

the local contractor. After thorough rolling and sanding of the surface, this pavement was at once thrown open to traffic. This surface is as non-skid as it is possible to make and seems to have corrected the dangerous condition, no more trouble so far having been experienced. This work cost about \$0.82 per square yard and in the aggregate will amount to about \$1400. Payment is being made from the city's general fund by special appropriation of the council.

In resurfacing our pavements, we have attempted to do the work without destroying the old base. A base that has been compacted by years of use is as good as any that can be built new and certainly should not be disturbed without good cause. As stated in the beginning, we do not consider our work the last word and we are open to innovations and are willing to try anything once.

MAINTENANCE PRACTICES ON CITY STREETS

By J. V. Schneider, City Street Commissioner,
Richmond, Indiana

In reports published in some of the municipal journals, it probably has been noticed that the amount of money spent by the street department of Richmond is rather high as compared with other cities. Such figures are somewhat misleading. The total expense of our department is about \$90,000 per annum. Of this amount, however, about \$33,000, or 37 per cent, is spent for trash and rubbish collection, about \$8,100, or 9 per cent, for street cleaning, and about \$33,000, for street maintenance and repairs. The other work of our department consists in repairs to sewers, bridges, buildings, etc., and amounts to about 17 per cent of our total expense. Street maintenance is, of course, our most important work.

A large percentage of our streets are waterbound macadam or trafficbound gravel. By this latter I mean streets that have become compacted under traffic. These types present our greatest problem. They become rough, through chuck-holes and corrugations forming and from settlement of trenches made by the utilities. All streets are damaged by this latter work. We have an arrangement in Richmond under which the utility, or any person for that matter, must make a deposit with the city to cover the expense of repairs, before permission can be secured to cut into any improved street. The amount of the deposit is based upon the units of work to be done at rates determined by past experience and fixed by ordinance. After the utility or private persons have completed their work, the street repair work is done by the street department. The cost of this class of work, in the aggregate, amounts to a large sum; and while it is paid back to the city,

it is credited to the general fund and does not reduce the expense of the street department. This reflects against the economy of our operations.

This class of work, as well as other pavement repair work, is done by a gang known as the "patching squad." The equipment for this gang consists of a flat-bottom, low-side auto truck with a Littleford tar kettle hooked on behind, as a trailer. For repairs to streets other than concrete, the aggregate ordinarily used is No. 4 or No. 6 stone for the base of the patch, penetrated with tar or asphalt. The tamped, penetrated base is surfaced with a coat of sand or pea-gravel. The aggregate is loaded in the truck in compartments, one for sand and the other for coarse stone. The kettle is equipped with a pressure kerosene burner which heats the bituminous material to any desired temperature and gives entire satisfaction.

Holes to be patched are swept clean and, if deep, given a coating of bituminous material. They are then filled with the patch material, either premixed or penetrated in place. So-called utility or service ditches are refilled by the utility and allowed to settle thoroughly, additional fill being added as required. After a sufficient time has elapsed, about 2 inches of the top is removed by hand and a patch added as in a chuck-hole.

In the case of permanent pavements, as where a concrete base exists, the method of repair is somewhat different. After a trench has had time to settle, it is dug to the depth of the old pavement (at the edges to a greater depth) and widened into the solid ground under the remaining old pavement so as to form a shoulder on the undisturbed foundation and thus prevent settlement. This hole is then filled with concrete of the desired thickness and allowed to set before the wearing surface is added. If the pavement is of one-course concrete, the slab is made of one course for the full depth and opened to traffic after sufficient time has elapsed for setting.

The service trenches in "black top" pavements, where no concrete base exists, are most troublesome. In such cases, it sometimes requires several patches before proper surface is finally re-established.

Corrugations frequently form in asphalt pavements, especially where stop and go signs are installed, at street intersections. It is our practice to remove them with a sharp pick or mattock during cold weather when the bitumen is brittle. If this is carefully done, no further treatment is necessary as the surface will become smooth under traffic. If, however, a rough job of adzing is done, it will be necessary to add a thin layer of rock asphalt or similar resurfacing material.

Frost boils are also very troublesome and cause much grief for the street department. We usually take care of these in

the spring of the year by digging away the old surface and putting in a large patch, as in repairing a chuck hole.

Occasionally some of our secondary streets get in such condition as to make necessary a general resurfacing with a mat. Last year, one such job was done by applying emulsified asphalt and chips without tearing up the old surface, which was solid but full of small chuck-holes. In this case, the pitted surface was swept clean and an application made of about 0.15 gallon per square yard of 100-penetration, 50 per cent, emulsified asphalt. On this was spread from 10 to 24 pounds per square yard of pea-gravel and another similar application made of the asphalt. This was dragged with a triple suspension maintainer to shape the surface and fill the pit holes.

This was our first experience with emulsified asphalt for this class of work and at the beginning we were not very successful. At first the mat did not hold to the original surface but picked up badly. This we found was probably due to the use of asphalt with improper penetration and water percentage. When a change was made to 150 penetration and about 60 per cent emulsion asphalt, better results were secured.

In past years concrete sidewalk and gutter repair work was done by or at the expense of the property owner. During the past year several claims for personal injury were made against the city, because of defective walks which the property owners were not able to have repaired. Our board of works instructed that dangerous conditions be remedied by the street department so that we now have an additional expense. This work, with that of setting back curbs at street intersections to provide larger radii, keeps a concrete gang busy.

The surface drainage of all of our improved streets is taken care of generally by sewers. As most of our street grades are flat, inlets were usually installed at street intersections in locations so that one would serve the gutters of both streets. In most cases, this placed the casting of each inlet in the circular intersection where the curb was built to a radius of 6 feet. In the old horse and buggy days, this was satisfactory. With the advent of the automobile and truck, however, they proved a nuisance as hardly a week passed that a casting was not struck and broken. In each case where repair was made, the radius of the curb was increased to 12 feet or more and the inlet casting moved to the straight part of the curb. The gutter grade, of course, had to be changed to provide drainage to the new inlet location. This work is well worth the cost and is generally approved by the motorists.

During the past year, our department has done a great deal of ditching and grading of unimproved streets, using so-called free or township labor. Men are sent to us with work orders by the social service authorities and are paid in script

which is honored by the township trustee in giving orders for the necessities of life. In some cases these men have done very satisfactory work but as a rule they are worth what they cost. With the advent of more normal conditions, it is our hope that our work may be done in a more orderly and systematic manner and that charity will be dispensed where charity is due and that a man will again become worthy of his hire.

RELATIONSHIP OF STREET RAILWAYS TO CITY TRAFFIC PROBLEMS

By W. P. Cottingham, Engineering Assistant,
Gary Railways, Gary

A street railway company has a very vital relationship to and interest in every city problem—an interest and relationship that is measured by the tax dollar if in no other way. If you will examine the books of your city treasurer, you will find that the street railway company is one of your large taxpayers. The assessed value for taxation purposes of the electric railway lines in Indiana is shown to be \$28,000,000 in 1929, exclusive of buildings for car storage, shops, substations, power houses, and offices. With tax rates varying both up and down from \$3.59 per \$100, according to local conditions, you will find the railways carrying tremendous tax burdens. From that standpoint, then, if from no other, the railways are interested in city problems. It requires over 50,000 passengers per month to pay the taxes on Gary Railways, or approximately the gross receipts of two days' operation.

GENERAL PROBLEMS

In considering the causes and results of the traffic problem we will find, in general, that the solution is the unknown quantity. Surely we can agree on a considerable list of causes, such as congestion, speed, inadequate roadway widths, inadequate pavement surfaces, poor circulation of traffic, improper traffic routing, jay-walkers, lack of police regulation, too much police regulation, regulated parking, unregulated parking, obstructions in roadways, railroad grade crossings, street cars, busses, trucks, automobiles, horse-drawn vehicles, baby buggies, roller skates, people. This list is not complete and I reserve the right to introduce additional factors or to ignore some of these as we proceed. Most of the items sound as if they applied exclusively to the present day, indicating that the traffic problem is strictly a twentieth century affair. The following newspaper clippings from the Christian Science Monitor of December 14 would rather contradict this belief: