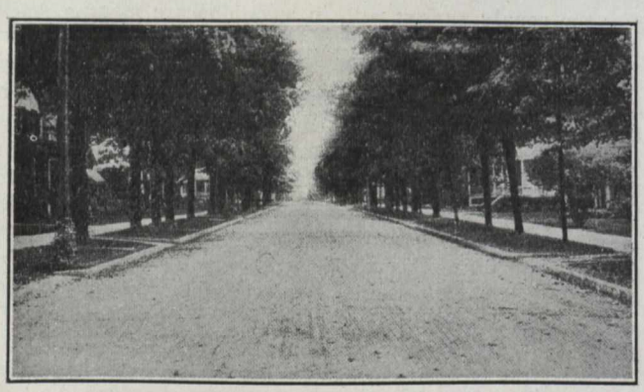
most as often liable to be quite wrong. The case is totally different with a chemist or bacteriologist who has for a considerable period carried out systematic and frequent analyses of a certain water whether he knows the source and surroundings or not; and departure from the average or normal contents at once strikes him and a proper note of warning will not fail to be sounded.

A CONCRETE PAVEMENT WITH THIN WEARING SURFACE OF BITUMEN.

During the past few years a distinctly new type of pavement, consisting of a properly constructed concrete base and a thin wearing surface of bitumen and sand, has been developed and extensively used on several streets in Ann Arbor, Michigan, and to a more limited extent in other places.

The city engineer, E. W. Groves, describes this pavement and we here reproduce his statements in abstract form:

About five years ago, the writer, in order to prolong the life of certain streets paved with asphalt blocks, which at that time showed considerable wear, tried an experiment of covering the surface of the pavement with a thin layer of hot coal tar and sand. After being subjected to various conditions of traffic for about two years, this thin wearing surface proved to be so satisfactory that it was determined to try it for new construction work on a concrete base. During the summer of 1909 one block on a residence street, having about 1,800 sq. yds., was paved with concrete, a layer of coal tar and sand being placed thereon as a wearing surface. In the spring of 1910 this was so satisfactory that petitions were presented asking for approximately 18,000 sq. yds. of similar pavement, which we laid during that year. Before the end of the season of 1910 petitions were presented asking for 61,000 sq. yds., which we are laying this year, and at the present time there are on file petitions

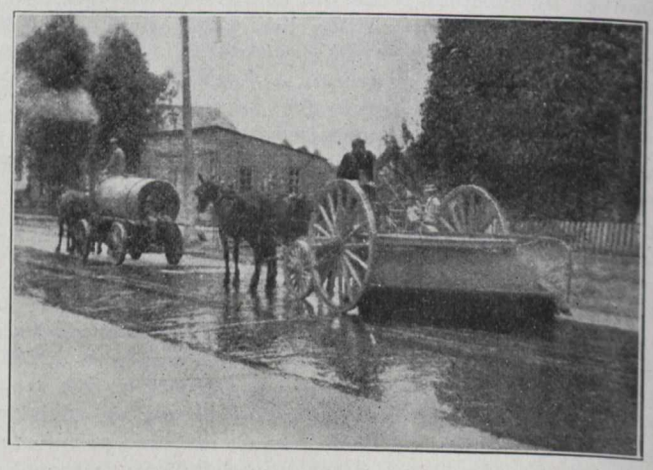


View of Street in Ann Arbor, with Wearing Surface of Bitumen.

asking for approximately 100,000 sq. yds. for the season of 1912. All petitions presented ask for this form of pavement, and there seems to be no difference of opinion among the property owners as to the kind of pavement that should be laid. This is probably a revelation to those who are familiar with the letting of paving contracts.

The concrete is laid in strips one-half the width of the street, and 25 ft. long, an expansion joint ¾ to 1 in. being left every 25 ft. across the street, perpendicular to the axis and at each curb. The surface of the concrete is given a wood float finish and roughened by brooming and indenting the surface with a tamp arranged for that purpose. After finishing a section as described the form at the center of the street is removed, and the pavement for the other half of the street is laid, the new concrete being deposited against that which has been previously laid, so that while there is a joint at the crown of the street it is hardly perceptible. This would be objectionable were it not for the bituminous covering, which completely covers it.

After the concrete has hardened and is thoroughly dry and clean, the surface is covered with hot bitumen and No. 4 Torpedo sand. The bitumen is applied from a sprinkler wagon designed for that purpose, having a fire box under the tank for heating the material to a temperature of about 200° F. The bitumen is immediately distributed evenly over the surface of the concrete with an ordinary street sweeper, with a well worn broom, and the surface well covered with torpedo sand. Approximately ½ gal. of bitumen is used per sq. yd. of surface and a cu. yd. of sand will cover approximately 250 sq. yds. making a wearing surface about ⅜ in. thick.



Sprinkling and Spreading Bitumen

The writer has experimented with various materials for the wearing surface, as follows: Crude coal tar, asphalt, tarvia, and these of various degrees of viscosity. It was finally decided to have a bitumen distilled for this special work and this is being done by the Barrett Manufacturing Co., of Chicago, and is being sold under the name of Dolarway bitumen. The results obtained with this material are satisfactory and produce a pavement resembling the better class of bituminous pavements with a base second to none.

The work at Ann Arbor is done by the city, which has its own equipment, purchases material and hires the labor. With labor at $2.00 for nine hours, cement at $1.10 to $1.30 per bbl., and gravel at the mixer at $1.00 per load of 1⅓ cu. yards, this pavement is put down for less than $1.00 per sq. yard.

The reasons for the popularity of this pavement are cheapness and durability. The writer has long been of the opinion that pavements for our cities have been costing entirely too much, and I believe that in the matter of cost this pavement solves the paving problem as completely as concrete solved the sidewalk problem. I also believe that this pavement is the only one which has been discovered which is suitable for country highway work. It would cost much less than any other permanent pavement that could be laid, and the cost of maintenance would be reduced to a minimum.

It meets the demand for a low cost, durable pavement, approximating in cost that of an ordinary macadam road and in durability that of our better types of street pavements.