

that it takes a comparatively long time to heat them entirely through; and acceleration of the heating could only be accomplished at the risk of damaging the furnace walls. In addition to this, the shaft should not be filled to the top until after several days' working.

In concluding this preface, it may be mentioned that the experimental trials witnessed were not conducted for the purpose of determining the output of pig iron per electrical horse-power year—this had been satisfactorily determined by the experiments at Sault Ste. Marie, as well as by the Swedish inventors in their experiments with the furnace preceding the one investigated at Domnarfvet—but to demonstrate the commercial feasibility of the furnace, and to prove whether uniform working without disturbance could be expected.

Description of the Plant.

The experimental plant (Fig. 1) was installed in an old building adjoining the basic-Bessemer converter house. The machinery, which was specially designed and constructed

From the switchboard the current is conducted through copper bars, laid in cement channels, to the three-phase transformers. The capacity of these transformers is 1,500 K.V.A., and their ratio of transformation 14:1. By regulating the tension of the generator, the low tension sides of the transformers can be altered, through small intervals, from 20 to 85 volts. The ratio of transformation can be altered to 7:1 by means of certain easily performed changes of coupling in the transformers; in which case the low tension can be varied between 40 and 170 volts. The transformers are cooled with air supplied under pressure by two electric blowers. A switchboard is situated conveniently near the furnace for controlling its operation. On it are mounted the following instruments:—One three-phase precision wattmeter for differently loaded phases; three ampere meters—one for each phase, and one voltmeter. The ampere meters, and the wattmeter, are connected to the current system by means of transformers. The voltmeter and tension terminals of the wattmeter are directly connected to two of the conducting bars.

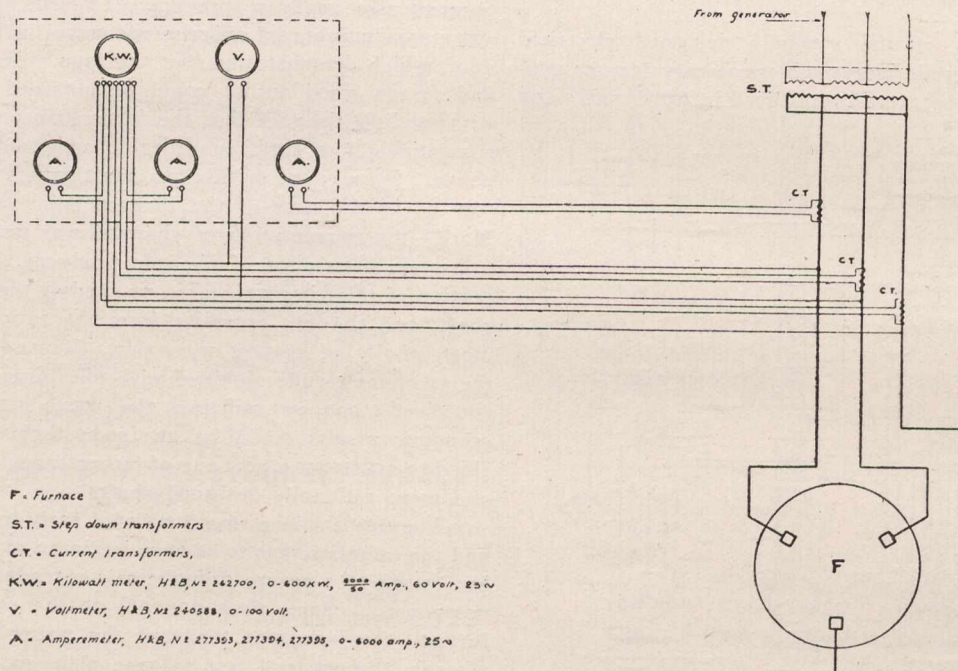


Fig. 3.—Diagram Showing Connections of Instruments Controlling the Furnace.

for the experimental trials, consists of a three-phase synchronous motor of about 900 horse-power, supplied with a current of 7,000 volts, and 60 periods, from a three-phase cable line in the ironworks. This motor is directly coupled to a three-phase generator, which supplies current of 25 periods, adjustable to between 300 and 1,200 volts, through small intervals to the transformers erected in the immediate vicinity of the furnace. By means of this extensive regulation it is possible to determine the most suitable voltage to be employed with furnaces of different construction, and operating under various conditions.

The fields of both the synchronous motor and the generator are fed with current at a tension of 220 volts, from a direct-current generator of 20-kw. capacity, directly coupled to the system. For starting the system a three-phase synchronous motors, directly coupled is employed. This is fed with a current stepped down to 500 volts. The arrangement for controlling the machines may be seen from the coupling scheme shown in Fig. 3.

To protect these instruments from heat when tapping, an iron curtain, which may be lowered or raised, is placed in front of the switchboard. The connection of the instruments is shown by the connection-diagram, Fig. 3; while the external appearance of the arrangement is shown by the photograph, Fig. 4. It will be seen that the wheels—by which the electrodes are adjusted—are placed under the instruments in such a manner that the wheel and ampere meter opposite to each other belong to the same phase.

Description of Electric Furnace.

In general appearance this electric shaft furnace is unlike any hitherto constructed, being very similar in design to an ordinary blast furnace, in which the tuyeres are replaced by electrodes.

A vertical section of the furnace is represented by Fig. 5; and Fig. 6 shows a plan with the shaft and electrodes removed. The height of the furnace above ground level is about 25 feet. The melting chamber or crucible containing