsequent amendments has since become its largest function.

Its new duties, however, were not permitted to absorb its entire attention. It has continued its educational work and has contributed through its researches more largely perhaps than any other single agency to the development of modern, scientific methods of road improvement.

As a result of a departmental reorganization in 1915 activities relating to farm irrigation and drainage and other rural applications of engineering principles were consolidated with the bureau in order to bring under single direction all engineering functions of the Department, and these activities are now carried on by the bureau's division of agricultural engineering.

The functions of the bureau at this time are, therefore, of three principal classes. These are (1) the administration of the Federal-aid and national forest road construction work, to which has been added recently, under an agreement with the National Parks Service, the direction of road construction in the national parks; (2) the conduct of research in the fields of highway design, construction,

maintenance, administration and finance; and (3) research and extension work in agricultural engineering, involving land drainage and irrigation, farm mechanical problems, farm architecture, and the water supply, sewage disposal, heating, and lighting of the farm house.

In administering the Federal-aid road work the bureau cooperates with the highway departments of the several States. By the Federal highway act of 1921, an amendment of the original act of 1916, provision was made for the designation of a Federal-aid highway system to consist, in each State, of not more than 7 per cent of the total mileage of public rural highways then existing.

In the designation of the Federal-aid system the bureau acted as the national correlating agency. Through its influence and cooperation the roads selected in each State by the State highway department were united with the selections of all adjoining States, and a connected network of interstate highways was established. Thus designated, the Federal-aid system now includes approximately 184,000 miles, and all Federal-aid road appropriations are applied to this system only, to be expended

with the necessary funds appropriated by the States under the joint administration of the State highway departments and the Secretary of Agriculture, the latter represented by the Bureau of Public Roads.

At the close of 1926 approximately 56,000 miles of the system had been improved with Federal aid under the joint direction of the Federal and State authorities, and over 14,500 miles were at that time in course of improvement. In addition there had been approved for immediate construction nearly 1,600 miles, so that the sections of the system already improved or definitely scheduled for improvement with Federal aid amounted to approximately 72,000 miles. When to this are added the sections of the system improved by the States without Federal aid the total improved mileage approaches 150,000 miles.

The Federal appropriations for expenditure on the Federal-aid system are apportioned among the 48 States and Hawaii on the triple basis of area, population and mileage of post roads, each factor having the same weight, and there is thus set aside to the credit of each State a fund from which definite allotments are made for the improvement of specified and approved sections of the system. The

Federal portion of the cost of construction is limited by law, with certain exceptions, to not more than \$15,000 per mile, and must be matched by at least an equal contribution by the State.

In the administration of the work the Bureau of Public Roads represents the Secretary of Agriculture and the national interest, its duties involving cooperation with the State highway departments in the development of plans for the improvement of the highways which will be mutually acceptable, inspection of the work of construction as a basis for approval by the Secretary and payment of the Federal share of the cost.

The maintenance of the roads improved devolves upon the State highway departments, but the engineers of the bureau make periodical inspections of their condition, and the State authorities are notified whenever the roads are found to be in need of repair.

The improvement of roads in the national forests is carried on by the bureau in cooperation with the Forest Service of the Department of Agriculture and in certain instances with the State highway departments also. Special appropriations are made by Congress for carrying on this

work which has for its purpose the development of the natural resources of the forest areas by improving their accessibility, the facilitation of fire protective measures, and the betterment of means of communication within and across the forest reservations.

West of the 103rd meridian, which coincides approximately with the eastern boundary of New Mexico, the forests occupy nearly a fifth of the entire land area. Because of their scattered location and large area practically every main interstate road in the West must pass through one or more of them. As they are under Federal control and non-taxable by the States the government must necessarily bear the burden of road construction within their boundaries, and such roads must also, of necessity, be correlated with those of the States and with the Federal aid system. This is being done through close cooperation between the Bureau of Public Roads, the Forest Service and the several State authorities whereby systems of major forest roads articulating with the State and Federal-aid systems have been designated; and the roads selected are being constructed under the direction of the bureau.

In its connection with the improvement of roads in the national parks the bureau acts merely as the technical advisor of the National Park Service, and at the request of that service makes surveys and plans for desired improvement and supervises the construction.

The physical and economic researches of the bureau have for their purpose the promotion of economy in design and construction and the improvement of the service value of the highways. The necessity and importance of this work have increased in direct proportion to the expansion of the national, State, and local programs of highway improvement, and the bureau is recognized as a leader in meeting this need.

A number of the more important physical researches are carried on at the experiment farm of the Department of Agriculture at Arlington, Va. Measurements of the magnitude of impact forces applied to highway surfaces by motor trucks and the effect of these forces upon various types of surface, studies of the wear of roads by the wheels of vehicles, and investigations of the properties of soils which contribute to their value as subgrades for roads, are conducted at this point.

As in the administration of the Federal-aid and national forest road work much of the bureau's research activity is of a cooperative character. This is true of the State-wide highway traffic surveys which have been made in cooperation with the highway departments of Connecticut, Maine, New Hampshire, Vermont, Pennsylvania, Ohio, and California, and with the authorities of Cook County, Ill. Besides developing general information of the most important character with reference to the fundamental principles of traffic flow, useful to all highway officials, these surveys have placed at the disposal of the highway departments of the States in which they have been made exact information with regard to the traffic importance of the roads under their direction which has enabled them to develop programs of future improvement upon a solidly scientific basis.

Many of its tests and investigations produce results which are capable of immediate application with beneficial results. This is true of the studies of the efficiency of road construction operations carried on recently. As a result of these studies it has been shown to be possible to make large improvements in the economy of road building methods by the elimination of avoidable working time losses

and by certain adjustments of the working force and equipment to the work to be done.

In certain of its other investigations the bureau does not look for immediately applicable results. It views highway improvement as a long-continuing process and is not deterred from undertaking investigations of a fundamental character merely because their completion must be long delayed. Typical of such long-time investigations is the work that is being done in the study of the characteristics of an almost limitless number of soil varieties as highway subgrades.

By the agricultural engineering branch, both before and since its consolidation with the bureau, much of the information fundamental to the design of land drainage and irrigation works has been developed, including the duty of water for the irrigation of various crops, the proper depth and spacing of tile drains for the drainage of various kinds of soil, the laws of the flow of water in ditches and conduits of various kinds, and other useful and necessary facts. Important among the recent investigations of the division have been the studies of the efficiency of various applications of power to farming operations; and, of primary interest to city dwellers are its studies of the efficiency of oil burners for home heating.