THE ROOTS OF THE HIGHWAY PROBLEM

By Herbert S. Fairbank, Deputy Commissioner
Bureau of Public Roads, U. S. Department of Commerce

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Road building is a means to an end. It is not in itself an end. The end is the facilitation of a steadily mounting volume of highway transportation. It should occasion no surprise to find, as we do, that highway travel, measured in vehicle-miles, has increased since the early thirties almost exactly in the ratio of the increase in value of our gross national product - the measure of all the goods and services we produce. Transportation, being the essential bridge between production and consumption, it would be rather remarkable were there not this substantially parallel change, both of increase and decrease, between the volume of highway transportation in its maturity and the value of goods and services produced. That highway travel persists in adversity the experience of the depression taught us. That it can be curbed by arbitrary restriction (with what certain economic loss we do not know) the wartime rationing of gasoline and vehicle supply has shown. But the speedy return of the travel measure to parallelism with the measure of production, following the removal of wartime restrictions, is one of the most convincing demonstrations possible of the essentiality of highway transportation as an element of the national economy.

Highways are the servants of this essential highway transportation, and the Number One highway problem remains today as it has always been, how to find the means of achieving and maintaining in the highways of the country a condition of reasonable adequacy to the service of their continuously increasing traffic.

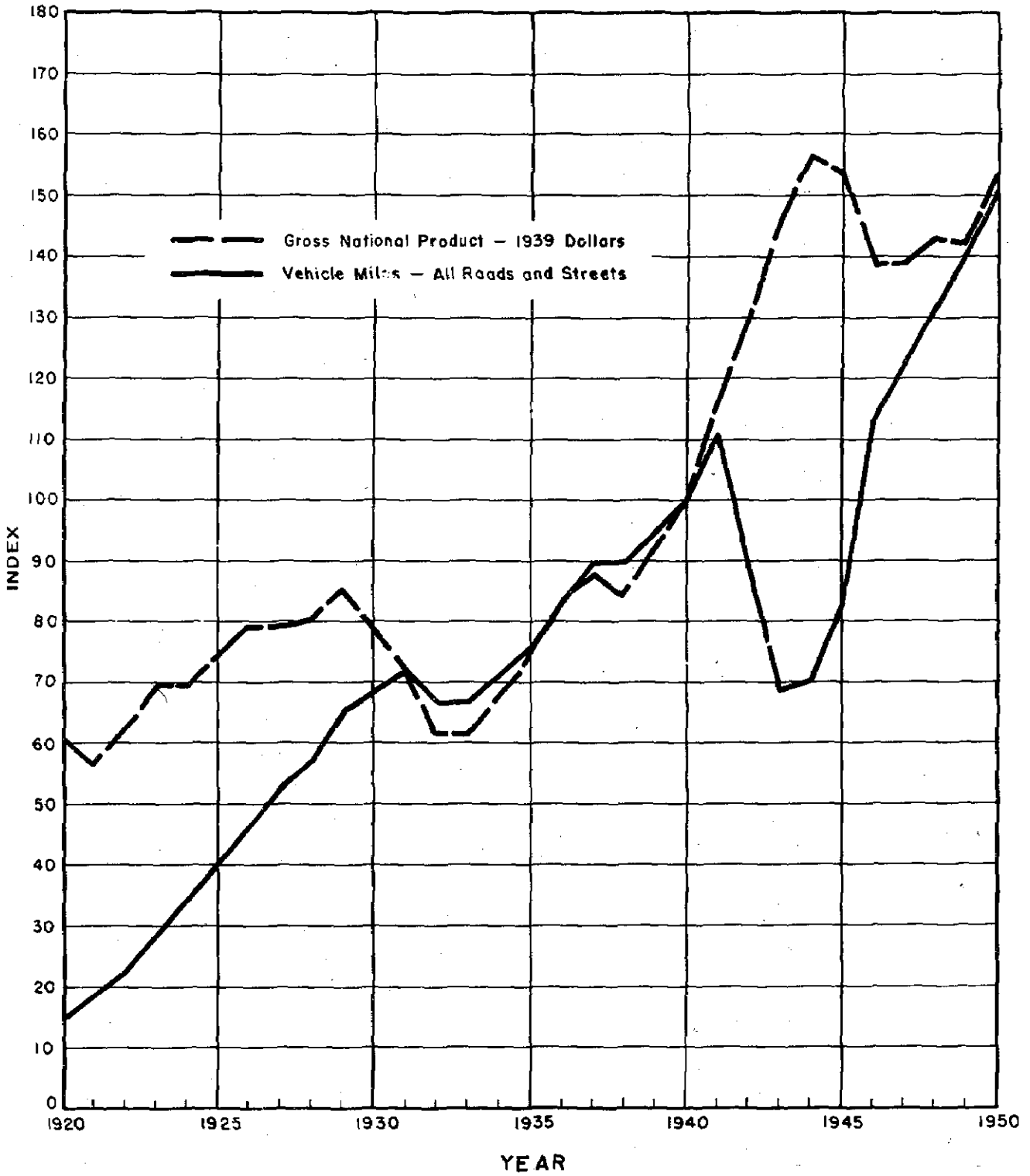
The history of the motor vehicle is a record of increases - increase in the number of vehicles, increase in their speed of travel, increase in their maximum sizes and weights, and increase in per vehicle travel.

Trailing Highways

Highway improvement, since the decade of the twenties at least, has constantly trailed these increases of vehicles, vehicle usage, and vehicle demand. The fact of this trailing is not, as implied on occasion, the result of engineering short sight. Road

INDEX OF THE GROSS NATIONAL PRODUCT AND VEHICLE-MILES OF MOTOR-VEHICLE TRAVEL

1940 = 100



builders have not ignored the probability of traffic growth; nor have they been more prone than other prophets to under-estimate the phenomenal rate of that growth. Highway research has found in due course appropriate solutions for most of the physical problems of road building, and in recent years has made remarkable advance in the discovery of principles of traffic flow, knowledge of which permits the design of highways adequate in their capacity for the safe and convenient discharge of any volume of traffic flow, as well as in their strength and stability for the support of traffic weight. Unto the needs of the time, the technical arsenal of highway engineers has always been sufficient for the creation of better roads than were built.

If our roads and streets of today are inadequate to today's transportation needs, and of that there is not the shadow of a doubt, the cause in no great part is to be traced to past shortcomings of road builders, but rather in large part to the shortage of financial means for the building of better highways ten, twenty and thirty years past. In the earlier parts of these past periods, the predominant road building task was the extension of surfacing to cover a large mileage of roads never before surfaced. The slogan, and the simple objective was - "get the traffic out of the mud." Motor vehicles were relatively few; trucks were comparatively small and light; traffic volumes were everywhere relatively slender; and the speed of travel was low. Most city streets were already paved and city traffic congestion and parking problems did not exist. Usage of the local rural roads was measured in magnitudes of a few vehicles daily.

Problems Simple in the 1920's

By common consent, the first necessity was the improvement of the primary intercity roads. This we did, and we made good progress at it. Road user taxes on vehicles and fuel, levied at low rates, but increasing in yield with the vehicle registration, and largely devoted to the single task, proved sufficient by the end of the twenties to complete an initial grading and surfacing of nearly all the primary rural highways in nearly all of the States. That first building produced no wide roads. Two-lane surfaces, and narrow ones generally, provided ample capacity for the greatest traffic yet developed. Grades and alinement went up and down and around. The low travel speed and traffic volumes required no other. Surfaces and foundations strong enough to support axle loads of 18,000 pounds were the maximum requirement on the roads of heaviest usage. The largest trucks imposed no greater loads. Even had it been possible to foresee the later need for wider, straighter and

stronger roads of lighter gradients, the greater immediate need was to stretch the still limited revenue dollars as far as possible in order to get some kind of reasonably satisfactory surfacing as quickly as possible over the whole of a minimum primary system.

Road building was a joy in those days of the twenties. There was a sense of high accomplishment as the muddy gaps narrowed, and motorists in ever more reliable "touring cars" could each year stretch their tours until at last (amazing wonder!) even the adventure of a transcontinental trip had lost its terrors.

The Serpents Appear

It was then 1930 and almost immediately in the road builders' paradise several serpents appeared to raise their ugly heads. Traffic was still increasing. In cities the traffic lights turned red to halt a previously uninhibited progress. People were driving faster. The sharper curves of the pioneer alinements were becoming dangerous. The higher speed, the denser traffic, the wider and more numerous trucks demanded wider lanes. On a few rural highways, two lanes were proving insufficient to accommodate the volume of traffic, and the provision of three and even four was contemplated. Not yet was the weight of trucks a serious problem. But the pioneer surfaces, many of them of the less durable order, were wearing out and crying for relief by stouter pavements.

Agriculture was mechanizing. On many a road branching off from the improved primary highways, farmers' cars and trucks were building up a traffic as great as a decade before the main roads carried. The farm-to-market road began to claim a share of the road-user tax dollar. Unfortunately, as that share increased, an over-eager reduction of road tax levies, hitherto the principal support of local roads, tended to offset the gain and deprive the farmers' roads of much of their needed increase of improvement revenue.

Came the Depression

A depression was setting in. Say this for the depression. It brought the WPA into being; and the WPA, however indefensible were its make-work philosophy and inefficient its operations, nevertheless built thousands upon thousands of miles of farm-to-market roads. It rebuilt a good many pavements in cities too - pavements that had once seemed so completely adequate, but which had at last succumbed to the wear and the weight of a now formidable traffic. And, performing these useful services, the WPA made it

possible a while longer to retain for the then urgently needed rebuilding, strengthening and widening of the pioneer surfaces of the primary roads substantial revenues, of which they would have been earlier deprived by pressure of the other emerging needs.

But, while the depression was yet upon us, road builders acquired a new worry. The weight of trucks began to increase significantly. The supporting strength required in road surfaces and their foundations is determined by the maximum weight to be applied to them with considerable frequency. The load capacity of bridges is measured in terms of the gross weight of vehicles in relation to their length. A bridge designed to support short vehicles of 30,000 gross weight will carry with equal safety longer vehicles of greater weight.

Truck Weights Increase

The roads and bridges built on the primary highways during the twenties were designed upon the assumption that the weight of vehicles would be held within the limits prescribed by State laws. Generally, these limits were set at 18,000 pounds or less for the weight on a single axle and about 30,000 pounds for a short truck. Prior to 1930 the limits were rarely exceeded and the roads and bridges were little affected by traffic loads. In 1930 it is estimated that less than eight axles in every thousand weighed more than 18,000 pounds. The weight of trucks, short or long, hardly ever exceeded 30,000 pounds. By 1936 the number of axles carrying more than 18,000 pounds had increased to 13 per thousand as a country-wide average and in a few States the frequency had mounted well above that rate. Trucks exceeding 30,000 pounds gross weight had increased to 40 per thousand the country over and to substantially greater frequencies in a few eastern States. This was a disturbing, but not yet an alarming trend. Road and bridge damage attributable to excessive vehicular weight was rarely observed.

By 1936, however, it was apparent that the rule of first things first which had governed the nation's earlier attack upon its road problem, was due for a change. The initial surfacing of the primary rural highways had been practically completed. A good many of the original surfaces had worn out and had been replaced with stronger and wider surfaces. It was realized that we were facing a second round of primary road improvement, the standards of which, in view of the attained volumes and weights of traffic, would have to be set substantially above those of the earlier period.

But it was recognized that the necessities of further improvement of the primary highways of the rural areas could no longer have the singleness of attention which had accomplished their initial improvement. In the country the needs of secondary farm-to-market roads were receiving recognition; and in the cities an increasing traffic congestion and parking difficulty were causing concern.

Highway Planning Surveys Begun

It was with the purpose of determining as precisely as possible what the various needs were and where they existed, what changes of policy would be required to meet them, what cost would be entailed and what means would be required to meet the cost, that highway planning surveys were undertaken by all State highway departments in cooperation with the Bureau of Public Roads in the years from 1936 to 1938. These surveys, for the first time in our history, mapped and catalogued the condition and determined the traffic usage of all of our rural roads. They laid the basis of what was intended to be, and with some lapse during World War II has been, a continuing inventory of all of the country's highway needs.

At the completion of the basic surveys, by 1940, it was possible, as never before, to grasp the nation's highway problem in its entirety. It is from their findings currently brought up to date that we now are enabled to define with substantial precision, the deficiencies and improvement needs of all segments of the country's highway and street systems. The surveys are the present source of the facts which permit highway questions to be resolved and highway administrative and financial policies to be formulated on an assured footing of the reality of needs and the commensurate adequacy of measures and means.

The Job Ahead in 1940

By 1940 the surveys had developed a clear picture of the job ahead. They had shown it to be a job of formidable proportions and complexity. Much of the primary rural system was shown to be already overtaxed in its volume capacity and load-supporting ability by the developed traffic. The clear trend of traffic growth foreshadowed a continued obsolescence that would eventually extend to practically the entire system, and would call for large reconstructive and modernizing expenditure in the years ahead. But the surveys also showed that it would not be feasible to give to this needed modernization of the primary rural highways anything like the priority of claim upon road-user revenues that had been accorded their pioneer

improvement. They revealed a condition of congestion of the arteries of cities that would call for heroic measures before it was cured. And they brought into clear focus deficiencies of the secondary farm-to-market roads that would not much longer abide the postponement of their correction. They showed that at the expected rate of revenue accrual, there would not be money enough to accomplish all the improvements needed in a reasonable period, and that the opposing pressures of those with particular interests in farm-to-market roads and city streets were tending only to rob the primary road Peter to pay one or the other Paul. The more reasonable course, it appeared, would be, on the basis of the factual information then available, to attempt to provide sufficiently for all needs in appropriate balance.

War's Interlude

The time was ripe for planning of this more reasonable sort, but as it turned out the hour was late. The nation was already being prepared for a war which in another year was upon us. All peacetime plans for the further development of the highways went into abeyance. Road construction, excepting only the minimum essential to give immediate access to war plants and new military establishments, was brought to an abrupt halt. Even the materials and manpower needed for road maintenance were severely curtailed. Motor vehicle usage was sharply restricted in all ways but one. Over the protests of highway officials, to exact a maximum of essential freight haulage from a minimum supply of trucks, the States were asked to set aside their legal limitations upon the weight of vehicles, and did so. The heavier loadings wreaked severe damage upon surfaces designed for the previously normal lighter weights; and with normal reconstruction in suspense, the condition of the roads grew worse with each year of the War's continuance. Roads were officially held to be expendable, and they were expended.

We emerged from the war with a highway system in bad repair, with road building forces depleted and equipment plants dissipated, with a four-year backlog of overdue reconstruction to overcome before we could restore even the prewar state of the highways, and with a precious five years lost to the program of improvement extension and modernization envisaged as necessary in 1940.

Post-war in Prospect and Retrospect

Motor vehicle registration had declined during the war and traffic had dropped well below the level of 1936 volumes. The average age of vehicles in use was at a record high. It was expected that the

time required for replacement of wornout vehicles and the return of traffic to its prewar peak would permit the regain of roadbuilding progress lost, and that the wartime license of truck overloading would again be brought within legal limitations.

Roadbuilding plans had been stockpiled for post-war execution. State and local highway revenues accruing during the war period had been saved for post-war expenditure. Congress, advised by the economists to expect a slump during a period of conversion from war to peacetime production, had authorized Federal-aid highway appropriations of record amount to be available immediately upon the cessation of hostilities. Guided by the evidence of the planning surveys, the Federal legislation provided for substantial assistance to secondary road improvement and urban arterial construction besides the continuance of primary highway improvement.

The actualities of the post-war period were unfortunately to prove very different from these anticipations. Motor vehicle registration and traffic regained their prewar heights in a year from the war's end and have continued to rise fantastically, each year to a new record, culminating in 1951's expectation of more than 52 million vehicles (150 percent of the 1941 prewar peak) and upwards of half a trillion vehicle-miles of travel.

The numbers and travel of trucks have increased at rates exceeding the passenger car increases, reaching this year, with an expected registration of more than 9,000,000, a level close to 100 percent above the 1941 prewar peaks. Dashing the hope of a post-war return to prewar loading practice (essential for the assurance of a reasonable life expectancy of much of the existing surface mileage) truckers have insisted upon the economic necessity of heavier loading. Despite invigorated enforcement of law, the frequency of axle load applications above 18,000 pounds is today at least 15 times greater than in 1936.

The expected post-war slump failed to materialize, and highway officials, ready with plans and funds to go to work promptly, found few bidders for their offered work and prices far above the expectation. Many of the prewar contractors failed to return for post-war work and those who did encountered initial difficulties in reestablishing their equipment plants, in obtaining skilled labor, and in guarding their bids against the hazards of an uncertain price trend.

The hoped-for prompt beginning of Federal-aid work on the secondary roads was delayed by the reluctance of local officials and the legal inability of State highway departments to provide

matching funds, and by other causes. Similar delays in utilization of the aid extended to cities resulted from various causes, among them the difficulty of obtaining rights of way for the long desired arterial improvements, difficulties accentuated by the necessity of razing homes in a time of widespread city housing shortage.

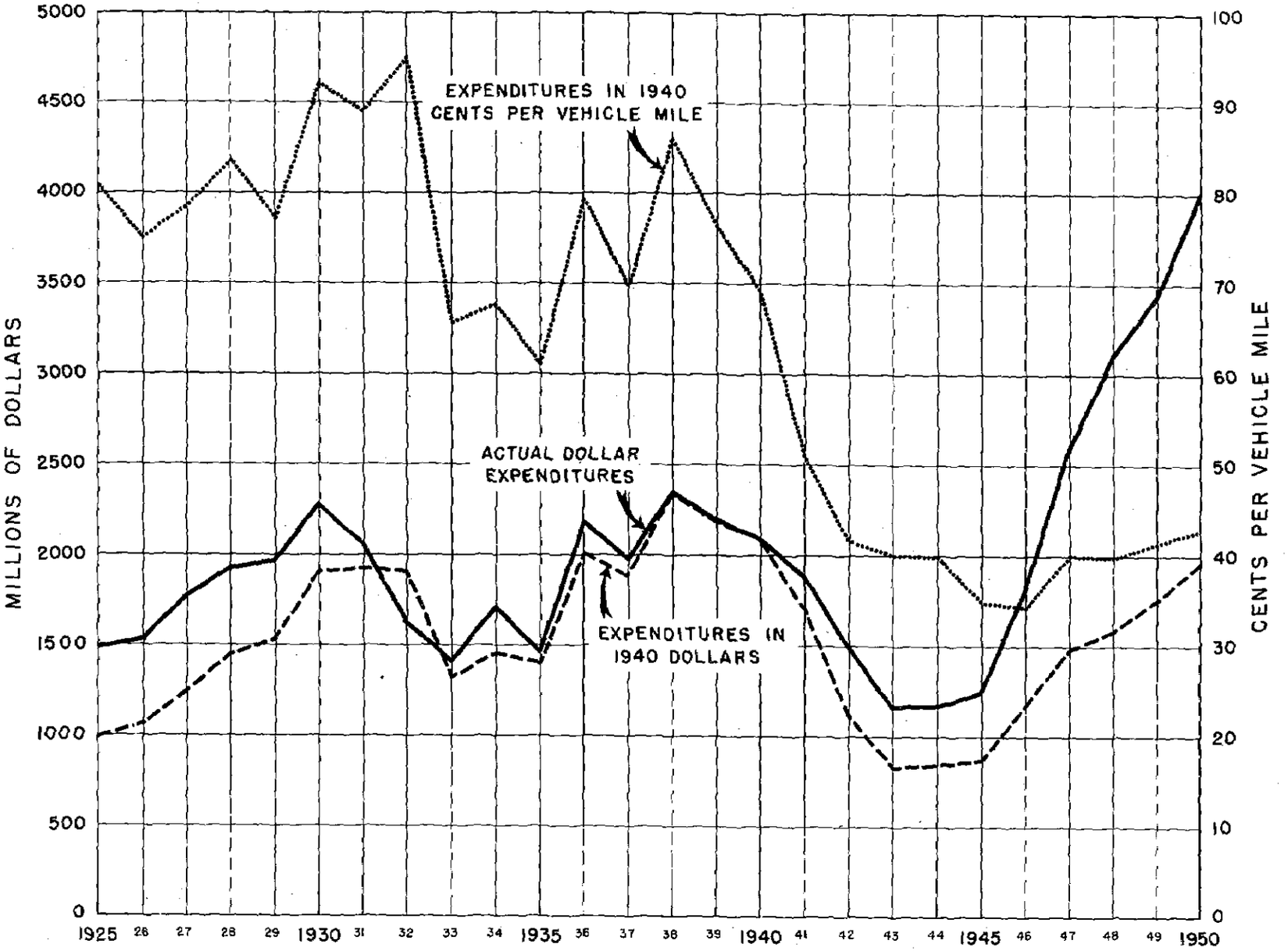
Both urban and secondary road projects were delayed in undertaking by the mutual misunderstandings and hesitancies to be expected when governmental bodies, previously acting independently, are suddenly called upon to cooperate.

Secondary Road Progress a Bright Spot

With regard to the farm-to-market road program, I am happy to report that most of these difficulties have been overcome; in no small part as the result of the excellent services of a board of outstanding county engineers appointed by Commissioner MacDonald as consultants to the Bureau of Public Roads, and interpreters of the aims and procedures of the new program to the local officials of the several areas they respectively represent. Of the upwards of 400,000 miles jointly designated by State and local officials as a system of principal secondary roads, improvement of 55,000 miles has been completed and projects approved and under construction will soon add another 25,000 miles to the record of accomplishment. And, most heartening as a harbinger of future good, is the report by our interpreter consultants that the greater benefits of the program are to be found in the demonstration it is giving to county and other local officials of the benefits that would derive from the further spread of competent engineering direction of local road work. In the State highway departments, as in the Bureau, there is increasing accent upon the necessity of special divisions to deal with the particular problems of secondary road improvement. From our vantage point in the Bureau of Public Roads, the accomplishments of the Federal-aid secondary road program appear as one of the sunnier spots in a generally frowning prospect.

To return to another of the darker sides of the picture, the expected rapid progress in overcoming the war's backlog of undone rehabilitation and modernization of the highway systems, has been in part denied by inflationary forces which have robbed the dollar of half of its prewar purchasing power. So that, despite some increase in gasoline and other road-user tax rates, and notwithstanding the nearly doubled yield of these taxes resulting from the great increase in motor vehicle usage, the revenues available to highway administrators in 1950 could engender actually less road building effort than was purchased with revenues half as large in the periods 1929 to 1931 and 1936 to 1940.

EXPENDITURES BY ALL UNITS OF GOVERNMENT FOR HIGHWAY CONSTRUCTION, MAINTENANCE, AND ADMINISTRATION, 1925-1950



With demand for highway service greatly increased in consequence of the multiplication of vehicles and their usage; with heavier and faster movement requiring much greater capacity and strength in the roads built, the 1950 highway expenditure converted to 1940 purchasing power and expressed in terms of cents per vehicle-mile of traffic was no more than half the expenditure of the later twenties and early thirties reduced to the same basis. Viewed in this light, the cause of the happy results of early effort and the frustrations and unsatisfactory progress of the present program may be better appreciated.

Another War

We come now to another period of war, or half war and preparation for possible all-out hostilities. The highways must carry a greater part of the intensified transportation required than ever before in our history. Highways not yet recovered from the beating they took in the last war, and providing, in consequence of the various circumstances described, each year a capacity less and less adequate for the mounting total of movement over them, are called upon for still greater service.

More and more, in recent years, the highways have become actual parts of the assembly lines of manufacturing industry, as parts of machines made in many, and often widely separated, plants are moved by truck to other plants for assembly into finished products. More and more the workers at all these plants come to depend upon automobiles and highways for their daily comings and goings between their homes and places of employment, and year by year the length as well as the number of these home-to-work trips increases.

For the very feeding of the nation - to mention a matter nearer perhaps to your own concern - the truck and the highway have come to play an indispensable and a vital role. Seventy percent of the livestock received in 1950 at 66 public stockyards, were delivered by trucks. The nearby city of Philadelphia in 1950 received by truck 95 percent of its milk, 99 percent of its live poultry supply, and 98 percent of its supply of eggs. In two days trucks haul lettuce, celery, rhubarb, asparagus and oranges from Los Angeles to Iowa and return with eggs. In 1949 the truck unloads of Florida oranges in Chicago were almost twice the number of rail unloads; in 1941 rail unloads were ten times the number of truck unloads. I cite these few of many similar statistics to illustrate the truckward flow of large parts of the total movement of agricultural produce.

Rationing Again

But, with these sorts of indispensable services to facilitate, what are we told when in the current situation we apply for steel wherewith to meet the construction needs of a highway program already held to a starvation minimum by the various impediments referred to? What are we told? Well, not as in the last war, that highways are expendable, but only that highway needs are "deferable", a word so new that you may look in vain for it in the dictionary.

In the exceedingly delicate task of distinguishing between degrees of essentiality of various uses of scarce materials, there is danger that award may be made to some functions which cannot be fully effective in the absence of associated functions to which material is denied. There is especially a common failure to recognize the essentiality of the role of transportation as a sine qua non of production. It was perhaps to this strange oversight that the Governor of Pennsylvania, a great steel producing State, referred, when he wrote in a recent letter -

> "Unless a better understanding is reached and the highway industry, especially in Pennsylvania, is provided with the proper allocations of steel and at the proper time, the highway programs in the nation and in Pennsylvania, which are so vital to the existing wartime economy, will result in little more than a wish."

It may be that the single underlying cause of all the various impediments that for more than a decade have held the highways of our country in a chronic state of inadequacy lies in a tendency to take the continued existence of roads for granted, in an erroneous popular belief that roads are eternal. Nothing could be farther from the truth. Roads have a very finite life, and in their surfaces especially, a not very long life. Maintenance, even the most careful, cannot indefinitely prolong the life of a road surface.

Nearly all of today's construction on the primary highway system is reconstruction, the reconstruction of surfaces constructed some years ago. As surely as we construct a pavement this year, just as surely will it become necessary to reconstruct that pavement some years hence. Roads, and especially road surfaces, are constantly coming to the ends of their economic lives, and must as constantly be reconstructed.

The thousands upon thousands of surface constructions that created the existing surfaces of the entire highway system were carried out in a past succession of years; in a future succession of years these past constructions will come to the necessity of reconstruction in a roughly similar order. Within an aggregation of individual surface sections as large as we have in any of our highway systems, it is possible to estimate the average life span of the sections as closely as your insurance company estimates the average life of its policy holders, and by the same actuarial methods.

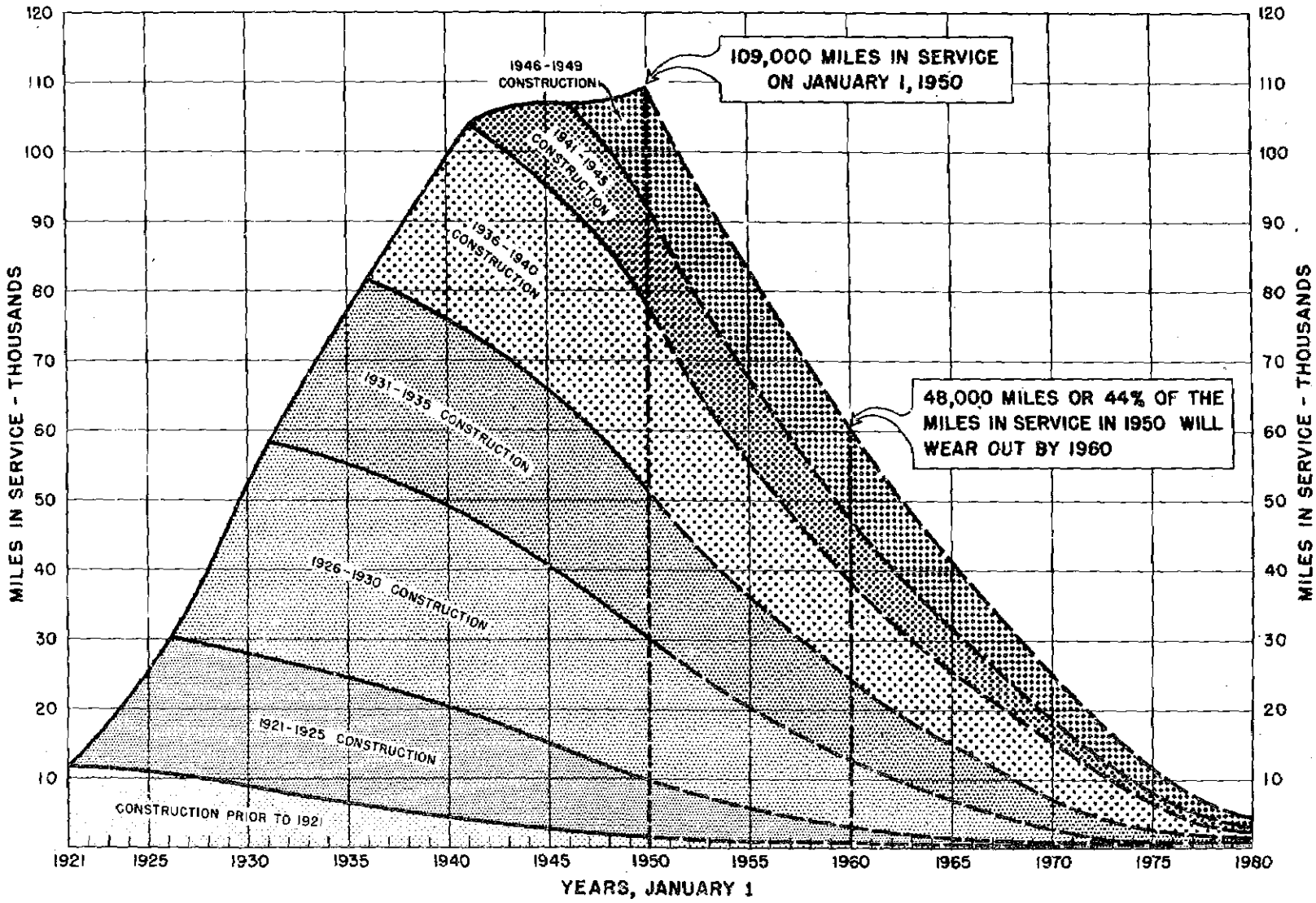
Applying these methods to data representative of the mileage of surfaces of given type constructed in each of a series of past years, it is possible to predict with considerable precision what mileage of surfaces now existing will wear out and require replacement in a future year, or what part of the presently existing surfaced mileage will require resurfacing in a future period. It is possible, for example, to say, with considerable assurance, that if this year the normal process of reconstruction were suspended and held in suspense for a period of 10 years, about 44 percent of the existing high-type surfaces on the Federal-aid primary system would by the end of that period be worn out and economically unusable. Which means, of course, that in the next ten years we must reconstruct 44 percent of these existing surfaces if the improvement of our highway system is to be kept at its present level.

The Harm of Excessive Axle Loads

Whatever interferes with, or retards the normal process of reconstruction, whether it be an arbitrary inhibition, such as the controls that have been imposed during our periods of war, or a deficiency of required revenue or other interference, inevitably results in a deterioration of the physical condition of the highway system. Whatever results in the hastening of physical deterioration of the road surfaces, as, for example, the excessive loading of vehicle axles, tends to increase the necessary rate of revenue accrual and in the presence of a deficient revenue accrual must cause in time a lowering of the physical state of the highway system.

That axle loads heavier than those which highways are designed to withstand do actually hasten the physical deterioration of highway surfaces, has recently been demonstrated in a road test conducted in Maryland. The road selected for the test had a reinforced concrete pavement which was constructed in 1941. In its nine years of life the pavement had been subjected to few loads exceeding its strength, and last year, at the beginning of the test, it had scarcely a crack.

44 PERCENT OF HIGH TYPE MILEAGE ON THE FEDERAL AID SYSTEM WILL WEAR OUT WITHIN THE NEXT 10 YEARS



BUREAU OF PUBLIC ROADS 1950 HC-6 Rev.

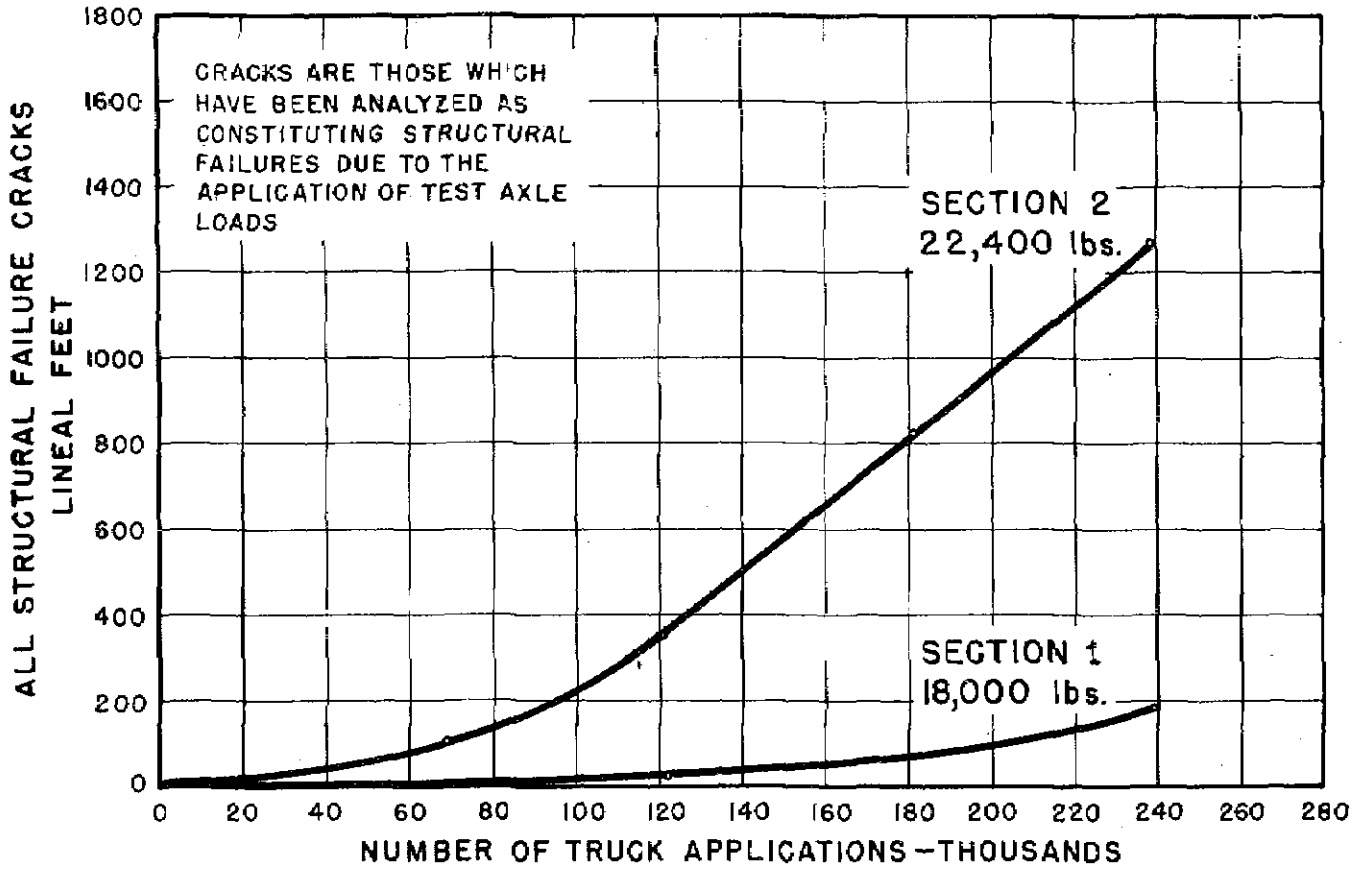
On adjacent lanes at one end of the test section, two-axle trucks were operated back and forth, night and day, for a period of six months. The trucks operated on one of the lanes carried 18,000 pounds on their rear axles; on the adjacent lane, similar trucks carrying 22,400 pounds on their rear axles were operated. On an adjoining section of the road, the two adjacent lanes were similarly subjected to the frequent passage of three-axle vehicles, which on one of the lanes carried 32,000 pounds on their rear tandem axles, and on the other had tandem axle loads of 44,800 pounds. The lanes subjected to two-axle vehicles had a test length of 2,000 feet; those subjected to the three-axle vehicles, a length of 2,840 feet.

After nearly 240,000 passages of the 18,000-pound axles on the first lane, only 196 lineal feet of cracks had developed. After an equal number of passages of the 22,400-pound axles on the second lane, more than six times as much cracking developed - a total of 1,269 feet. On the lane subjected to 32,000-pound tandem axles, 164,500 passages developed 1,050 feet of cracking. On the lane subjected to 44,800-pound tandem axles, only 92,000 passages developed 3,704 feet of cracking. At approximately the same number of passages the 32,000-pound lane had developed only 302 feet of cracks - less than one-twelfth of the footage developed in the more heavily loaded lane.

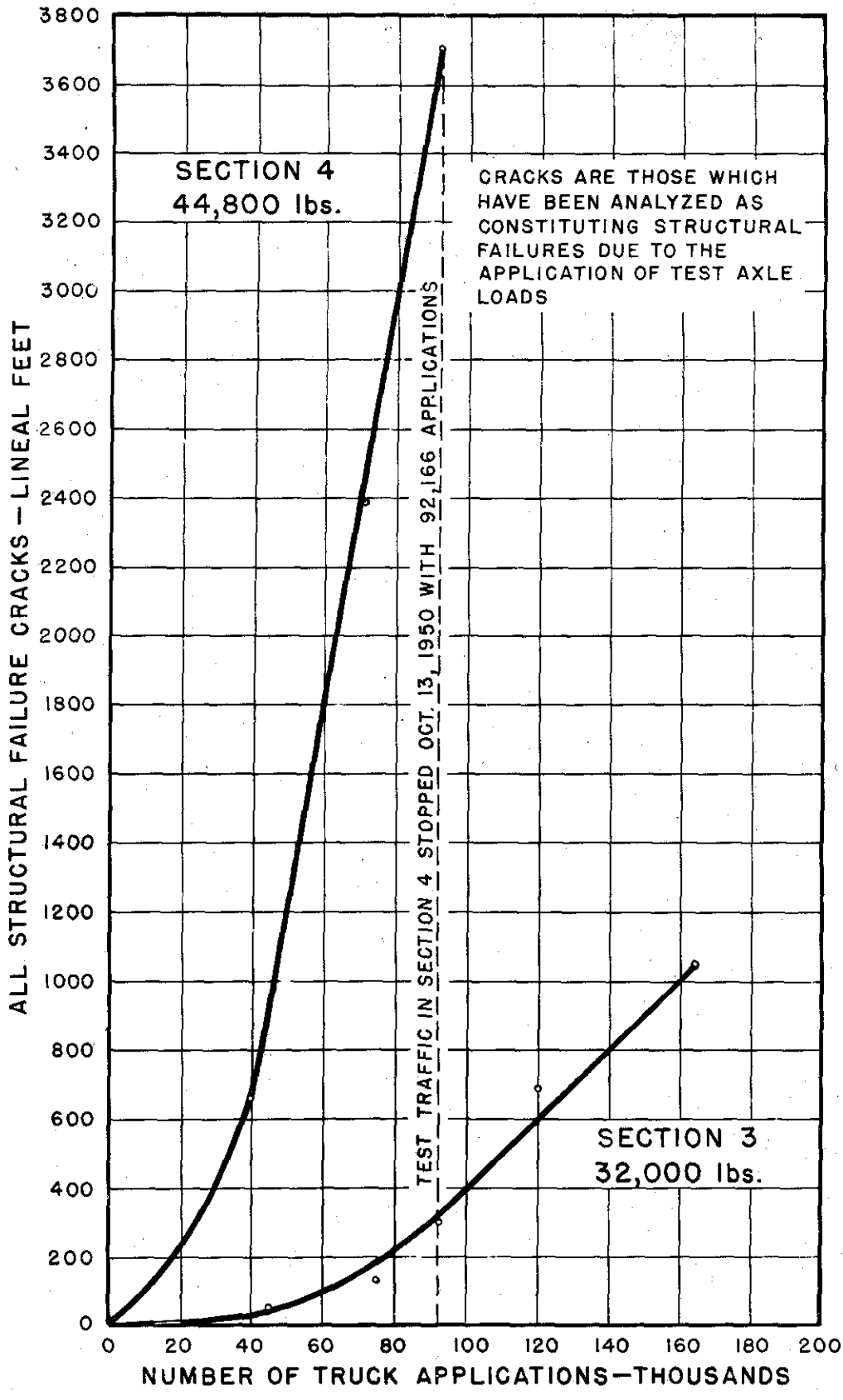
The results of this test demonstrate very clearly the effects of excessive axle loading in hastening the deterioration of road surfaces. The road tested is fairly representative of thousands of miles of concrete pavement now in existence which were designed for the support of axle loads of approximately 18,000 pounds. It will be observed that under loading of that magnitude, damage occurred at a minimum rate. The heavier loadings, excessive for the pavement design represented, caused deterioration at substantially greater rates.

The Maryland test supports the preponderant advice of State and Federal highway officials that it is necessary for the protection of large mileages of existing pavements and surfaces against undue wear and tear that the axle loads of vehicles be held within the limits fixed by present State laws. It supports the advisability of a vigorous enforcement of the laws, and the prescription of more drastic penalties to curb their all too frequent violation.

The test does not necessarily indicate that the existing legal limits of load should be retained indefinitely, or that future highways should be designed to support no heavier loads. If, as truckers assert, there is economic advantage to be gained by loading that will result in heavier axle loads, that fact should be proved. The advantage to be sought is the public advantage. If to achieve a probable reduction of truck operating costs, axle loads are increased, there will be an equally probable increase in the costs of roads to support



RATE OF CRACK DEVELOPMENT
UNDER LOADS OF SINGLE AXLES



RATE OF CRACK DEVELOPMENT
UNDER LOADS OF TANDEM AXLES

the heavier loads. The public which, in the long run, must pay both the costs of truck operation and the cost of roads, should be assured that it will not be called upon to shoulder an increase of road cost greater than the reduction of operating costs.

What Are We Building Roads For?

The question involved concerns the overall optimum economy of highway transportation, which involves a consideration of the algebraic sum of road and vehicular operating costs. If that optimum condition is to be arrived at by loading to heavier axle weights on roads built to withstand those weights, we should be building roads of that character. It is highly desirable that we decide what we are building roads for, as the Governor of Nebraska pointedly remarked in a recent address to the American Association of State Highway Officials.

To seek an answer to that question is the objective of other road tests and operating cost studies now planned. The road tests will attempt to determine the cost of providing roads which will support axle loadings both below and well above the present legal limits. The operating cost studies will seek to establish just what operating costs are realizable by loading above and below the existing limits. The public and public agencies will be well advised to await the results of these further studies before coming to a decision.

The Serious Problem of Highway Obsolescence

In the foregoing, we have been considering physical deterioration of roads in its bearing upon the dimensions of the needed road program, and the effects of vehicular loading in hastening or retarding the deterioration. Of equal moment is the large element of highway obsolescence. As a result of unanticipated increases in the volume of traffic and unrealized effects of traffic speed upon the design of highways, many of our roads have become functionally obsolescent before they are physically worn out. The obsolescence is a cause of traffic congestion and is manifest in excessive delays, heightened travel costs, and a lamentable toll of injury, death and property damage on the highways.

The study of traffic behavior has taught us much in recent years that will enable us to minimize the rate of obsolescence in highways of future design. The making of the necessary changes in the alinement and grades of our existing highways, the widening of surfaces, the provision of wider rights of way, and, where necessary, the protection of heavy traffic streams against the hazards and

frictions of frequent entrance and exit; these and other desirable changes are usually referred to as highway modernization. It is most essential that the costs of modernization be considered along with the costs of predictable physical deterioration in weighing the various provisions to be made for further highway work.

Highway Needs Studies and Sufficiency Ratings

The highway planning surveys have amassed the data necessary for sound decisions regarding the scope and dimensions, the policies and financing of the future road program in all of its parts. No program can be sound that does not comprise provisions for primary and secondary, rural and urban facilities in balanced proportions. Highway transportation cannot be bound by State, county or city lines. However we may divide by systems the administrative responsibility for road provision, transportation recognizes only one system, which is the sum total of all our roads and streets. The objective to be sought is the creation on all roads and streets of a condition appropriate to the efficient service of the segment of the total transportation each must somehow serve.

A number of States have provided an example that should be emulated by all, in the creation of highway needs study committees, formed of representatives of the legislature, of highway administrative officials of the State, counties and cities, and of the several road user groups and others concerned with the betterment of highway and highway transportation conditions. Agreeing upon the standards to be sought in the further improvement of roads and streets, a committee of this sort, drawing upon available technical assistance, can compare the condition facts of the existing highways developed by the planning surveys with the desired standards. By such a comparison it is possible to arrive at a so-called Sufficiency Rating of the entire highway system, section by section, which will take into account the structural adequacy, the capacity for traffic service, and the relative safety of each and every section, and indicate the existing needs in general and in particular. Agreed upon what needs to be done, the committee can hopefully agree upon the desirable means of doing it.

This procedure is working in the States that have tried it. It is a democratic procedure. It is a procedure that seeks to arrive at important decisions on a basis of fact and common sense, that discounts emotional appeal and frustrates political maneuvering.

It affords the best avenue I know to the effective solution of highway problems, and the Highway Problem. I commend it to you as a plan worthy of endorsement by your national body and support by your local granges in all States.