

## HIGHWAY DEVELOPMENT AND ITS PROBLEMS

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The development of a system of improved state highways in Indiana suitable for modern traffic has made slow but steady growth, starting about 10 years ago. Although this development made rather slow progress at first, it has increased in speed and quality of roads each year. Few states have done better in the selection of through routes best to accommodate the heavy through traffic which is rapidly developing.

### Proper Location of State Roads

The highway commission has frequently put up a fight against much opposition in order properly to locate a road to accommodate the through traffic. It is an easy matter for the commission to yield to private influences in routing a through road so as to satisfy individuals and thus insert perhaps an additional length of a mile in the road. Few of us have realized the future loss to the traveling public from additional lengths that might be placed in our state highway system.

One needs but to multiply the daily vehicular traffic by the number of days in the year, by the added length in miles, and by the cost per vehicle mile, to discover that an enormous burden may be placed upon the public by poor locations. We have been told this frequently and should ever keep it in mind so that we may use good judgment in the proper locating of our heavily traveled roads. Too frequently we confuse the theory of a system of through roads with that of purely local roads.

The importance of the proper location of a system of through roads may be brought to us by a simple problem. Let us assume that our state highway system has, or can be, shortened **1% by proper location**. With 5,000 miles of road in the state system, and assuming the cost of transportation to average 10c per vehicle mile, an average daily traffic of only 600 vehicles, the **annual saving to the traveling public by this shortening would be 5,000 (miles) x 1% x 600 (vehicles per day) x 365 (days) x 10c, or \$1,095,000.00.**

One scarcely realizes the magnitude of this important problem until he analyzes it in this manner. These figures do not include the saving in road maintenance on the shorter route.

Generally speaking, roads should be so located that they will **shorten the distance for the greatest number of vehicles.**

However, we should not make the mistake of **attempting always to make the through road and local road one and the same thing.** We need both. While generally a through road serves the local traffic, by improper location it is possible to spoil it for either. For instance, by routing it through a congested district over a longer route, two handicaps are introduced to the through traffic and the added local congestion may greatly interfere with the local traffic.

Generally it is not good practice to combine two important roads as they approach a large city, particularly if this combination adds length to either road. Such an arrangement may not only add to the already congested condition at such places but also by the added length make both routes less satisfactory. In such cases not only the through traffic but also the local traffic may not be so well accommodated.

The principal difference between a large city and an entire state, such as Indiana, is that in the former we can quickly and readily go from place to place, while in the latter, the distances are greater. By shortening the distances in the latter, it is possible to approach the conveniences obtained in the large city. **With the most direct routes, and with wide and suitable pavements free from congested districts, the whole state will gradually approach one large city as regards convenience of communication.** It is needless to enumerate the advantages of such a condition prevailing in this state. The desirability of giving great study when any important through highway is diverted from its most direct location between populous centers should be evident.

Frequently arguments are made for the location of a state road to accommodate the local traffic at the expense of the through traffic because the former is the greater. Regardless of the location of any state road, the local traffic need not be accommodated less, for local roads should be so built and connected with the state highway system that the local traffic will in no wise be discommoded by the location of a through route but, on the other hand, may be aided and helped by freeing districts already congested with local traffic from the ever increasing through traffic.

Mention may be made of the great advantage of the direct line from Indianapolis to Lafayette; yet our highway commission perhaps received more criticism for building this direct line instead of diverting it in a circuitous line 5 miles longer than for any other one piece of work that has been performed during the history of the commission.

This direct line from Indianapolis to Lafayette is not only of advantage to the heavy through traffic, but it is also a direct financial asset to the Purdue athletic department because it brings a greater number of people to every football game. It would not take a financier to compute the financial gain to the athletics of Purdue University if it were located

at the outskirts of Indianapolis, where large population could readily reach the athletic field for important events. However, if we can make the road so direct, wide, and accommodating that little inconvenience is encountered by the traffic from Indianapolis, the same advantages are approached as if the University were moved toward this populous center.

By locating this road on a direct line, no additional handicap was placed upon the people of Frankfort. Four state roads lead to this town and perhaps even more will reach it in future years. The building of this direct route from Indianapolis to Lafayette does not force the citizens of Frankfort to travel any additional distance. The only advantage that could have come to this city by diverting this road so as to pass through it would have been the small purchases made from its merchants by those passing through. The additional distance by way of Frankfort for through traffic is about 5 miles. For 1,000 vehicles per day this additional distance would have cost the through traffic annually about 1,000 (vehicles) x 365 (days) x 5 (miles) x \$0.10=\$182,500.00.

You can look back now and see how ridiculous it would have been to have imposed the enormous burden of the five additional miles on the through traffic in order to bring to the merchants of this city the little advantage they would secure. I cite this road as a concrete example of the advantages and saving to the public in locating a through road over the shortest practical route.

You perhaps noticed an article in the newspapers a few days ago about a system of through highways proposed by Congressman Hall, which system as proposed is to consist of about 7 transcontinental routes east and west and 15 or 20 routes north and south across the United States, with certain diagonal routes. There is little need of any such system of superhighways **if we use good judgment in laying out and developing our present federal system.** However, if we yield too much to individual demands in locating the present highway system by diverting important federal routes out of their way to accommodate purely local interests, we are certain to force upon us some such system of superhighways as Congressman Hall proposes. It is believed that the local traffic can be taken care of far better and the through traffic accommodated just as well by the proper laying out and development of our present approved federal highway system. Congressman Hall's proposed system is as extreme in one direction as the yielding to individual selfish interests so as to divert our present federal system away from direct lines would be in the other.

I am making this argument in order to **appeal to you to cooperate with your highway commission in making short cuts wherever at all possible so that you may do something for the future development of your state that will be an asset**

to it far beyond any minor local advantage from diverting through traffic out of its way for some small local accommodation. And, too, the following of direct lines will make unnecessary any such special superhighway system (and the unnecessary expenditure of billions) as proposed by Congressman Hall.

**Miles of Road in the State System and Rate of Improvements**

On January 1, 1929, there were in the state highway system 4,610 miles of road grouped according to surface as follows:

Miles		Miles	
0.89	Wood Block	871.06	Stone Road
81.29	Brick	1322.00	Gravel Road
1597.29	Cement Concrete	17.88	Earth Road
100.37	Rock Asphalt	105.95	Road Torn Up for Construction
31.53	Bituminous Concrete	7.72	Miscellaneous
257.53	Bituminous Macadam		
29.19	Surface Treated W. B. Mac.		
187.15	Bituminous Retread Top or		
2285.24	Dustless type..and..	2324.61	Non-dustless type

This makes a grand total of 4,609.85 miles.

**One of the big problems of your state highway commission is to transform the types in the right hand column of the above tables into the types of the left hand column.**

There are 354.62 miles of state routes inside of cities of over 2,500 population, which, if added to the state roads being maintained outside of cities, make a total of 4,964.57 miles of state routes. ("State roads" refer to roads on the state highway system, exclusive of detours, maintained by the state while "state routes" include the state roads, together with those streets inside of towns of more than 2,500 population which are marked with the state road numbers but are not maintained by the state.)

The mileage of different types of surface maintained by the state on January 1, 1929, might be regrouped according to surface in the following classes:

- (1) 2,073.45 miles Pavement
  - (2) 216.34 miles Surface Treated Stone and Gravel
  - (3) 2,193.06 miles Stone and Gravel Roads
  - (4) 17.88 miles Earth Roads
  - (5) 109.02 miles Road Torn Up for Construction
- 
- 4,609.85 miles Total

During the past fiscal year ending September 30, 1928, the state built pavements or some form of dustless top road as follows:

- 230 miles Cement Concrete
  - 64 miles Rock Asphalt
  - 26 miles Bituminous Macadam
  - 37 miles Bituminous Retread or Surface Treated Macadam
- 
- 357 miles Total

Assuming this present rate of improvement, which is the largest in the history of the commission, it would be 7 years before the present state highway system would be paved or improved with some form of dustless top.

It is true that the present rate of revenues, because of increased registration of motor vehicles and gasoline consumption, will likely increase each year; however, because of demands on the funds for widening the roads and because of a very extensive bridge program, it is doubtful whether this rate of converting our gravel and stone roads into some form of pavement can be increased with the present rate of revenue. This does not take into account the additions to the state system which are being made from year to year and which are very necessary as the traffic increases and our state develops.

### **Accidents on the State Highways**

We attempt to make a report of accidents happening on the state highway system each year with a view of securing, so far as possible data that may throw light on the causes of accidents. This information should aid us in reducing the number of accidents.

Because of the great number of minor accidents, it is necessary to limit these reports to those in which a person is injured or killed or in which property damage is \$25.00 or more. During the past year 668 accidents resulting in 191 fatalities were reported. These reports are made on a new form recently adopted by the American Association of State Highway Officials, which is a modification of the card form originally prescribed by the National Safety Council.

That accidents and fatalities are increasing at an alarming rate is quite evident from these reports. They furnish a valuable study preparatory to bringing about means for the prevention of accidents.

The summary of accident reports show that many things, such as narrow roadbeds, deep ditches, narrow culverts, close proximity of poles and trees, railroad grade crossings, glaring head lights, head lights too dim, obstructed view at road intersections, intoxication, and numerous other things, all furnish contributing causes to these accidents. A complete summary of these reports will be found in the State Highway Commission's Annual Report.

To close the comments on this subject, a slide will be shown on which is a curve of fatalities occurring on the state highway system during the past 8 years. It will be observed that the curve of fatalities is rising at a sharper angle each year, even though the motor vehicle registration curve is flattening. The latter curve is a pretty accurate indication of the traffic. The regularity of this fatality curve would indicate that there

are constant forces contributing to accidents on our highways. It seems unbelievable that we could predict a year ahead of time very largely the number of fatalities that are going to occur on our state highway system, yet the records of the past as indicated by the curve will show that unless we resort to some radical means of reducing accidents, this prediction can be quite accurately made. One might well predict that motor vehicle accidents on the state highway system will cause about 240 fatalities this fiscal year.

**The safety work of the Highway Commission is just as necessary as the building of good roads and it is one of the many problems which must be given attention and study.**

### Markers and Signs on the State Highways

Perhaps no one thing has brought any more commendation of our state highway system than the standard system of markers and signs which are now used thereon. While this work is costing about \$50,000.00 per year or about \$12.00 per mile, no one would advocate a reduction in our activities along this line. In fact, we are requested almost every day to do more centerline marking and erect more guide signs at strategic places.

A problem the commission has to confront is the disputed locations of routes through some of our cities where the convenience of strangers traveling through the cities conflicts with the interests of certain local merchants who are anxious that their business be augmented by marking the route their way. Here again you as officials in your local communities can do much by taking the right stand on such problems.

### Increase in Traffic

The traffic on the state highways is constantly increasing. Without an accurate traffic count, the trend of this traffic increase can be judged from the increase in motor vehicle registration, and from gasoline consumption. Fig. 1 clearly shows that the increase in motor vehicle registration is dropping, being this past year only 3.2%. However, the increase of gasoline consumption is getting larger, and since the gasoline consumption is an accurate measure of the use of highways by motor vehicles, we can conclude that the traffic on our highways is increasing at a rapid rate in spite of the tendency of the increase in motor vehicle registration to reduce.

### Increase Over the Preceding Year

<i>Motor Vehicle</i>	<i>Registration</i>	<i>Gasoline Consumption</i>
1919—21.1%	1924—11.5%	
1920—17.0%	1925—11.3%	1925—15.9%
1921—22.4%	1926— 6.8%	1926— 7.9%
1922—16.9%	1927— 5.4%	1927—12.9%
1923—23.3%	1928— 3.2%	1928—14.1%

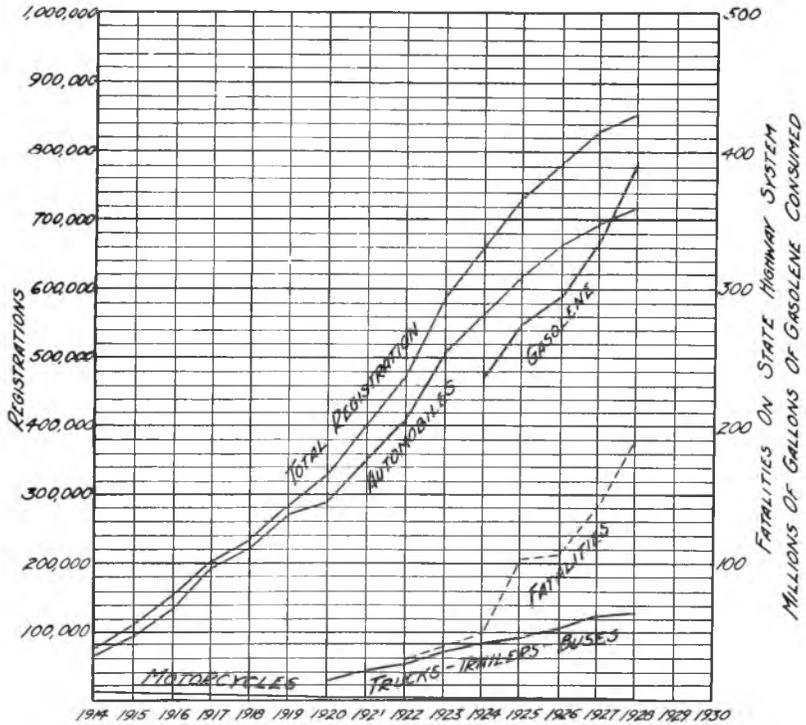


Fig. 1. Registration of motor vehicles, fatalities and gasoline consumed.

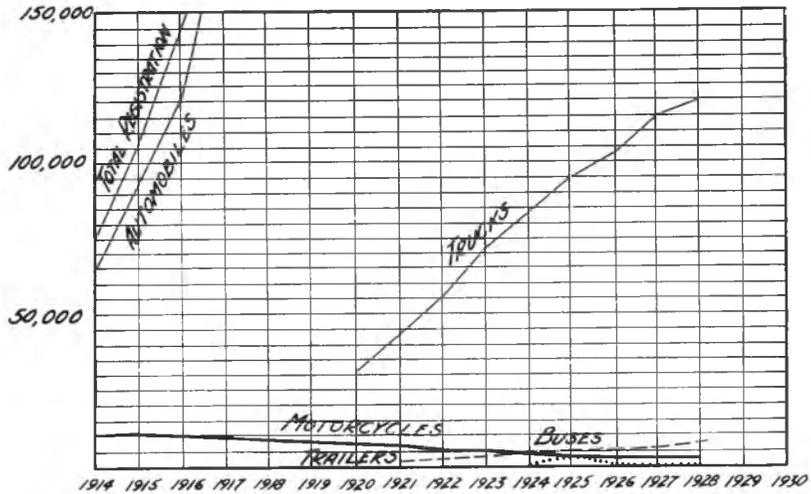


Fig. 2. Registration of motor vehicles.

Fig. 2 shows that busses have increased this past year 13% over the preceding year, which is indicative of the expansion of this public utility. It is useless to say that with this constant increase of traffic on our state highways the highway commission will soon be confronted with the problem of widening the pavements as well as many of the bridges to accommodate the traffic.

### Condition of our State Highways

Because of the increased amount of pavement each year the condition of our state highways for traffic is gradually growing better. It is particularly noticeable that our gravel and stone roads are far superior for winter traffic than they were a few years ago. You can well remember when but a few years back these types of roads were usually considered unsuitable for winter traffic. They cut up and usually froze rough and in the spring of the year were generally impassable for weeks and sometimes for months. However, with our better and more systematic system of maintenance, these types of roads now as a whole are perhaps generally better for automobile traffic during the winter season than during the summer season because of the dust nuisance during the latter period. This nuisance is greatly magnified not only by the increased traffic but also by the balloon tires and higher speed traffic.

While it is now necessary to restrict truck traffic on these types of roads during the spring thaws, it is unusual for them to become impassable to ordinary automobile traffic. Our laws permit the seasonal restrictions of heavy traffic on the stone and gravel types of roads. Through this restriction these roads are protected at critical times; however, **it is believed that there should also be some provision in the law wherein the heavy loads could be further restricted on pavements during the seasons of the year when the foundations are soft and unstable.** Fourteen-ton loads over our pavements during such times are certain to cause great destruction to them and to make necessary costly repairs. Provision should also be made for limiting the loads on weak bridges. Some states have provided for this restriction. Indiana should have such a restriction, not only to protect the weaker pavements but also to protect the weak bridges. It is doubtful under our present laws if we can limit the load that will go over a weak bridge to less than 14 tons.

### Cutting into State Roads

Owing to the development and progress being made in our state which is largely induced by the good roads we are building, public improvements such as drainage, power lines, telephone lines, and the like are being constructed at a rapid rate.

It is necessary to protect our improved roads against undue destruction by these other public improvements.

The highway commission has adopted a schedule of charges for cutting into state roads which we have attempted to make on a scale proportionate to the damage done to the roads. It is believed that such charges are more than justified, and I solicit your help and cooperation in protecting by some such means the costly highways we are building.

It is hardly fair to spend large sums of money for a costly road one day and permit another industry to destroy it the day following. The utility or project which destroys the pavement should bear the expense caused thereby. Our public utilities are just as necessarily a part of our present social and economic life as are our highways, and we should not impose any unfair or unnecessary expense upon them; however, on the other hand, they should cooperate with the governmental institutions to bear their legitimate part of the expense incurred by their development. **This is only another way of saying that each citizen should pay for the service he receives without imposing the burden of his luxuries and advantages upon his fellowmen.**

#### Cost of Maintaining Different Types of Surface on State Roads

Table 1 gives the cost of maintaining the different types of road surface on the state highway system during the past 5 years. This cost data is kept by our bookkeeping and accounting system in the central office and is a valuable record for the study of highway economics.

TABLE 1. ANNUAL AVERAGE MAINTENANCE (ONLY) EXPENDITURES PER MILE ON THE VARIOUS TYPES OF ROADS

TYPES OF SURFACE	Year 1924		Year 1925		Year 1926		Year 1927		Year 1928		Average Yearly Expenditures for the Five Years
	*A	†B									
Brick.....	53	\$184	47	\$240	50	\$254	41	\$335	61	\$295	\$260
Cement Concrete.	385	163	597	150	815	207	888	227	1,148	217	201
Bituminous Concrete.....	13	570	14	187	16	679	14	444	23	313	428
Rock Asphalt.....									12	232	232
Bituminous Macadam.....	24	606	49	554	123	596	102	350	150	454	489
Surface Treated Waterbound Macadam Gravel, Stone and Bituminous Retread.....	7	317	7	855	21	533	71	727	131	728	704
Stone.....	634	657	601	662	776	819	637	859	711	911	788
Gravel.....	1,539	711	1,351	591	1,131	627	981	639	1,073	747	664
Miscellaneous.....							1,703	479	1,264	465	473
All Types.....	2,655	605	2,666	500	2,932	553	4,437	519	4,572	541	541

\*Column "A" indicates mileage on which expenditure is based.

†Column "B" indicates average expenditure per mile.

TABLE 1-A. DISTRIBUTION OF MAINTENANCE EXPENDITURES FOR FISCAL YEAR ENDING SEPTEMBER 30, 1928

TYPES OF SURFACE	Miles on which Expenditure is based	EXPENDED ON				
		Surface	Roadbed	Structures	Snow Removal	Total
Brick.....	61.18	\$215.20	\$68.90	\$3.00	\$7.60	\$294.70
Cement Concrete.....	1,148.18	72.40	128.40	5.50	10.40	216.70
Bituminous Concrete.....	22.72	201.50	86.70	19.30	5.40	312.90
Rock Asphalt.....	11.95	89.80	121.50	20.00	.20	231.50
Bituminous Macadam.....	149.83	336.10	103.20	6.30	8.60	454.20
Surface Treated Water Bound Macadam, Stone and Gravel and Bituminous Retread.....	131.41	653.50	63.20	6.20	5.00	727.90
Stone.....	710.60	838.10	55.90	14.10	3.00	911.10
Gravel.....	1,072.90	677.40	49.50	16.70	3.80	747.40
Miscellaneous.....	1,263.59	385.30	61.90	13.80	3.80	464.80
All Types.....	4,572.36	\$447.80	\$76.60	\$11.80	\$5.65	\$541.80

## KEEPING THE RECORDS STRAIGHT

By Lawrence F. Orr,  
State Examiner, Indiana State Board of Accounts

Editor's Note:—Mr. Orr was unable to attend the Road School due to pressure of official business. At our request he very kindly supplied answers to the following questions submitted by local road and street officials.

In answering inquiries and making examinations of accounts, we realize that an official may desire at times to undertake to do something for the benefit of the municipality, which the law prevents, and that in his desires to do so he is not guided by any selfish motives whatever. The only safe course, however, is to follow the law. As public officials, we can not do the things we can as individuals. Public officials can only exercise the powers and duties granted by statute. As individuals, the statutes provide what we can not do.

Hence, in the answers which we have given to these inquiries we have considered the law first and proper accounting which applies in consideration of the statutes.

Our department does not desire to be in a position of administering for public officials. We are an examining department, a department of public service. We are endeavoring to assist taxpayers and public officials throughout the state in the matter of obtaining good and efficient government within well defined financial limitations in order that the best results may be obtained without extravagance and waste of public funds. We believe we are in a position to render such services and we offer our department as one of service to the public.