

appear to be obtained by using an asphalt having a penetration of ninety to one hundred and ten, as determined by the standard method of testing adopted by the American Society for Testing Materials.

The United States Department of Agriculture has published a bulletin, (No. 691), giving specifications somewhat in detail for bituminous materials of different kinds and for different uses; which bulletin is available for distribution. Reference is here made to that pamphlet for more details, but the writer believes from experience and observation that for penetration work in northern climates the asphaltic material should be a little heavier than that suggested in said specifications.

Precautions

Where properly built under suitable climatic and traffic conditions, the bituminous macadam pavement is economical both in construction and maintenance. If a hole appears in the surface it should immediately be patched, using a mixture of small stones and hot asphalt or tar. If a general breaking of the top surface appears imminent, it should be given a seal coat of hot asphalt and pea stone before such breaking up occurs.

A few condensed rules are here given for the prevention of unsatisfactory results with bituminous macadam.

Be sure that the drainage, subgrade and foundations are suitable.

Have the surface of the bottom course even and without depressions before laying the top course.

Have the larger sizes of broken stone predominate in the top course.

Use dumping platforms or self-spreading wagons for spreading all broken stone.

Use a sufficiently hard bitumen for both penetration and seal coat, as a soft material permits the surface to soon become wavy.

Get all penetration work complete during the spring and summer months. If done in the late fall the penetration is not complete and the pavement is liable to become loose in the following winter.

Patch holes immediately if they appear in the surface.

If tar is used, apply a light seal coat at intervals of two or three years.

PUBLIC UTILITY COMPANIES IN 1918

Large Increase in Volume of Business, but Profits are Less Owing to High Operating Expenses

COMPARATIVE statistics of express, telephone and telegraph companies in Canada during the year ended June 30th, 1918, were given in the Dominion House of Commons on April 24th by Hon. J. D. Reid, Minister of Railways. The statistics were compiled by the statistical branch of the Department of Railways. Those dealing with the express companies show that the operating mileage on June 30th, 1918, was 43,247 in Canada, which was about the same as in the previous year, while foreign mileage was 19,296, an increase of about 3,000 miles. The cost of property and equipment of express companies was \$1,949,246. Gross receipts totalled \$18,680,092, as compared with \$16,836,373 in the previous twelve months, while the net operating revenue was \$450,243, as against \$1,096,111 for the year ending June 30th, 1917. The net corporate income of the express companies was \$443,535. In 1917 a dividend of 10 per cent., amounting to \$200,000, was paid by the Dominion Express Co. and a similar amount applied to reserves, leaving a credit balance for the year of \$522,123. Dividends were not declared by the express companies in 1918, nor were any sums set apart as reserves.

Telephone figures indicate a substantial development of the telephone business for the year ending June 30th, 1918. The number of reporting units increased from 1,695 in 1917 to 2,007 in 1918. The growth was greater in Saskatchewan

than in any other province. The number of reporting units by provinces were as follows: Prince Edward Island, 32; Nova Scotia, 143; New Brunswick, 31; Quebec, 173; Ontario, 528; Manitoba, 38; Saskatchewan, 727; Alberta, 8; British Columbia, 14; Yukon, 1. It is noted that the governments of Alberta and Manitoba own practically all of the telephone systems in the two provinces. Saskatchewan is also a large owner of telephones, but there are in addition, in that province, about 1,000 lines in the hands of private organizations. The capitalization of telephone companies operating in Canada is given as \$85,274,691 and the cost as \$104,368,627, an increase of \$10,000,000 as compared with 1917. Earnings of the telephone companies in the last twelve months under review amounted to \$22,753,289, while operating expenses totalled \$13,644,524. Net earnings as represented in the difference between gross receipts and operating expenses were \$9,108,765 in 1918, as compared with \$8,025,855 in 1917. Additions to and subtractions from primary net earnings reduce that amount to \$5,187,323.

Coming to the telegraph companies, the figures presented show that on June 30th, 1918, their cost was placed at \$10,226,988, a slight increase over the previous year, while the capitalization of the companies having headquarters in Canada was \$6,300,000. The gross revenue was \$7,770,646, as compared with \$7,272,755 for the previous twelve months. Operating expenses were \$5,820,335, as compared with \$4,940,228 during the previous year. The net operating revenue amounted to \$2,016,429. Wire mileage totalled 210,100, a slight increase over the previous year. The number of telegraph offices totalled 4,664, as against 4,615 at the end of June, 1917.

PULLMAN HEATING TUNNEL*

By C. M. DIBBLE

OF the many details necessary to the installation of the new shell shop, for the Pullman Car Works, one of the largest, and at the same time, one of the most important, is the heating tunnel. It runs from the rolling mill to the north end of the shell shop, and then around to the west side, where it meets the present tunnel from the boiler and power house, a length of about 1,170 feet.

This tunnel is made of reinforced concrete, and is four feet wide by five feet high inside. The top of the tunnel is practically at yard level, and is designed to carry a load of about one thousand pounds per square foot.

In the tunnel is a fourteen-inch steel pipe line which carries the exhaust steam from the rolling mill engines to the radiators in the shell shop. This steam was formerly allowed to escape into the air.

Ordinarily the pipe would have been put in with flanges screwed on both ends of each 20-foot length, the ends then being bolted together with gaskets between them. We have done away with all this by welding our individual lengths together by means of the acetylene torch. In addition to this saving, we are able to use a thinner walled pipe, there being no threads to cut.

Each length before being placed in the tunnel has both ends chamfered with an air chisel. The lengths are then placed with the ends butted together, the chamfers joining a V-shaped groove. The welder fills the groove with the acetylene torch, revolving the pipe on temporary rollers as he proceeds around it.

After the lengths are all welded into one long pipe, permanent rollers are placed under it to permit free travel for its expansion when heated by the steam. This expansion causes a lengthening of the pipe of from eight to nine inches in the run from the rolling mill to the shell shop. This travel is taken up by means of an expansion joint which is in effect an enlargement of the pipe on one side of the joint within which the other side slides back and forth. The steam is prevented from escaping by means of packing between the outer and inner pipes.

*The Pullman Car Works Standard.