40,000 miles of county highways would enable the counties to reduce the county tax levy 16 cents. He had been misinformed on this. A check of the tax levy for 1932 in 89 counties shows that the average levy for the road fund is about 7 cents, and out of 89 counties only 8 have a higher levy than 16 cents. Therefore, no such relief could be had.

I do not believe that the state department should attempt to take over these local roads. The greater number of the highways maintained by the county highway department are local in character and serve only the local community within which they are situated. There is a local interest in these highways that cannot be served by the state. If there is a real desire to relieve the taxpayer, that is, the real property taxpayer, I believe the time has come that, the state highway system having been developed and extended until it controls about all the trunk lines of major importance, this department can successfully carry on its work and protect the investment already made without the use of the great amount of money which has been at their command. Enough of the gasoline money could be paid to the respective counties to enable them to maintain the county highway system and eliminate the local county levy for this department. And I believe that investigation will sustain me when I say that the state cannot maintain these local roads with as low a mileage cost as the counties can. It is a truism in government operation that any given department with too great an amount of money cannot be operated economically. By absorbing all county roads, this department would become too big, and it would be endangered in that it would be thrown wide open for political interests to use and build up a mighty political machine. That should and must not happen.

REBUILDING OLD ROADS
By Thomas D. Kelsay, Miami County Highway Superintendent

Being confronted with a small appropriation for our road program in Miami County during the past year, I found that I would be unable to build any new roads or to do any "black-topping." I therefore exerted my energy toward the rebuilding of as many of my old roads as the size of my appropriation would warrant. It not only proved successful, but also met with the approval of the taxpayers; and, inasmuch as they are our paymasters and employers, it behooves us to please them.

The rebuilding of old roads should become a part of the program of all highway superintendents. Too many superintendents have overlooked the needs of some of our gravel roads in their eagerness to place some "black-top" in the county sys-
tem. I am much in favor of "black-topping" or any economical hard or dustless surface, but I am not an advocate of such expensive road building when it will accommodate only a few of the taxpayers and so reduce the limited budget that maintenance of the rest of the roads must be neglected, thus forcing a large portion of the taxpayers to travel over inadequate roads.

At the present, our country is facing a most serious financial condition. Taxpayers are desperate and determined that economy shall be practiced and the taxes lowered. But too often it is false economy to permit roads to go to rack and ruin when by a small investment they could be properly maintained. It must be borne in mind that a rough road can do more damage to an automobile or a truck on one trip than it would cost to pay the average individual county road tax levy. We had a 6-cent road tax levy, which would, on an average valuation of $5,000, make the road tax $3.00 per year. For 1932, we do not have any road tax levy at all, and the only funds available for road maintenance will be the gasoline tax, amounting to about $40,000. With this, we must take care of 570 miles of roads with an average expenditure of $70 per mile. This averages 19 cents per mile to combat the daily traffic damage to our roads.

But all of these handicaps do not constitute sufficient reason to neglect roads if it is at all within my power to take care of them; so I have been busy trying out different methods of handling my roads in order to secure the most value for the money. It is my opinion that the most value is secured for the least money by the rebuilding process.

METHOD USED

In the south part of Miami County is an arterial highway 12 miles long which connects State Road 21 and State Road 31 and by reason thereof is heavily traveled, requiring expensive maintenance. It passes through a level stretch of country with a uniform right-of-way of 40 feet. In many places, the gravel had spread out into the side ditches and occasionally was within 3 feet of the fence lines. The traveled part of the road would average at least 30 feet in width. This road was constructed about 30 years ago at a time when they believed "the bigger the rock, the better." Consequently, there was a bed of rock in the center of the road about 8 feet wide and, when the weather was dry in the summer, we would have a rock road to bump over and all we could do was to drag some dust on the top occasionally.

I began to rebuild this road by scarifying and removing the oversized rock. We used a No. 10 grader and scarifier with a 30 caterpillar wide-gauge and wide-track tractor (Fig. 1). We would make about two rounds through the road with the scarifier, working only a mile at a time, and then put the
blade on the grader and spread all of the loose material to the side in order to get the rocks where they would not again be placed in the road bed by the traffic. We would then rake the rock into piles, load it into trucks with coke forks, and remove it to washouts and other places where it was needed along the road shoulders.

The most expensive operation in this process was the raking of the rock into piles. We found that we were much more successful by removing every other tooth from the rakes in order that the small rock and pebbles would not be removed. There is special equipment to carry these rocks to one side, but we do not know how successful or practical it is.

After the rock was removed, we then brought all gravel from the grass-line to the center of the road. This should be done before any work is started on the side ditches and care should be used to get all of the gravel from the outside to the center. Otherwise, in working the side ditches, earth will be pulled over the gravel. Then, too, if any packed gravel is left near the grass-line it will form a water pocket on the berm. After the gravel was placed in the center of the road, we then went out to the fence line and started our ditches. (We do not construct a ditch deeper than is necessary to secure plenty of drainage, although in some instances it is necessary to construct larger ditches than is necessary in order to secure ample earth with which to construct the berm.) After the ditches were thus dug and the dirt therefrom placed upon the berm, we rolled the berm with our 30-tractor before spreading the gravel back. We spread the gravel only to a width of 22 feet and then dragged it often with a multiple blade drag until the gravel became firmly packed. On this particular road, the
gravel was well mixed and the road has the appearance of new material (Fig. 2).

COST DATA

We found the cost on this 12 miles of road to be as follows:
Two operators, 25 days each at $4.00 per day .............. $200.00
Gas for tractor, 500 gals. at 9 cents (20 gals. per day) 45.00
Oil for tractor, 26 gals. at 56 cents .................... 14.56
Hauling rock with truck, 8 days at $10 per day ....... 80.00
Dragging berm, 2 days with truck ...................... 20.00
Raking rocks, single hands at $3.00 per day .......... 300.00

Total cost ................................................. $659.56
Cost per mile ........................................... $54.98

After thus reconditioning this road, we found it to be practically as good as a new road and, inasmuch as the cost was only $54.98 per mile, we unhesitatingly recommend the reconstruction of such roads as an economical measure.

ROAD MARKERS

By H. A. Firestone, Elkhart County Highway Superintendent

There is much good to be derived from marking our county highways with standard markers such as curve, slow, and stop signs. Elkhart County, like all other counties, has a great many dangerous curves and narrow bridges on her improved highways, all of which we have marked with U. S. standard markers, the same types of signs as those in use by the Indiana State Highway Commission. I urge every county to mark as