To make an approximate estimate of the theoretical heat-energy, necessary for a certain process, the following figures are very useful:—

The total heat-energy in one ton of steel at 1400° C is. . . .	330	K.W.H.
To increase the temperature of 1 ton of melted steel 1° C. .	0·4	"
The mean energy to melt 1 ton of slag at 1400° C.	600	"
To increase the temperature of 1 ton of melted slag 1° C. .	0·6	"
The energy necessary to expel the carbonic acid from 1 ton of limestone.	500	"

The heat produced by most of the chemical reactions in a steel bath or between steel and slag is known with fair accuracy. In a paper, read by Mr. Frick (*see* 'Jern-Kontorets Annaler,' 1905), a table of the most usual reactions is given.

Calculations based on those figures show:—

The theoretical energy to melt and finish 1 ton of steel from cold, raw materials, containing an average 0·1 per cent Si, and so rusty, that 0·1 per cent carbon is lost in reducing same, 4 kg. lime being added to form a basic slag, if tapping temperature = 1550° C.	390	K.W.H.
Same, if tapped at 1650° C.	430	"
The theoretical energy to superheat 1 ton of liquid steel		
100° C, say from 1500° to 1600° C.	40	"
150° C, say from 1500° to 1650° C.	60	"
200° C, say from 1450° to 1650° C.	80	"
The theoretical energy to eliminate 0·01 per cent phosphorus from 1 ton of liquid steel, without increasing its temperature, if an oxidizing slag is formed with 1 per cent P_2O_5, 50 per cent CaO, 20 per cent FeO, 20 per cent Fe_2O_3, and 10 per cent SiO_2, 15 per cent hereof having been delivered with the steel.	15	"

Final temperature of the slag = 1650°.

Similar calculations can be made for any case. Those given are only meant to convey an idea of the magnitudes involved.

The actual power consumption may now easily be calculated.

Example 1.—10-ton furnace, working with 8·5 tons, 560 kilowatts power-consumption, melting cold materials as above, tapped at 1650° C.

Mean temperature of bath = 1550°.

Electrical losses, 4·2 per cent. . . . . =	23·5	K.W.
Radiation losses.	160	"
Total loss.	183·5	"

$$\therefore \text{ Total loss in per cent } = \frac{183{\cdot}5 \times 100}{560} \; \ldots\ldots\ldots = \; 32{\cdot}8 \text{ per cent.}$$

Efficiency of furnace. . . . . =	67·2	"