furnace. The prime costs for the electric plant are also lower.

The following tables give all the data required for calculating the cost of one ton of iron produced. For a plant of, say, three furnaces of each 3,000 h.p. capacity the following staff and labor would be required: 1 chief engineer, 1 assistant, 2 chemists, 3 foremen, 2 electricians, 10 men in each of 3 shifts.

TABLE I.

Continuous Run of One Furnace Belonging to Strömsnäs Jernwerks A. B. from Oct. 1, 1912, to Sept. 1, 1913.

Number of charges	26,549
Weight of ore used, tons	11,338
Weight of limestone, tons	907
Weight of charcoal, tons	2,700
Produced pig iron, tons	7,258.3
Weight of charcoal used per ton of pig iron, lbs.	830
Total number of hours when running normal, hours	7,957
Total power consumed kw. hour, kw. hour	15,291
Total power consumed per ton iron, kw. hour	2,107
Weight of pig iron produced per 1 horse-power year, tons	3.05
Weight of pig iron produced per 1 horse-power year, tons	4.14
Total consumption of electrodes, tons	28.42
Consumption of electrodes per ton of pig iron produced, lbs.	8.7

operation, in August No. 2 was running, and now No. 3 is ready for starting up.

"The plant was originally designed for two furnaces only of 3,000 h.p. capacity each (the power consumption is actually 3,400 h.p.). The furnaces are placed in the central bay; on one side all the electrical gear is placed, transformers, switches, regulators, etc., this part being entirely isolated from the metallurgical part. The power is generated 9½ miles away at Forshufvud which power station belongs to the company. The voltage is 12,000 on the line and is reduced to low pressure by the transformers and adjusted by the regulators to between 50 and 100 volts as required.

"The furnaces, as well as the whole of the plant, have been designed by the Electro-Metals Co. and are mainly following the lines of the well-known Trollhattan furnaces, although the various details naturally show modifications based upon the experience from Trollhattan. There are 6 electrodes, cylindrical in shape and arranged to be used continuously without waste by screwing the ends together.

"The pouring bay is conveniently fitted with an electric overhead traveller as well as trolley tracks for transporting iron and slag. The iron can either be poured to pig or conveyed in ladles to the Bessemer and open-hearth works. The slag is run into block moulds and makes excellent building stone.

"The crushing room is at the end of the furnace building. There are 3 crushers of the ordinary jaw type. There is a railway track outside and the daily requirements are supplied in the trucks so that there is no need

TABLE II.

Continuous Run of the Trollhattan Furnace for Three Three-month Periods from 1st October, 1912, to 30th June, 1913.

(This furnace was run by the Swedish Association of Iron Masters with a view to establishing the practical success of the system as well as to give the various members an opportunity of trying their various kinds of ore. Thus, in the table below different kinds of ore were used during the period indicated.)

Period.	1 Oct., 1912, to 31 Dec., 1912.	1 Jan., 1913, to 31 March, 1913.	1 April, 1913, to 30 June, 1913.
Number of charges	6,193	7,107	7,281
Kiruna A ore ..... Tons	1,047	223·3	799.8
Tvollavara ore ..... "	973·4	123·3	762.6
Klacka-Lerberg ore ..... "	885.6	1,453	1,426.5
Persberg ore ..... "	8.82	47·97	148.4
Total ore ..... "	2,914.8	3,047.6	3,137·4
Limestone ..... "	169.94	252.8	273·5
Charcoal ..... "	699	719	738
Pig iron produced ..... "	1,905.86	1,933·32	2,000.14
Charcoal per ton pig iron ..... Lbs.	825	835	830
Actual Working time ..... Hours	2,158.5	2,113.7	2,147
Consumed power kw. hours ..... Units	3,957,565	4,095,588	4,216,544
Consumed power per ton pig iron ..... "	2,076	2,118	2,108
Produced pig iron per kw. year ..... Tons	4.22	4.14	4.15
Produced pig iron per h.p. year ..... "	3.10	3.04	3.05
Consumption of electrodes, total ..... "	5·307	8.670	7.896
Consumption of electrodes per ton pig iron ..... Lbs.	6.2	10.0	8.8

NOTE—The ore from Kiruna and Tvollavara is of the highest quality obtainable in Sweden. It will be seen that the output of the furnace as well as the consumption of electrodes depends largely on the quality of the ore used.

At a meeting at Kristinehamn of the iron masters in the district last spring the following observations were made by the chief engineer of the Hagfors electric furnace plant after the first year's running:

"The work with the foundations of our plant was commenced at the middle of April, 1911; eleven months later, or the 15th of March, 1912, furnace No. 1 was in

for big storing bins. One of the crushers is fairly large with wide enough jaw space for the biggest lumps, and the ore passes from the crusher to the smaller ones, and thence by a bucket elevator up to a belt conveyer above the charging platform so that the raw material may be unloaded where required. There is a small ore store but this only contains some limited reserve amounts of the