various kinds of ores used. These are from Taberg, Finnmossen and Nordmark. The charcoal is transported from the stores by a ropeway.

"Up to now three different kinds of pig iron have been produced: (1) Pig iron for open-hearth treatment; (2) pig iron for Lancashire treatment; (3) pig iron for Bessemer treatment.

"The quality which is desired for the open-hearth pig is semi-spiegel and contains Si, 0.40-0.60%; Mn, 0.30-0.50%; P., 0.011-0.018%; S., 0.015%.

"It will be seen later on that it is more economical to produce pure spiegel iron in the electric furnace, and arrangements are being made to alter the open-hearth furnaces so as to use spiegel iron only.

"It has been assumed in various quarters that it would probably be difficult to maintain a constant product in an electric furnace. Experience shows, on the contrary, that a much more constant product is obtained from the electric furnace than from our old blast furnaces. One of the reasons for this fact is that there is such a large receiver or collecting basin in the lower part of the electric furnace that this collector acts as a regulator on the quality.

"The Lancashire pig needed is quite white and has the following analysis: Si, 0.20-0.30%; Mn, 0.20-0.30%; P., 0.011-018%; S., 0.015-0.020%.

"In the beginning there was a tendency for the sulphur to be unduly high but this was put right by making the slag more basic whenever the furnace was run for Lancashire pig.

Bessemer Pig.—"The analysis of the quality used is: Si, 1.00-1.40%; Mn, 2.50-3.00%; P., 0.015-0.019%; S., 0.005%.

"Excellent Bessemer has repeatedly been made of this pig. At first the result was not good, but it was soon found that we had to increase Si and Mn. It had been assumed that the amount ought to be as usual, but the reason for the higher content being required is probably that the temperature of the electro-Bessemer pig is lower than for ordinary Bessemer pig from blast furnaces.

"We intend, however, to re-arrange the receiver in our electric furnace with a view to increase the temperature. Our general experience points to the following results: It is cheaper to make spiegel than grey pig because: (1) More current can be put through the furnace; (2) the current consumption is lower; (3) thus the production is higher; (4) the electrode consumption is lower; (5) the repair costs are lower.

"It may further be stated that rich charges give better results than poorer. The quality of the pig is not influenced by the percentage of iron contents of the ore.

"The electrode consumption has been relatively high and this is influenced by the following conditions:—

"1. High power consumption (which, of course, increases if the charges are poor).

"2. Too lively gas circulation and too large a proportion of CO_2 in the gas. (Of course the carbon consumption is correspondingly lower).

"3. Too large electrodes for the load.

"Since the 15th of January we have used the gas from the furnaces as fuel under our open-hearth furnaces and I estimate the value of the gas at from 2 to 3 shillings per ton of pig iron produced.

"Finally, regarding the influence of the electric pig on the finished steel, our experience shows that the change tends to make better steel; this holds good both for Bessemer as well as soft and hard open-hearth steel."

The steel produced at Hagfors is of the highest quality and is mainly used for locomotive boiler tubes, piano wires and high-tension wires generally. Practically the whole of the output is exported.

In Sweden generally the electric reduction of iron ore is regarded as revolutionizing in this industry and elaborate preparations are being made for constructing mills of considerable capacity. Recent experiences have shown that larger electrodes can be used at the same time as the current intensity on the electrodes is increased. Larger furnaces will therefore be designed and some of those now projected will have a capacity 8,000 h.p. each.

It has been found that when using coke instead of charcoal it is advantageous to run on burnt lime, as otherwise the power consumption is too high, which largely depends on too much CO_2 being produced.

Refining Furnace.—The Electro-Metals refining furnace is designed for 2-phase current, although 3-phase may be used by suitable design of the transformers and coupling the connections on Scott's system. The furnace has been correctly and carefully described in the July 25th, 1913, number of the *Electrical Review*, as well as in the *Iron and Coal Trades Review* and various other publications. A number of these furnaces are now in operation in Sweden and in Sheffield, England, and the working results are highly satisfactory.

To run this type of refining furnace is extremely simple, everything being so well arranged and balanced that any steel melter who knows open-hearth work can take charge of the electric furnace. No special training or skill is required from an electrical point of view.

These furnaces give a marvellous product inasmuch as it is quite easy to produce a high-class steel from any ordinary scrap with the greatest ease. The ordinary steel smelter used to open-hearth work will not believe the results in the beginning, but once he has familiarized himself with the proper use of various slags to remove sulphur and phosphorus, as well as how to determine the carbon content or to add alloys, he will be loath to return to the open-hearth furnace which, indeed, is a very clumsy and incomplete apparatus compared with the electric refining furnace.

The process is equally suitable for high and low grade steel, for castings, drills, tool and quality steel of every kind and use.

In a country like Canada, where electric current may be produced cheaply from water power the resmelting and refining of ordinary cheap scrap in an electric furnace becomes a very attractive undertaking, and it is curious that it has not been started long ago.

The following figures, taken from an article published in the *Electrical Review* of July 25th, give the actual costs of production.

Working Costs.	Per ton steel £	s.	d.
Electrode consumption	0	4	0
Lining, roof, felting	0	6	0
Slag materials	0	2	6
Labor (assuming auto-regulation)	0	6	0
Tools	0	1	0
Electric energy, 825 kw. hours @ .6d.	2	1	3
	3	0	9

These are actual figures taken from the Works cost sheets and are obtained from a furnace of 2½ tons capacity, so, naturally the figures are considerably reduced in larger furnaces.