Distribution: Serious objection, in that heavy piping expenditure would be entailed.

Eastern Location.—Site: Effluent from Morley Ave. sewage disposal plant necessitates a location to the east. No advantage in site east of Victoria Park.

Reliability: Borings indicate feasibility of driving tunnel in good shale at favorable depth; also splendid location for intake. (See Fig. 2). Victoria Park "an almost ideal location."

Purity: Water from a point one mile from shore (2½ miles from Morley Ave. outlet) and 40 ft. below lake level, quite satisfactory, with after treatment; and fully as desirable as that taken from further east. Vastly superior to the present supply as regards turbidity.

Distribution: Admirable position for connection to present system. Distribution begins immediately upon leaving plant.

The report supports the choice of Victoria Park as the site for the proposed plant on the ground that it is most favorable from a distribution standpoint. The extensions can work in harmony with the present John St. station, constituting as well a duplication to serve the entire city in the event of interruption of the present plant. As the city expands eastward it will be logically situated for distribution. The supply there is comparable in quality with that of Scarboro' Heights, and 4½ miles nearer the city. The lake bottom is admirably suited for tunnelling and a crib may be conveniently located at a reasonable depth. A bar or ledge about a mile wide runs out from shore on an easy gradient, and at one mile out has reached a depth of 50 ft. Borings revealed suitable shale at this point 82 ft. below the lake level, this formation extending to the shore on a grade approximately paralleling lake bottom.

Pitometer Survey.—An interesting feature of the report is the result of an investigation by pitometer survey into the city consumption, as indicated in Fig. 4. The area of Toronto, excluding the Island, Harbor, Ashbridge's marsh lands, Humber Bay, and that portion of the Lake west of the Island, within the city limits, approximates 29.6 sq. mi., or 18,949 acres. From the plan the average consumption per day over this section of the city, within the period covered by the compilation, averaged 46,247,000 Imp. gal. An examination shows that in Districts "B" and "C" the average daily consumption amounts to 26,335,000 Imp. gal., or 56.9% of the total water supplied, or, in other words, 56.9% of the total water supplied per day, is consumed in 3,433.19 acres, which constitutes 18.1 per cent. of the entire acreage of the city. These figures show that the maximum usage is in the business and manufacturing section of the city, and that special distribution service must be provided in order to convey the requisite quantity of water at adequate pressure to the maximum user.

RAILWAY EXTENSION IN SOUTH AFRICA.

Amongst the larger projects which the South African Railway administration has on hand at the present time is an important deviation of the existing line between Maritzburg and Rietspruit, about 70 miles from Johannesburg on the main line from Durban. This alteration, which is known as the Town-hill deviation, has been contemplated for many years, its object being to reduce the heaviest gradient on the line, which is as much as 1 in 30. It will extend to about 12 miles in a country which is exceptionally heavy, and the work is so great that the department has decided to divide it up into several sections.

STEEL HARDENING AND TEMPERING.

THE hardening of steel has been thoroughly studied by metallurgists, who have given a great deal of time and thought to their investigations with a view to establish a satisfactory theory to account for this very marked phenomenon in connection with steel. The theories brought forth are both numerous and varied. Mr. R. B. Hodgson, of the Crooks-Roberts Company, Sheffield, recently read a paper before a meeting of the Institute of Mechanical Engineers of Great Britain, containing some interesting and practical notes on the hardening process. The following is abstracted from his paper:

In connection with the heat treatment of steel, microscopical evidence has proved most valuable, and it is believed that if two samples of carbon steel selected from two different and distinct sources, but each giving approximately the same chemical analysis, be prepared for microscopical examination under normal conditions, their appearance will be practically the same.

In reviewing carbon steel we find that an increase in the percentage of carbon is attended with increased hardness. In these days, however, we cannot base the definition of steel entirely on the peculiarity due to carbon, since there are other elements that can confer hardness to the iron. Iron readily alloys with different metals, such as aluminium, chromium, molybdenum, manganese, nickel, palladium, platinum, thodium, titianium, tungsten, uranium, vanadium, and many very important and remarkable results are obtained from the resulting alloys. The only metals that we need consider for our purpose are chromium, manganese, and tungsten since alloy steels containing these three metals lend themselves to, and are particularly suitable for cutting tools, which have to deal with work under conditions such that require the tool to be not only harder than can be expected in the case of ordinary carbon steels, but also capable of greater endurance under the two special circumstances of modern increased speeds, or to deal with the machining of very hard materials.

Chromium is used extensively in the production of special steels, as armourplates, axles, projectiles, and tool steels. The chrome iron-ores as found in either Asia Minor, Bohemia, France, Norway, North America, Silesia, and Shetland Isles, are the sources from which the alloy of iron with chromium is obtained. Ferrochromium is prepared as a commercial article in a variety of grades, having different percentages of carbon and chromium. A grade specially valuable and used in the manufacture of high-class tool steel is 0.5 to 1 per cent. carbon, and 65 to 70 per cent. chromium. In the finished tool steel, such as very hard turning tools, the quantity of chromium varies between 2 and 3 per cent.

All steel contains some manganese, although the narrow limits of its contents, 0.2 to 1 per cent., as usually present in ordinary finished commercial carbon steels, does not materially influence the properties of the steel. Manganese frequently occurs in iron-ores and is partially reduced along with the iron, 5 to 20 per cent. Manganese will result in the production of a white pig-iron in a highly crystalline condition, containing a large amount of carbon in chemical combination, this is called "spiegeleisen," on account of the beautiful bright appearance of its crystalline plates, a condition which disappears if the manganese is increased above 20 per cent.

An alloy used extensively in steel making is that known as ferro-manganese, containing from 75 to 87 per