

was also very high. In heat No. 9 the units (K.W.H.) consumed per ton of pig were 5,715; in heat 10, 4,151; and in heat 11, 5,111: or an average of 4,949 K.W.H. per ton of pig iron: whereas with a furnace designed for the work the consumption should not exceed 3,500 K.W.H. per ton of pig iron, and under good working-conditions should be less.

It is impossible to form any accurate opinion as to labour-costs on a short run of this description on such a small furnace. Two furnaces per shift were employed on the furnace, with the assistance of one ladleman when required. Owing to the extremely small output—only just over a ton per twenty-four hours—the labour-costs were extremely high—approximately £4 10s. to £5 per ton of pig iron; whereas with a furnace properly designed for the work an output of 15 tons should be obtained with labour-costs of about £1 1s. per ton, exclusive of repair labour, such as bricklayers and fitters, &c. In such a furnace the charging could be done by labourers, with one skilled foreman per shift to supervise and be responsible for the working of the two furnaces.

The following may be taken as the approximate costs of producing pig iron in two furnaces producing each 15 tons per twenty-four hours, based on eight-hour shifts:—

COST OF PRODUCING 30 TONS OF PIG IRON PER TWENTY-FOUR HOURS IN TWO FURNACES OF 15 TONS CAPACITY.

	Cost of 30 Tons.			Cost per Ton of Pig Iron produced.		
	£	s.	d.	£	s.	d.
Materials:—						
61 tons of sands @ 3s. per ton	9	3	0	0	6	1·2
4 tons of lime @ £2 12s. 6d. per ton	10	10	0	0	7	0·0
12 tons of coke-breeze and coal @ £1 10s. per ton	18	0	0	0	12	0·0
Total materials	37	13	0	1	5	1·2
Labour:—						
Furnace labour—						
3 foremen @ £1 per day	3	0	0	0	2	0·0
24 labourers @ 14s. per day	16	16	0	0	11	2·4
6 pitmen @ 14s. per day	4	4	0	0	2	9·6
3 electricians @ 16s. per day	2	8	0	0	1	7·2
9 labourers @ 14s. per day (yard work)	6	6	0	0	4	2·4
Total labour	32	14	0	1	1	9·6
Ferro-silicon (50 per cent.), 750 lb. @ £13 per ton	4	7	0	0	2	10·8
3,000 lb. electrodes (Soldenburg), (100 lb. per ton), @ 2d.	25	0	0	0	16	8·0
Power (3,500 K.W.H. per ton), 52,500 K.W.H. @ 0·1d.	43	15	0	1	9	1·9
Repairs, including labour and refractories, @ 5s. per ton	7	10	0	0	5	0·0
Incidentals (rent, light, water, &c.) @ 2s. per ton	3	0	0	0	2	0·0
Management, @ 4s. per ton	6	0	0	0	4	0·0
Contingencies, @ 2s. per ton	3	0	0	0	2	0·0
Depreciation, 7½ per cent. on £50,000 = 7s. 6d. per ton	11	5	0	0	7	6·0
Grand totals	174	4	0	5	16	1·5

I have assumed that the Soldenburg electrode will be used in above estimates. If the ordinary carbon electrodes are used the price would be at least 4d. per pound, and costs per ton of pig iron would be increased by 16s. 8d. If coke-breeze cannot be obtained and coke at £4 per ton has to be used, the cost would be increased by £1, and the total cost would then be £6 16s. 2d. per ton.

It will be noted that the chief items of cost, apart from labour and power, are lime, coke-breeze, and electrodes. The lime I have taken at £2 12s. 6d., the price given by Mr. E. Parry in his pamphlet on "The Manufacture of Carbide of Calcium in New Zealand," published in 1918 in the *New Zealand Journal of Science and Technology*.

The price of coke delivered in New Zealand, obtained by the High Commissioner's Office by cable, is £4; but in this country small coke or breeze which is useless for most purposes can be obtained for a few shillings per ton, and can probably be bought in sufficient quantity in New Zealand at considerably less than half the price of coke, and, mixed with some local coal, will give quite satisfactory results. I have taken this mixture of coke-breeze and coal at £1 10s. per ton; and preferably a hard anthracite coal should be used. If coke-breeze is unobtainable and coke at £4 per ton has to be used, this will increase the cost of pig iron £1 per ton; and if the actual cost as the result of investigation is found to be somewhere between £4, and the figure of £1 10s. taken, the correct figure will have to be substituted. In any case it will be highly desirable to use at least 30 per cent. of coal in admixture with the coke, and this would probably appreciably reduce the average price of the fuel below £4 per ton, as some local coal could probably be obtained at a lower figure than coke.

Recently in Sweden a new electrode called the Soldenburg electrode has been introduced for ferro-silicon and similar furnaces, and the latest reports are that it is giving very satisfactory results, one furnace having been working continuously for over twelve months. This electrode is made by feeding in the coke paste or mixture into a steel tube on the top of the furnace, where it is tamped and