## ELECTRICITY IN IRON AND STEEL MAKING.

THE investigations that the U.S. Bureau of Mines is making into the metallurgical industries, the appliance of electricity to various processes, and especially in the manufacture of iron and steel, is given attention in Bulletin 67, "Electric Furnaces for Making Iron and Steel," just issued. It gives a historical review of the development of electric furnaces for making iron and steel, and discusses the problems which remain to be solved in the use of electric furnaces for the smelting of iron ores and the production of pig iron at a profit on a commercial scale. In discussing the electric furnace for the making of iron, it is stated that the electric furnace was not developed as a competitor of the blast furnace, but for the purpose of finding a furnace and a process that would be able to produce iron in those localities where blast-furnace practice was not feasible, or where the increasing cost of suitable fuel was becoming prohibitive to the existing practice of smelting in blast furnaces.

Broadly speaking, it is declared, it may be stated that the feasibility of smelting iron ores in an electric furnace depends upon the relative cost of either charcoal or coke and of electric power. As regards the latter, it must be cheap.

In those electric-furnace iron plants that are operating at the present time only hydro-electric power is used. The cost of producing power for electric-furnace work must, of course, vary with local conditions and hence depends upon the initial cost per kilowatt of installation. In general, there are few localities where the electric smelting of iron ores would be feasible with the electrical energy costing more than $20 to $30 per kilowatt-hour.

The second part of the report presents a brief historical review of the development of the electric furnace in the manufacture of steel up to the present time. The types of electric furnaces in commercial operation for the manufacture of steel and, in general, types which have not yet attained wide use, are described in detail. A description is given of the practice of the European and American electric-furnace steel plants, and a comparison made in a general was of the different types of furnaces and the more established methods of steel manufacture with the electric furnace process.

It is stated that the cost of making steel in the electric furnace varies with local conditions. The cost of power does not enter so largely into the final cost as it does in some other electro-metallurgical processes, especially the refining of molten steel. Plants are operating successfully under a power cost of 1 cent per kilowatt-hour in localities where material can be obtained at the price common to other processes. Plants such as the one at Ugine, France, have been established in remote localities, where the cost of power is very low, 0.2 cent per kilowatt-hour, but the cost of material is high.

For many years all high-grade steels were manufactured by the crucible process, but since the advent of the electric furnace there has been a gradual adoption of that furnace for refining steel. For the complete refining of the highest grades of steel the use of the electric furnace is now thoroughly established in Europe. Any product that can be made by the crucible process can be made by the electric furnace, and in most cases with cheaper raw materials and at a lower cost. In the electric furnace complex alloy steels can be made with precision. The high temperatures attainable facilitate the reactions and alloys need not be used so largely for the purpose of removing gas. Very low carbon steels can be kept fluid at the high temperatures. Steels free from impurities and of great value for electrical apparatus can be made. With the electric furnace large castings can be made from one furnace, whereas in the crucible process steel from several crucibles must be used. For small castings, which require a very high-grade metal free from slags and oxides, electrically refined steel is especially adapted. The electric furnace gives a metal of low or high carbon content as desired, hot enough to pour into thin molds and still free from slags and gases.

There is now a tendency among consumers of rail and structural steel to require a higher grade steel at an increased price rather than steel of acid Bessemer or even of basic open-hearth grade at a lower price. With the high cost of power that now prevails throughout the steel centres of the United States the electric furnace can not compete profitably with either the acid Bessemer or the basic open-hearth process in manufacturing steel of like grade from pig iron. It is in combination with either of these processes that the electric furnace seems destined to be prominent in steel manufacture. The cost of superrefining in the electric furnace the molten steel from either of these processes, exclusive of the cost of the molten steel, varies from $1.50 to $2.25 per ton, depending on the cost of power and the impurities to be removed.

## THE ROAD MOVEMENT IN BRITISH COLUMBIA.

In the past 10 years the government of British Columbia has spent over $20,000,000 in roads and trails. There are in existence 20,000 miles of completed or partly completed roads, and in the recent budget speech of Hon. Price Ellison, Minister of Finance for British Columbia, it was stated that from all parts of the province have come numerous demands for roads, bridges, etc.

With a view to determining the requirements in the way of new roads, and in the bringing up to standard of existing roads, the Department of Works compiled estimates last year for the necessities of the immediate future. The information was derived from road superintendents throughout the province, and was supplemented by statements of the character of the country to be served and the reasons for their construction.

To link up the system of roads, as shown by the estimates received, will require the sum of $55,000,000, not including the requirements of the years to come. In a rougher way it has been estimated that between $100,000,000 and $125,000,000 will be ultimately required. When it is considered that since the census-taking of 1901 the population of the province has been increased by 350,000, in other words trebled, we can understand in some measure the increased demands on the treasury so created, not only in roads and trails, but in requirements of every character. Outside of the population of the various urban centres, there are 250,000 persons employed in the timber, fishery, mining and farming industries, and these are scattered from end to end of the province. The population of British Columbia will increase in a similar, if not greater, ratio for some years to come, and it is submitted as a wise and necessary policy that provision should be made as soon as possible for the inevitable needs of the near future.

The Maffel Schwartzkopf company of Berlin announces that it has defeated American competitors by obtaining a contract to deliver 14 high efficiency centrifugal pumps of 2,200 horse-power for the permanent pumping stations at Miraflores and Ancon, on the Panama canal.