Prepared for publication in the Engineering News-Record
Submitted December 20, 1933.

What Is The Future Road Program?

By H. S. Fairbank, U. S. Bureau of Public Roads

When the emergency money is gone, what then? This is the question that many are asking. There is warrant for asking it; and it must be answered, or we fail as highway engineers. This much is sure: The answer can not be phrased in the old terms. Principles that seemed fixed and immutable a year ago, clear and solid as ice, have thawed in the light of this new day and turned to water. What form will they take when they recrystalize? That is the question that faces us today.

This instant of time at which we stand is the moment after a collision. It is as if countless billiard balls had all been rolling swiftly toward a common center, each coming on, straight as an arrow, following its own course, until suddenly they all strike together. Where are they going to come out? What course will they each take when they are through knocking against each other? The chance that any one will continue exactly its former course is small indeed. But which way? Ours is that red ball; which way is it going?

If we are going to attempt to answer the question at all, we shall probably have to use the method of the billiardist. We shall have to cast an eye back along the previous path of our ball, and as many other eyes as we have down the past courses of the other

balls that are striking against it; and, maybe, if we are good at estimating the forces of impact and the angles of incidence and reflection, we can make a guess as to the direction of the resultant force that will expel our ball out of the tangle and on into the future. A fair guess is the best we can hope for. Expert, indeed, the player who can predict that line with precision!

Suppose we start by looking back along the red ball's path - the past course of highway history. No need to look further back than the coming of the motor vehicle. What has happened since then?

What, principally, the automobile did for the highway was to extend its range of service. When for the plodding pace of the draft horse it substituted its speed, and for the animal's limited endurance it exchanged its tirelessness, it greatly increased the normal distance of travel by road. Whereas the horse had seldom drawn his burden beyond the limits of the county, the gasoline motor pushed its vehicle quickly past the borders of the State, into and through the neighboring States, and on and on until it reached and passed the national borders. And, whereas, the horse-traveled roads were all very much alike in the local character and small volume of the movement over them, the far-ranging motor vehicle quickly set apart from the generality of roads, the character of which remained almost unchanged, a small class which, fed by the others, and joining the principal cities, became the trunk lines upon which flowed an

accumulation of traffic drawn from wide areas and densely populated cities.

New policies of highway administration were shaped to fit the changing need. The restored importance of the highway brought it within the scope of State and National interest. The need for coordinated development of the main routes over long distances precluded effective administration by numerous local authorities, and led directly to State control and ultimately to a share of Federal responsibility. The accumulation and rapid growth of traffic on the relatively small mileage of roads which, by reason of location and the inevitable selection of the traffic itself, have become trunk lines, have conduced with compelling logic to the creation of the State and Federal-aid highway systems and to the priority and higher degree of improvement that have been accorded these limited systems.

Throughout the period of about fifteen years during which efforts of the State and Federal Governments have been concentrated upon the upbuilding of the main trunk lines, there has never been a time when the demands of the traffic using them have been fully met. Within the limitations of funds available highway authorities have attempted to meet the most pressing requirements and, with annually increasing funds over a period of years, it was possible steadily to approach the goal of an adequatly improved main road system in all parts of the country. To an increasing degree the funds that made

this possible were paid by road users in license fees and gasoline taxes. Such payments grew to the point where they covered 90 percent of the annual expense of the State and Federal-aid highways and nearly 25 percent of the expenditure on local roads. And it was this increase in the contribution of road users themselves that made possible a steady enlargement of the Federal-aid and State systems with further relief of the burdens of road cost carried by the local governments.

But, great as was the increase in the motor vehicle funds, and important as they become as sources of highway revenue, the total revenue available for road purposes never at any time enabled the road builder to catch up with the economic needs of the constantly pressing traffic. Always it was necessary to limit expenditure to the meeting of the most urgent of immediate needs. Never was it possible, as a general plan, to provide adequately against future requirements.

So we find that, with all the splendid work that has been done, and with full recognition of the enormous general improvement in the highways of the country, there are still, according to the latest available figures, more than 92,000 of the 358,000 miles of State highways that are unsurfaced. Of the surfaced portions more than 156,000 miles are improved with surfaces of low type, many of them even now inadequate for the present traffic; and only about 110,000 miles are improved with the higher types of surface that eventually

must be constructed on a large part of the system.

Of the 806,000-mile Federal-aid system - the most important roads of our entire network - nearly 30,000 miles remain unsurfaced and 83,000 miles have low-type surfaces. Only about 93,000 miles have been improved with surfaces of high type.

The local roads, of which there are nearly 2,700,000 miles, are in very large part unsurfaced. Only about 600,000 miles have been provided with surfaces of any kind and on at least 550,000 miles the surfaces are of low type.

It is apparent from these figures that, despite the large amount of work that has been done, there is still much more that must be done before even the most important roads shall have been adequately improved, as to surface only, to say nothing of all the refinements of curvature and grade and intersection design that press for attention. Until these things have been done we shall not have met even the most insistent of present traffic demands. Beyond that there is a vast amount of effort that must certainly be expended to provide the rural transportation service the future will require. But, before we look ahead to that, there are some other things of the past that deserve our attention.

As we look back along the course of our red ball of highway history we see that although it was generally straight and direct, there were some undeniable wabblings, especially in the more recent years.

As the condition of the main highways has vastly improved, the unimproved state of the local roads has been thrown into stronger contrast and there has been growing discontent among the many, whose homes and farms are situated apart from the main lines of travel, over what seems to them to be unreasonable neglect of their local roads.

At the same time it has become increasingly apparent that the systematic and rational improvement of these local roads with reasonable economy and efficiency will not be possible so long as they remain under the sole administration of local authorities.

The gradual absorption of the more important local roads into the State highway systems has relieved the most aching needs; but as this process is continued there comes a time when it becomes difficult to distinguish among the vast unchosen mileage the particular miles that should next be transferred to the State administration.

There has been increasing difficulty in the collection of the property taxes that have been the main support of the local roads. Steadily there has been transferred to these roads an increasing portion of the motor vehicle tax receipts, but more rapidly still the yield of the property taxes has declined. A point has been reached where it would hardly be an exaggeration to say that the property tax as a means of producing road revenue has broken down. Whether the condition is temporary or permanent is a question that many are asking?

Motor vehicle taxes,- everywhere steadily increased in rate,- have produced, until the most recent years, annually increasing revenue. In some States there is evidence that rates have approached close to the point of diminishing returns. In others it is clear that a considerable further increase would be practicable and fair. It has been demonstrated that these taxes are capable of producing sufficient revenue for the support of all roads thus far added to the Federal-aid and State systems with a considerable balance for allotment to roads still under local control. How much more they can yield is an open question. That they can be made fully to take the place of the failing property tax is extremely doubtful. As a matter of old-fashioned economics, the test of which is a favorable balance of return from the investment, there are

probably two of our three million miles of rural roads that motor-vehicle owners, as motor-vehicle owners, simply can not afford to improve. Also, on the basis of the old economic principles, the property tax is more reasonable than any other to supply whatever funds are desired for the improvement of these lesser roads, because whatever direct benefits are conferred are mainly benefits to property.

In the most recent years we have seen the effort made to master the difficulties of the local road problem by transferring it from local to State authorities. It has been a brave effort, the success of which has thus far been menaced by a tendency to dodge the financial necessities.

And, finally, in this review of the course of our red ball, we see a decided quiver caused by recent doubts and disputes as to the public responsibility to provide for the operation of the larger motor trucks, and the responsibility to the public of those that operate such trucks, especially in the conduct of a hiring transportation service.

We have followed our red ball to the present. It is in the tangle, impinging upon, and being impinged upon by, a large number of other balls. Where it will come out and what course it will take when it does is what we are trying to decide. Before we can do so we shall have to examine the past courses of some of the other balls and try to estimate the directions they will tend to impart to our red ball with which they have collided.

Take first the white ball of the railroads. How does it strike against our red ball and what are likely to be its effects? In all railroad experience one fact stands out sharply: That they have always

rendered, and, by the law of their nature, must continue to render, by rail, an incomplete transportation service. They must depend upon the highways to accumulate freight for them at one end of their haul and distribute it for them at the other.

The railroads, as they now exist, were built thus to work in double harness with the highways; but the highways they were built to work with were roads over which loads were moved very short distances by animal power. In other words, the railroads were built to reach within horse-drawn wagon haul of the origins and destinations of their freight. With the economic range of movement over the highways materially extended by the motor vehicle it is clear that they now reach further toward those origins and destinations than economic occasion warrants.

This is the cause of most of such duplicate and competitive service by rail and highway as now exists. Clearly the remedy must involve some withdrawal of the railroads within a smaller mileage. What part and how much of the existing rail system must be abandoned to achieve the new equilibrium is a question yet to be answered. The answer will be influenced considerably by what comes out of the present controversy over the size of motor trucks. The greater the load allowed to be moved over the highways, the longer will be the economic highway haul, and the greater will be the needed withdrawal of the railroads.

The chief concern of the road builder is this: That wherever the railroads let go, there the highways must be prepared to pick up. Therein, the future course of the red ball will be strongly affected by impingement with the white.

Now let us turn to note that there is a blue ball of electric power that, before the collision, was driving straight and hard toward eventual widespread distribution of cheap and abundant power throughout the land - not in large cities only, not confined to cities of any size, but everywhere, town and country alike, throughout the land.

There are tremendous potentialities in this ball; for experience teaches that wherever power is cheap and abundant, industry will develop. In the past, such supplies of power have not been everywhere available; and where they were available, there cities have come into being and grown in size and prosperity.

One of the two principal factors influencing the location and growth of most cities has been the availability of power. The other has been the favor of railroad location. Where rail lines intersected have been spots that above all others have been favorable to the development of cities.

In the past, both of these factors have tended to concentrate industrial growth at certain points - at points where transportation facilities were favorable and power was cheap and abundant. In passing it may be noted that, in both respects, the influence of railroad location was predominant; for, aside from poorly distributed water power, the great source of our power was railroad-transported coal.

Against these forces, that tended to concentrate industry, the new widespread distribution of electric power comes to oppose a diffusive tendency, a tendency that is abetted by the presence of motor vehicles ready to serve the transportation needs of the kind of distributed industry it will promote.

The indications are that the blue ball of distributed electric power is likely also to have a great effect upon the future course of the highway red ball; for, if there is to be a new decentralized rural and small town industry, that industry will have highway needs that have not entered into the past calculations of the highway builders.

Now turn once more to see whence came this purple ball. It is the ball of the mechanization of industry. It has recently attracted a great deal of attention; but before it was noticed it had been rolling to this collision for a hundred years and more. Steadily, through its course, it has been reducing the number of workers required to supply the daily wants of a static world. Steadily it has been releasing these workers to the doing of the new things that have kept the world from becoming static. It released workers from agriculture to man a vast system of mechanized manufacturing industries. In turn, it released workers from the older manufacturing industries to man new ones; to build an electrical industry, a chemical industry, a motor vehicle industry. It will go on releasing men from works that can be reduced to routine to the doing of things that are new, that lead on and on and always on, out of the familiar into the imagined and into the now unimaginable.

So far as we are here concerned, what is most important about the effects of mechanization is that it has tended constantly to reduce the percentage of all workers required to supply our daily wants - the things that are called consumption goods - and to increase the percentage employed in producing the means by which the consumption goods are produced and distributed. We may, for convenience, lump all such means under the single name, plant; but it must be remembered that the name covers much more than the factories and their equipment which we ordinarily think of as the manufacturing plant.

No small part of the manufacturing plant we have been creating have been the cities themselves - the cities in which the forces of transportation and power have tended to confine manufacturing industry. To build up Detroit to enable it to contain its motor vehicle industry - to build it from what it was in 1900 to what it was in 1930; to build, not its factories only, but its homes and apartment houses and streets, and sewers, and waterworks, and telephone, electric, gas and traction facilities - all that occupied a veritable army of men. In the doing of similar things other armies and brigades have been occupied in Los Angeles and New York, in Chicago and Miami, and in every city and town in the country whose Chamber of Commerce could point with pride to the growth of its industry and population.

That growth has come to an abrupt stop. The men that have been employed in creating it have been out of jobs. Take them all together and they make up a large part of the construction industry; and make no mistake about it, this depression will disappear when the construction industry is again active.

But that it will become active again in doing the same things that formerly occupied it, is extremely unlikely. That it will go back to building big cities bigger is not in the cards. Remember those diffusive forces that are now at work.

What is much more likely, indeed certain, is that some of the men that have been building factories in large cities will shortly start building new and better factories in small towns, where "overheads" are cheaper, and where expansion is possible at something less than prohibitive cost. And some of the men that have been building homes and streets and waterworks and so forth in large cities will start doing the same things in small towns. Some of them, certainly, will find renewed occupation in the large cities; not probably in making them larger but in making them better; in opening up their congested older sections; making them more habitable; adapting them to the altered conditions of modern existence for which they are badly fitted.

There will be men to do all these things and more; for, remember the purple ball of mechanization is still rolling. It will go on releasing men from routine tasks to the doing of new things; and the new things that will be done will be largely in Rural America. That is what concerns us most here. There has always been a frontier to absorb the released energies of mankind; and the frontier that will do that in the immediate future lies in undeveloped Rural America and not in the overdeveloped large cities. To say that this will have profound effects upon the highways - the highways that are the streets of Rural America - is hardly to overstate the case.

Having examined very briefly the past courses of those other "balls" or economic forces, and formed an impression of the nature of the effects their impacts may have upon the future course of highway development, let us now turn back to where we left our own "ball," at the moment of collision, and see what has been happening to it.

We find that the customary highway revenues have dwindled during the depression. In property taxes the shrinkage has been great. In motor vehicle taxes it has been small; and, incidentally, the smallness of this shrinkage has been one of the striking phenomena of the depression. At present the Federal emergency appropriation probably about makes up the deficiency in yield of the other sources of revenue. It probably does no more.

It is significant that highway construction was the first and is continued as one of the most important works provided by the Federal Government for relief of unemployment. It is more significant that in the National Industrial Recovery Act the Government has departed from its long-established policy of participating only in the improvement of the main, interstate roads that constitute the Federal-aid system, and is insisting upon expenditure of a portion of the appropriation on "secondary or feeder roads." And it is more significant still, and symptomatic of a future state of health for the country's

transportation system, that deliberate efforts are being made by the Bureau of Public Roads to discover the roads of this category that will, on the one hand, feed the railroads most effectively and, on the other, relieve them of the burdens of unprofitable branch lines.

What of the future? Must property taxes be completely abandoned? Will the motor vehicle taxes hold up? Can the Federal Government continue its support? Can the taxpayers stand more road building? What about the farm-to-market roads? Why not build a great transcontinental defense highway a hundred feet wide and straight as the crow flies from New York to San Francisco? What will the roads of the future be like?

These, and an almost endless variety of other questions that come to the Bureau of Public Roads, manifest the interest - often intelligent, sometimes just interest - of citizens everywhere in the future of the highways. Many of the questions indicate fear that the country will not much longer be able to support the luxury of its highways.

The gift of prophecy was not included among the writer's endowments; but to a certain extent the future of the highways is so compellingly conditioned by the known facts of the present that no clairvoyant faculty is needed to envisage it. To that extent a forecast may be ventured.

Most certain of all is the assurance that we shall go on building highways. There will be no highway holiday - not, at any rate, until we are ready for a city street holiday also.

There appears to be no strong reason for belief that the property tax will be permanently abandoned as a revenue producer for local roads. For such roads it accords closely with the character of the benefits accrued and its retention is logical. Difficulty of collection should pass with the depression; decentralization of industry and a rural development beyond anything dreamed of a few years ago seem to be the probabilities of the immediate future and they will bring the property tax back to its old reliability. In the meantime, popular demand for relief from tax burdens may accelerate the tendency toward transfer of control over local roads to State administration.

Motor vehicle taxes will be increased in States in which rates are now low. There will be no permanent shrinkage in total yield, but on the contrary a considerable increase, taking the country as a whole. It is significant that already the automotive industry leads in the recovery.

The Federal Government not only can, but must continue its support. While unemployment lingers the Federal contribution is likely to remain high.

Transfer of complete responsibility for all rural highways to the State highway departments is to be expected in all States. Efficient administration will require adequate financing and State-wide traffic surveys in all States. The more nearly such surveys take on the character of general rural planning the more likely are they to supply the information that will be the imperative need of the immediate future. It has been possible to plan and carry out the pioneer improvement of intercity highways with a minimum of precise economic study. It will not be possible to deal efficiently with the marginal problems of the future without accurate knowledge of needs.

Long-time planning and continuity of administration will be imperative.

The Federal-aid system and State highway systems, as now designated, approximate an actual general-use system of primary importance. Errors of selection should be rectified as indicated by survey data. Rectification will be simplified when the local roads pass under State control.

Continued pressure toward real traffic adequacy of the primary general use system must remain a secure item in the highway budget. It will be the duty of administrative officials to resist unwise diversion of funds required for that purpose to gratify ill-considered demands for unduly rapid local road improvement.

Complete traffic adequacy of primary general-use highways will not be reached until economically maintainable dustless, all-year surfaces, designed to resist the maximum loads that may be expected to be applied with significant frequency, have been laid on the entire mileage; and, further than this, the width of surface, curvature, sight distance, intersections, and grades have been brought to safe standards consistent with vehicular operation at the maximum probable speed. At present the least of these requirements - a maintainable surface of adequate strength - has yet to be realized on a large part of the recognized mileage of general-use highways. The further refinement to complete adequacy is for the most part, still ahead.

The construction of the general-use routes into and through the cities and of alternate by-pass routes around them is also very largely still in the future and urgently pressing.

Anticipating a quick acceleration of rural development it will be realized that satisfaction with right of way width sufficient only for the minimum requirements of present construction is a penny-wise, pound-foolish policy. Federal insistence upon provision of widths consistent with ultimate requirements on roads built with emergency funds will lead to general realization of this important need.

The roadside ditch will be recognized as a hazardous anachronism and will quickly disappear, supplanted by underground drainage. In the space it formerly occupied footpaths will be provided where density of pedestrian and vehicular traffic requires.

Fill and cut slopes will be flattened and grassed over and the cost of flattening will be saved by reduction and almost complete elimination of the necessity for guard rails.

Roadside landscaping, naturally and sensibly designed to restore and maintain an appropriate natural state of rural beauty will be accepted as essential to a complete highway improvement. Not for esthetic reasons only, but equally for reasons of safety and traffic convenience, the roadside filling station and lunch stand will be forced to submit to regulation by public authorities.

Separation of highway and railroad grades at intersections will proceed at an accelerated pace.

Narrow and unsafe bridges will be replaced by adequate structures.

On routes where density of motor truck traffic has reached the point where the truck tax payments will pay the cost (on the average about 1,500 trucks a day) separate roadways will be provided for truck traffic only. On routes where the density of truck traffic is high but less than the density necessary to pay for separate roadways, additional surface width may be provided. Motor

truck and bus taxes, where now inadequate, will be adjusted to cover all extraordinary highway costs entailed by truck and bus operation in addition to a pro-rata share of normal highway costs.

If the wiser counsel prevails, there will be no construction of excessively elaborate, economically unwanted transcontinental boulevards. A far grander project is ripe for beginning--the planned improvement of the more important local roads in anticipation of a rural development, exceeding anything yet seen or imagined, that seems to be the inevitable goal of new economic forces now at work.