diana. The staff has been careful to see that the work is conducted under such scientific care that a number of relations of general scientific value will result.

RIDE AND LIVE

Paul G. Hoffman,
President, The Studebaker Corporation,
South Bend, Indiana

Thirty years ago this spring I was the chauffeur on the first long motor trip of the Hoffman family. The car was a 1905 Pope-Toledo purchased second-hand by my father at a cost of approximately $1,500. It was an open car. The chassis would have done credit to Rube Goldberg. Advertisements called it the world's first mile-a-minute automobile. Tires cost from $75 to $90 apiece, were good for about 2,500 miles; punctures were frequent. A steering knuckle cost $30, and a new one was needed every so often. Springs, priced at about $30, broke every time you hit a bad bump. There were seven lugs on each wheel; to change a tire was a major operation. For touring we carried 16 spark plugs, all available inner tubes, two extra casings, tools enough to outfit a small garage. We lived in Western Springs, southwest of Chicago. Our trip, for which we had to wait until spring, had as its destination Sycamore, Illinois, approximately sixty miles away. Preparations were made weeks ahead. We started bright and early on Saturday morning, with five people and an enormous hamper of lunch. Our adventures, briefed, were as follows:

In the first few miles I changed four spark plugs. Otherwise, everything was lovely.

On the far side of the Fox River I tried to shift from third to second gear to climb a hill, and failed. When the car was out of gear there was no service brake. We started to roll backward. My aunt screamed, tossed out the lunch basket, and followed it herself in a flying leap. I stopped the car by backing into the bank.

After trying again and making the grade, we reached a fork in the road. Nobody knew which one to take, and we had no maps. Father said "left," and Grandfather said "right." Grandpa had the more positive manner, and we went right. We should have gone left.

It began to rain. Considerable time was lost putting up the curtains.

The road became a bog in which we finally sank. I cut brush to give the wheels traction. We got out of the first mud-hole, went a short way, sank again.

Night came on. I lighted the headlamps. Old-fashioned rock-carbide lamps, they flickered and flickered, went out. No help at all for seeing ahead. We slid into the ditch and were
stuck for good. A neighboring farmer gave Mother and Aunt a bed for the night. My aunt nearly had hysterics because a woman had had her head chopped off in that house, and the farm wife insisted on telling all about it.

Next morning we managed to get out of the ditch under our own power. We had come forty-five miles and had had enough; we headed for home.

Presently the engine stopped cold. Trying to crank it, Grandpa gashed his forehead on the sharp top of the radiator. The cut bled freely. My aunt and my mother began to weep.

I discovered what was wrong with the engine. A valve at the bottom of the crankcase had been turned when we were stuck in the ditch. The oil drained out, the engine “froze”! I had extra oil and managed to start the engine, but we had burned out all the bearings, and I found that the engine would die if the car speed dropped below thirty miles per hour.

At St. Charles, where we had started to roll downhill the day before, the two ladies got on the street car and went home. The nearest garage was at Aurora, fourteen miles away. We three men headed for it. We struck at least fifty “thank-you-ma’ms” in the road between Aurora and St. Charles, taking them at thirty. Grandpa used most of his vivid vocabulary.

The car stayed in the Aurora garage about a month and was practically rebuilt....

Motoring was like that thirty years ago. Roads were wretched. Cars were inferior. Servicing facilities were poor. About 140,000 cars were registered that year in the whole country. Figuring an annual mileage of 5,000, which is high, approximately 700,000,000 vehicle miles were accounted for in 1908. There were during the year approximately 650 fatalities. Here's a figure I want you to keep in the forefront of your minds—the fatality rate per 100,000,000 vehicle miles was approximately 92.

Much has happened in the thirty years that have passed since 1908. More than 75,000,000 cars and trucks have been built. Thirty million of them are still in the land of the living, rolling merrily over our highways. More than one-third of our entire population consider themselves qualified drivers—a vast army of 40,000,000 men, women, girls, and boys. Thanks to a dramatic expansion of our highway system, we are out of the mud and can boast of more than 130,000 miles of hard-surfaced roadway. And here's the biggest figure of all—one that you can try to wrap your mind around—those 30,000,000 cars and trucks covered during the year of 1938 more than 250,000,- 000,000 miles.

During the thirty years, the increasing impact of more and more cars covering more and more miles has brought with it a thousand changes in the American way of life. That's a story all by itself, but you and I have seen it happen.
DEVELOPING A HIGHWAY SAFETY PROGRAM

We have seen highway fatalities mount almost steadily from year to year—from 650 in 1908 to almost 40,000 in 1937, a terrific toll. But let us not forget that that rate of 92 fatalities per 100,000,000 vehicle miles was reduced to approximately 16 in 1937. In my opinion, the decline up to five years ago can be attributed almost solely to better cars. All-steel bodies, shatter-proof glass, four-wheel brakes, improved steering and roadability, all played their part. Improved roads were a factor to some extent.

It is only during the past five years that there has been anything approaching an organized highway safety movement. In the early part of 1936 the National Safety Council announced its new war on accidents. The Council, along with other civic organizations, asked the financial support of the automotive industry. The Automobile Manufacturers Association requested its Street Traffic Committee, of which I was chairman, to make a survey of the whole safety situation and bring back recommendations as to what we might or might not do, together with the approximate cost of any program we recommended.

We first proceeded to get the facts about accidents in 1935. We found that real, sure-enough facts were hard to get. As someone put it, facts are our most neglected natural resource. No one really knew exactly what was happening, although the National Safety Council was making a sincere effort to find out. The best guesses were that during 1935 there were approximately 36,000 fatalities, 1,000,000 non-fatal injuries, and approximately $1,100,000,000 cash loss from accidents. The fatality rate was approximately 18 per 100,000,000 vehicle miles, a substantial reduction from that 92 in 1908 but a thoroughly unwarranted figure in 1935.

Our first superficial look at the safety activities which had been going on in 1935 was not encouraging. Despite the magnitude of the problem, the idea seemed prevalent that safety speeches, safety weeks, and horror campaigns would meet the issue. We didn’t agree at all, because talking about safety had been going on for years. However, as we dug deeper, we found a small body of experts who had been doing little talking but much work and who suggested an entirely different approach to the safety problem. Among those men were Lew Wallace, Chief MacDonald of the United States Bureau of Public Roads; Sidney Williams of the National Safety Council, Dr. Miller McClintock of Harvard, Burton Marsh of the A. A. A., and Lieutenant Frank Kreml of Northwestern. From them we obtained real encouragement, and we concluded that a coordinated safety program could be developed by a rational and scientific approach that was certain to produce results. Our conclusions were that
1. Accident reduction and relief of congestion were a public responsibility and had to be administered by public officials at public expense; that there was no essential difference between fire and crime hazard and highway accident hazard except that the accident toll was many times more costly in both lives and money.

2. There were known and proved techniques in fields of education, enforcement, and engineering which had reduced accidents wherever they had been applied. These techniques had demonstrated their effects in Iowa, Rhode Island, and Massachusetts, and in cities such as Milwaukee and Evanston. The real problem was that of broadening the scale and area of their operation.

3. The application of the techniques required trained men—specialists in education, enforcement, and engineering—rather than amateurs or political favorites.

4. There was need for enlightened public support for the officials who were endeavoring to do a good job, in order to obtain for them the necessary funds to carry on their programs. Guesses as to the amount of money needed to do a real safety job in the United States varied; but leaving highway construction out of the picture entirely, the guesses as to the increase of expenditure necessary ranged from $25,000,000 to $100,000,000. In view of the fact that $160,000,000 of special motorist taxes had been diverted in 1935, the public funds necessary were obviously available once the general public understood the problem and insisted upon a real program.

Having reached the conclusions which I have enumerated, the objectives of a sound program stood forth in bold relief. There was a need first for a continuation and intensification of research for the soundest possible techniques in the fields of education, enforcement, and engineering; second, for augmenting the supply of trained men; and third, for the development of a widespread, intelligent, organized support of those public officials who merited it for both financial and political reasons.

The next task of our committee was to develop a program to meet these objectives. We spent many weeks consulting that same corps of experts I previously mentioned, and then proceeded to lay out our program. We concluded that there were a number of existing organizations which needed just one thing to make them more effective, namely, additional funds; and, therefore, we decided to engage in no direct activities but to make a selection of institutions and organizations to whom financial support should be extended. This wasn’t as difficult a task as might be assumed.

In the field of enforcement, for example, Northwestern University had pioneered in traffic police training. As a corollary to this activity, the traffic department of the National
Association of Chiefs of Police had made several installations of accident investigation bureaus. Perhaps I would be more accurate if I said that Lieutenant Frank Kreml had pioneered in both of these enforcement activities. We felt that he could be safely entrusted to take over the responsibility in both the research and training fields.

In the field of traffic engineering, the Bureau of Street Traffic Research, then at Harvard, now at Yale, had functioned for a number of years and was recognized as the greatest research organization in the traffic field. Here again, all they needed was additional funds to intensify research and to provide for fellowships so that men could be trained as traffic engineers and made available for states, counties, and cities. The Bureau of Street Traffic Research was under the direction of Dr. Miller McClintock, who is one of the leading traffic experts of the world.

In the field of education we found that the Highway Education Board and the National Education Association were jointly interested in a research project looking toward the establishment of standards of safety instruction in our primary and secondary schools. A proposal was submitted to us about which we were most enthusiastic. In the educational field, the American Automobile Association had also been doing a most interesting work in establishing school patrols and instruction in the driver-training field. It took no amount of acumen to conclude that with additional funds this activity could be expanded and thus made more effective.

There was need of research in training in the field of motor vehicle administration. Here the National Safety Council had been as helpful as its funds would permit, but the members had been called upon for services they could not render because of lack of money. That, however, was only a small part of the responsibility we assigned to this organization. We had in mind offering some financial support to various civic organizations for the establishment of safety departments; but, obviously, their effectiveness would be hampered unless they were welded into local and state safety organizations. The National Safety Council was by long experience the ideal organization to carry out this assignment.

The National Safety Council had agreed to undertake the coordinating job. We approached directly and indirectly the American Legion, the 4-H Clubs, the General Federation of Women's Clubs, the National Congress of Parents and Teachers, and the National Grange. We offered them funds with which to establish safety departments and carry on a campaign of safety education among their own membership. After considerable negotiation, all of these civic organizations indicated an enthusiastic interest in participating in this new war on accidents.

I have given you a quick, over-all look at the tentative or-
ganization of safety activities we proposed financing. There was only one tiny fly in our ointment. The directors of the Automobile Manufacturers Association had expressed a willingness to expend as much as $50,000 annually in safety work. Our program called for more than $400,000 per year. When we presented our report, they were a few minutes recovering from the shock. They responded by offering to contribute a large part of the money, but suggested solicitation of other units of the automotive industry. Well, to make a long story short, the parts makers and suppliers of the industry took a keen interest in the campaign and contributed largely, and with their help the money was raised to finance the activities for the first year. In June of 1937, the safety activities carried on by the Street Traffic Committee of the Automobile Manufacturers Association were transferred to the newly organized Automotive Safety Foundation.

Since this new war got under way, we have contributed more than $1,250,000. The returns from that investment have been magnificent—the techniques have been improved, the training has been extended to many hundreds of men, and the civic organizations have not only done a fine job of convincing their membership that it is smart to drive safely but they have been a telling influence in supporting public officials both politically and in securing necessary money.

SOME RESULTS

Let's see what has happened. You will recall that the accident rate of 1935 was 18 per 100,000,000 vehicle miles. In 1936 it was 16.4, in 1937 it was 15.8, and in 1938 it was approximately 12. That $\frac{33\%}{3}$ reduction in accident rate means little until you apply it against the present vehicular mileage: 1938 accounted for 250,000,000,000 vehicle miles as against the 200,000,000,000 in 1935. The lower rate prevailing last year meant a saving of 12,000 lives and, as a guess, 300,000 injuries and not less than $300,000,000 of cash loss.

The reduction in the national percentage was quite spectacular, but when the local figures are studied one gets a truer perspective. Into the national average go those states such as Iowa which are doing a fine job and certain states doing nothing at all, cities which have a well-balanced program and cities which have none at all. If we take the average of those states which have fine safety programs, we arrive at a rate of about 8 fatalities per 100,000,000 vehicle miles; whereas the worst states are running more than 20. These studies of local figures completely convince one that a state or city can pretty well write its own safety ticket. If it is willing to plan for, work for, and pay for safety, it is attainable.

In conclusion, I am going to make a prediction and a forecast. Within thirty years the accident rate in the United
States can be brought down to 5, perhaps 4, or even 3. I make that forecast with confidence, for several reasons. In the first place, we are just entering upon a new era in road building. Our first objective was hard roads; then it was wide roads; and now it's safe roads. Our road engineers know how to build roads that are almost accident-proof—elevated highways in cities and divided roadways in rural areas. The only problem is one of financing. It is my guess that we can finance 20,000 miles of such highways in the thirty years ahead of us, and a substantial percentage of our travel will be attracted to these facilities. An increasing degree of safety will be engineered even into our secondary roads. In the second place, control of the driver through education and selective enforcement is just getting under way. The children now in primary schools will almost all be subjected to safety training in secondary schools. Our 40,000,000 drivers today for the most part learned to drive by catch-as-catch-can methods. In the years to come, they will be supplanted by drivers who have had proper training and who have been drilled in their responsibilities to a motorized civilization. The reckless will be barred from use of the roads; and, finally, as automobile travel becomes safer and more facile, there will be a constantly increasing use of automotive transportation. In 1908 no one would have dared predict 250,000,000,000 vehicle miles in 1938, but I predict 500,000,000,000 miles of annual travel by 1969. I hope that all of you here will be present at that time to say, “We saw it happen.”

HANDLING EARTHWORK EFFICIENTLY

J. L. Harrison,
Senior Highway Engineer, U. S. Bureau of Public Roads,
Washington, D. C.

In discussing this subject, it will be assumed that the gentlemen who are listening to this address represent various phases or fields of engineering activity and that, as a result, it is unlikely that an intensive presentation of a single phase of efficiency as applied to the handling of earthwork will be as acceptable as a more general presentation in which comment is made on a considerable number of the phases of this problem. As a result, some of the phases which are of sufficient importance to warrant lengthy comment will be given less consideration than some of you might, perhaps, wish. It has, however, been my hope that the interest you will have in comments on the relation of matters not so often mentioned to the efficiency with which earthwork may be handled will serve to make up for this deficiency.

May I also remark that this address deals with handling earthwork in the highway field. There are, of course, many