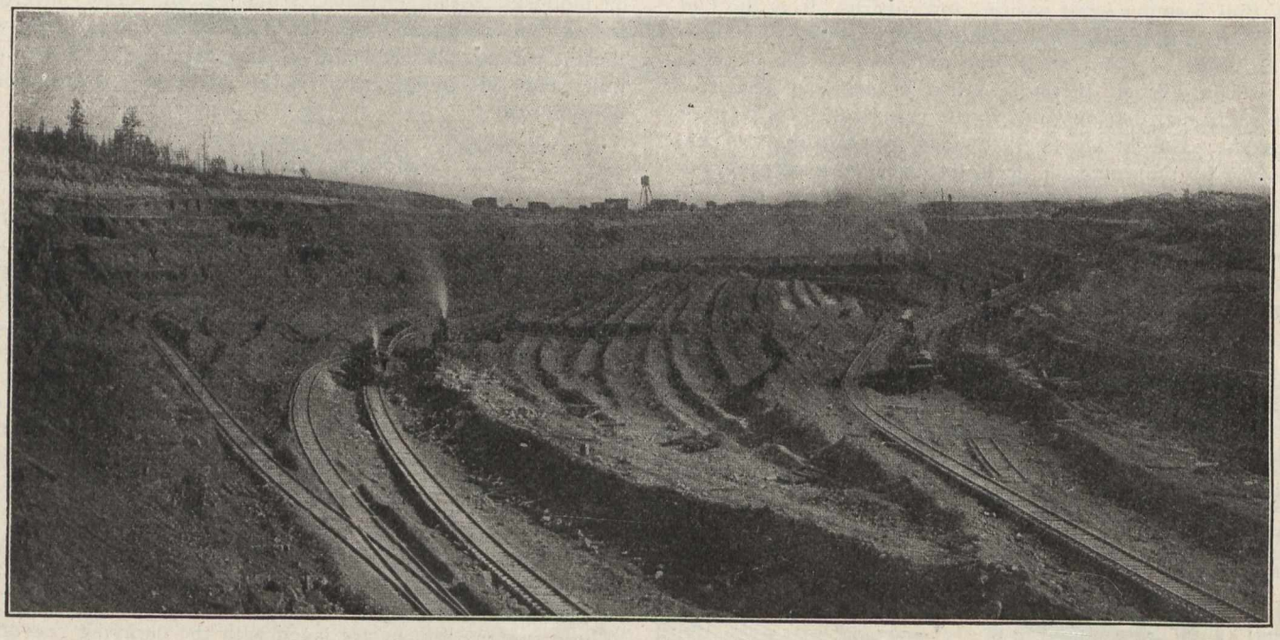

Fig. 4.—Mountain Iron Mine, 1904. From the Engineering and Mining Journal.

same sense of grandeur and majesty as we are upon first beholding Niagara Falls! One caused by the mighty hydraulic forces of nature; the other by the engineering skill and inventive genius of man.

And this is only one of the series of enormous holes made in scooping out with giant shovels, 79,000,000 tons of ore, in the past 12 years. There is 75 miles run of these beds of soft haematite ores, containing 50% of metallic iron and practically free from phosphorus.

Having described the modus operandi in which ores are formed in nature, we now pass on to a consideration of the properties of the ores of Commerce.

ELECTRIC STEEL.

By F. W. Harbord, Expert Metallurgist Engaged By Canadian Government Commission to Investigate Electro-Thermic Processes for Smelting Iron Ores in Italy, France and Sweden.

(From "The Times" Engineering Supplement, August 2, 1905.)

The great interest which the manufacture of steel in the electric furnace has aroused, both amongst manufacturers and engineers in this country, and the fact that there is already one electric furnace in Sheffield, and that it is reported that another Sheffield company have acquired the exclusive patent rights of the well-known Heroult process for the British Isles, make it important that we should consider the possibilities of electric smelting relative to steel manufacture in England.

While, on the one hand, the extravagant claims urged on behalf of electric smelting—that it will revolutionize the manufacture of structural steels as at present made by the Bessemer and open-hearth process—may be dismissed as nonsense, the attempts on the other hand to prove that it cannot compete with the crucible process in the manufacture of tool steels, or the open-hearth furnace for many of the higher class steels intermediate between these and common structural steel, may equally be disregarded. The truth lies between these two extremes; and the manufacturer who realizes this, and takes advantage of the great possibilities which the electric furnace offers to meet very many of the special steel requirements of to-day, and who does so with judgment and knowledge, will, without doubt, be in a most exceptional position, not only to meet foreign competition, but to more than hold his own against his British competitors. Since the Canadian Commission visited Europe last year, rather more than a year has elapsed. During this time very considerable quantities of electric steel have been made both in Sweden and France, and have been used with most satisfactory results for all classes of tools and cutlery, and for various other purposes for which the highest class crucible steel was formerly employed, confirming in every way the conclusions of the Commission that "steel equal in all respects to the best Sheffield crucible steel can be made." Considerable quantities of this steel have been supplied to Sheffield firms, who have thus been able to convince themselves of its exceptionally high quality, and it now only remains for our Sheffield people to make the steel for themselves, rather than import it. The manufacture of crucible steel for tool purposs, important as it is to the country, owing to the world-wide reputation for quality which is has acquired, is, however, only one comparatively small branch of our great steel industry; and perhaps the most important question is, to what extent electric smelting can be employed for the manufacture of the numerous classes of steels between this and ordinary Bessemer, or open-hearth steel?

We import annually very large quantities of Swedish Bessemer steel for tube blanks for the solid drawn tube trade, and for other purposes too numerous to mention; again, large quantities of Swedish pig-irons are imported for use in our open-hearth furnaces for the manufacture of special qualities of high-class steel for large forgings, axles, tires, special wire and other purposes, and in many cases steel of the required composition can only be made by using, either entirely or in part, these very high-priced pig-irons. Another very important branch of the steel trade is the production of dynamo steel of exceptional purity and low hysteresis, and in this direction the electric furnace promises great things, as steel of the greatest purity, low in carbon and manganese can readily be produced. If we add to these the manufacture of all kinds of ordnance, armour plate, projectiles, rifle, bayonet, and other high-class steel, we see that without attempting to compete with Bessemer or ordinary open-hearth structural steel, there is an immense field open to the electric furnace. Numerous experiments have shown that electric steel is not only extremely pure, but it is also exceptionally homogeneous, and this is a most important point in the manufacture of large steel castings. When it is remembered that, for special purposes, castings, sometimes of 50 to 60 tons, have to be made by mixing the contents of a number of crucibles not contain-