The electrification of the line has necessitated a number of improvements to road-bed and tracks as they were not in suitable condition for efficient operation. New 80-pound rails have been laid on the entire main line, the old rails being relaid on sidings. Most of the ties have been replaced and the track has been completely re-ballasted. The bridges were in good condition, but several reinforced concrete culverts have been built to replace old stone and wooden ones, while a number of masonry culverts were reinforced or reconstructed.

This rehabilitation of the line was partly carried out last year while the line was still under lease to the Pere Marquette Railway. The balance has been completed this spring.

The work of electrification and the selection and governing features of design of the rolling stock has all been carried out under the direction of the Hydro-Electric Power Commission of Ontario, of which Mr. F. A. Gaby is chief engineer. Mr. H. L. Bucke had charge of the field operations.

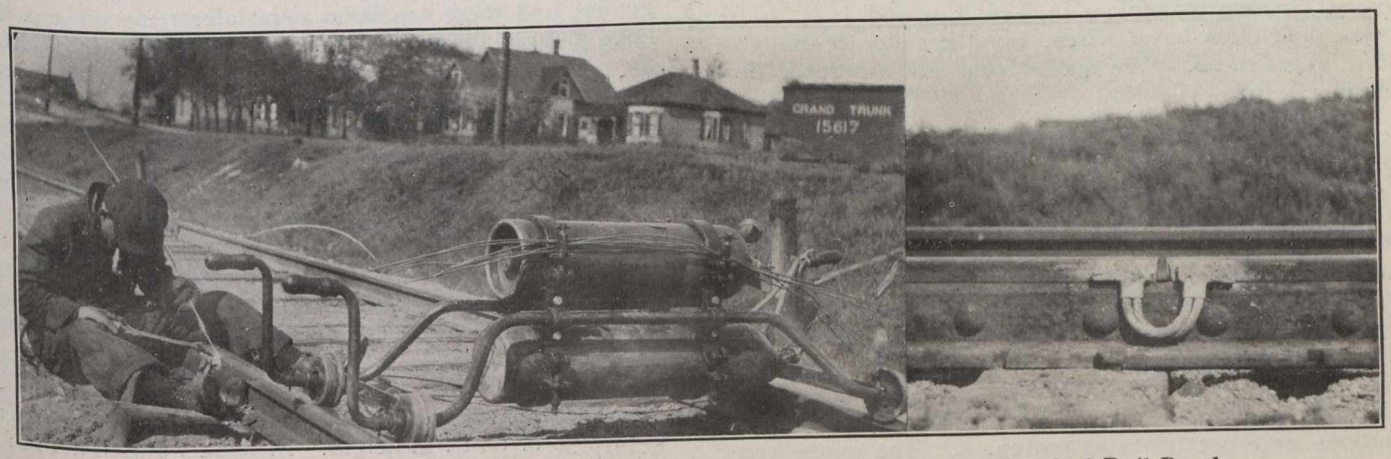

Fig. 6.—Views of Traveling Oxy-Acetylene Rail Bonding Outfit and of Finished Rail Bond.

REINFORCED CONCRETE STANDPIPES.

THERE are some exceedingly interesting types of reinforced concrete standpipes in service in Canada and the United States. The number ranges between 40 and 50, as the accompanying table shows, although the exact figure has not been computed. One of these is the standpipe for the waterworks system of Penetanguishene, Ont. It is a 300,000-gallon tank 50 ft. in diameter and 21 ft. deep, with side-walls of 1:1:2 concrete 12 ins. thick at the base and 8 ins. thick at the top. This tank was designed and constructed during the fall of 1912 by Mr. L. J. Mensch, of Chicago. The tank has a reinforced concrete dome and its flat base is about 6 ft. below ground level. It was described in February 20, 1913, issue of this journal.

Another, designed for Berlin, Ont., by Mr. Mensch, and constructed under the supervision of Mr. Connor, of Bowman & Connor, Toronto, was described in *The Canadian Engineer* for January 9th, 1913. It has a capacity of 600,000 gallons and is supported by a reinforced concrete shell cylindrical in shape, 76 ft. high with walls 12 ins. thick. The bottom of the tank is a dome of 24 ft. radius. The roof is also of dome construction, almost spherical. The tank is 50 ft. in inside diameter, 41 ft. in height with walls 12 ins. thick. The height over all is 127 ft. 4 ins.

Another, with a diameter of 160 ft., a height of 29 ft. and a capacity of 3,250,000 gallons, has recently been constructed at Halifax, N.S. In this instance the walls are 36 ins. thick at the bottom, tapering to 18 ins. at the top. It was designed by H. W. Johnston, assistant city engineer of Halifax. Mr. F. W. W. Doane, city engineer of Halifax, supervised its design and construction. The Standard Construction Co., of Halifax, were the contractors. This structure was described in detail in *The Canadian Engineer* for March 25th, 1915.

The foregoing examples of reinforced concrete standpipe construction have all been in connection with municipal water supply systems. There is a surge tank at Niagara Falls constructed by the Ontario Power Co., the design of which is extremely interesting. It is a reinforced concrete structure 75 ft. in inside diameter and 71¼ ft. high, with walls 24 ins. thick. Its purpose is to regulate the flow in a 6,400-foot reinforced concrete conduit. The tank was designed in 1911 by Mr. R. D. Johnson, then hydraulic engineer of the Ontario Power Co., and is of what is known as the Johnson differential type. It has a vertical riser in the centre which is 18 ft. in diameter.

The most interesting feature of its construction lies in the design of its base. The cylindrical wall is not rigidly constructed to the base. The designer points out that if such were the case a thickness of about 5 ft. or more at the base of the cylinder would have been required to provide a cantilever of sufficient thickness to withstand the stresses to which it would have been subjected, while the shell would have had to be thicker for a considerable height in order to take up the stress. This increased thickness would have diminished the capacity of the structure. Owing to the fact that it is located in a prominent part of Queen Victoria Park, the park commissioners insisted upon as small a structure as possible.

At a recent meeting of the New England Waterworks Association a very interesting topical discussion followed a paper on reinforced concrete standpipes. Evidently the first of this type was constructed in 1899 at Little Falls, N.J., and the adoption of the reinforced concrete type was very gradual up to 1910, as is shown from the accompany-