SMELTING BY ELECTRICITY.

The commissioners sent to Europe by the Dominion Government to investigate the status of the electrical reduction of ores and the making of steel, have sent in their report, which makes a volume of 221 pages, with several plans and diagrams. As mentioned in previous references to the subject, the commission was composed of Dr. Eugene Haanel, Superintendent of Mines, working under the Department of the Interior; C. E. Brown, assistant works engineer of the Canadian General Electric Co., Peterboro; M. Nystrom, draughtsman. In England these were joined by F. W. Harbord, who accompanied the commission as metallurgist.

In the electrical production of pig iron, the Héroult process at La Praz, France, and the Keller process at Livet, France, were investigated; and in the manufacture of steel by electricity they examined the Kjellin process at Gysinge, Sweden, the Héroult processes at Kortfors, Sweden, and at La Praz, and the Keller process at Livet. There is also a report on the Stassano process at Turin, Italy, though through an accident

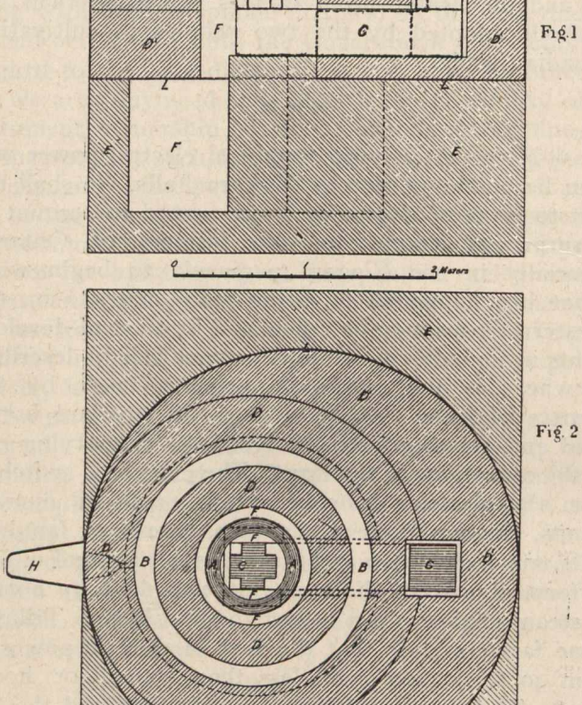


Fig. 1

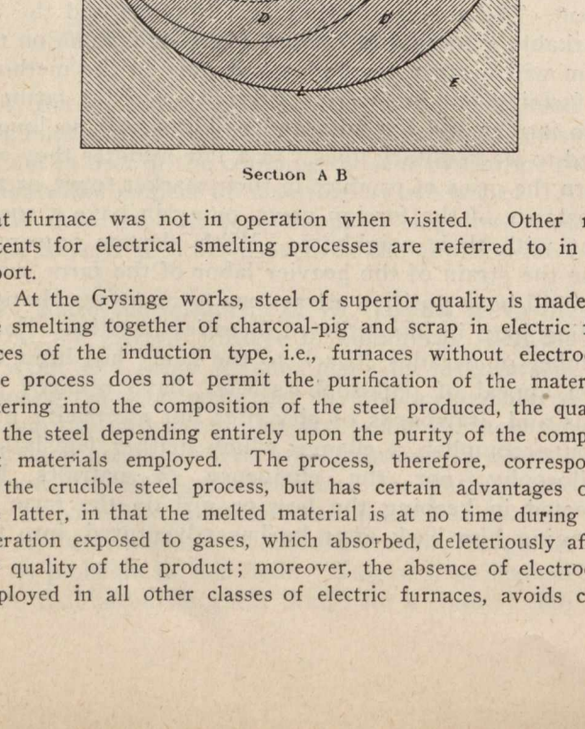


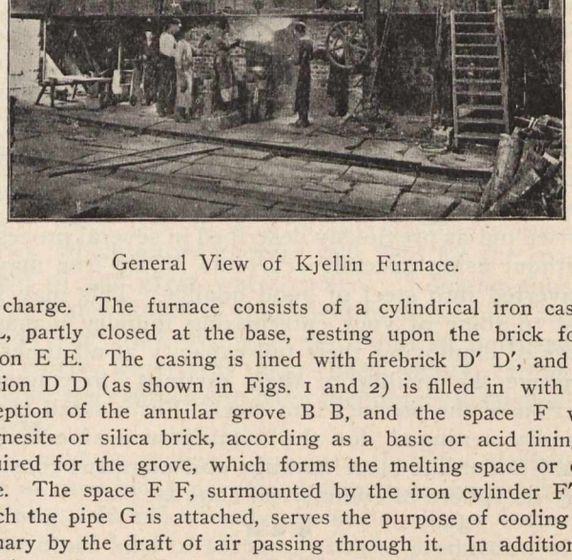
Fig. 2

Section A B

that furnace was not in operation when visited. Other new patents for electrical smelting processes are referred to in the report.

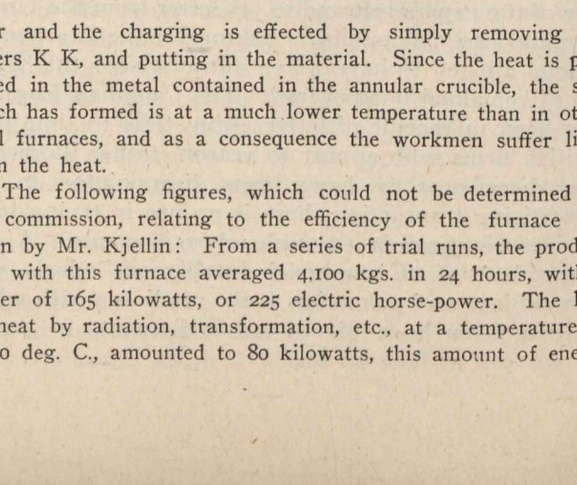
At the Gysinge works, steel of superior quality is made by the smelting together of charcoal-pig and scrap in electric furnaces of the induction type, i.e., furnaces without electrodes. The process does not permit the purification of the materials entering into the composition of the steel produced, the quality of the steel depending entirely upon the purity of the component materials employed. The process, therefore, corresponds to the crucible steel process, but has certain advantages over the latter, in that the melted material is at no time during the operation exposed to gases, which absorbed, deleteriously affect the quality of the product; moreover, the absence of electrodes, employed in all other classes of electric furnaces, avoids contamination of the molten material with the impurities which may be contained in the electrodes.

The furnace, of 225-h.p. capacity, is of the induction type, corresponding to a step-down transformer. Fig. 1 represents a vertical section through the tap-spout, and Fig. 2 a horizontal section through A B. The primary A A Fig. 1 consists of a coil of insulated copper wire wound about one leg of the magnetic current C C C C. The secondary is formed by the charge contained in the annular grove B B. To the primary an alternating current of 90 amperes and 3,000 volts is delivered. This current induces in the charge forming the single turn of the secondary, according to Mr. Kjellin, a current of 3,000 amperes at 7 volts. The conversion of electric energy due to the resistance of the charge takes place, therefore, in the substance of



General View of Kjellin Furnace.

the charge. The furnace consists of a cylindrical iron casing, L L, partly closed at the base, resting upon the brick foundation E E. The casing is lined with firebrick D′ D′, and the portion D D (as shown in Figs. 1 and 2) is filled in with the exception of the annular grove B B, and the space F with magnesite or silica brick, according as a basic or acid lining is required for the grove, which forms the melting space or crucible. The space F F, surmounted by the iron cylinder F′, to which the pipe G is attached, serves the purpose of cooling the primary by the draft of air passing through it. In addition to the air draft, water circulation is employed to keep down the temperature in the space occupied by the primary. K K are covers for the annular crucible, and H the tapping spout. The upper part of the furnace is at the same level as the working



Top View of Kjellin Furnace.

floor and the charging is effected by simply removing the covers K K, and putting in the material. Since the heat is produced in the metal contained in the annular crucible, the slag which has formed is at a much lower temperature than in other steel furnaces, and as a consequence the workmen suffer little from the heat.

The following figures, which could not be determined by the commission, relating to the efficiency of the furnace are given by Mr. Kjellin: From a series of trial runs, the production with this furnace averaged 4.100 kgs. in 24 hours, with a power of 165 kilowatts, or 225 electric horse-power. The loss of heat by radiation, transformation, etc., at a temperature of 1,400 deg. C., amounted to 80 kilowatts, this amount of energy