Scotch mixed brands, No. 3 ..... 5 cwt. per ton.
Cleveland mixed brands, No. 3..... 6 cwt. per ton.
Good clean scrap ..... 9 cwt. per ton.

For light castings I used—

Scotch mixed brands, No. 3 ..... 5 cwt. per ton.
Glengarnock, No. 1 ..... 6 cwt. per ton.
Good clean scrap ..... 9 cwt. per ton.

With the Doherty process I used:—

Scotch mixed brands, No. 3 ..... 3 cwt. per ton.
Cleveland mixed brands, No. 3 ..... 4 cwt. per ton.
Scrap (unselected and rusty) .....10 cwt. per ton.
Wrought iron punchings ..... 3 cwt. per ton.

By the introduction of steam (H_2O) in combination with the air blast, a new element is secured in combustion. The excess of oxide of iron in the large amount of scrap used, gives sulphydrate of ammonia, and when reduced to the ferrous state, is ferrous sulphide, and sets sulphur free.

The oxygen is removed from the oxide by the hydrogen and produces a much more strict form of metallic iron.

The oxide or rust visible on the iron is simply the metal going back to its original form—the ore—and in order to recover it, the oxide must be re-smelted; and to do this the same elements or their equivalent must be brought into action, as were at work in the smelting furnace in the first place; the only difference in the original ore and the oxide, being that the ore contains about 50 per cent of pure metallic iron, while the oxide contains about 90 per cent. Thus the practical foundry-man can at once see wherein the great waste takes place when the oxide is carried off with the slag and lost. It is a well known fact, that in melting cast scrap (the more rusty the more waste) there is a loss of 30 per cent in ordinary foundry practice, while it has been verified by me that the charges weighed into the cupola and the castings weighed out therefrom, the loss did not exceed 5 per cent. Here is a saving of 25 per cent., aside from the superiority in quality of the metal produced, which of itself was a finer, softer structure, and possessed fully 20 per cent. more physical strength. It might be of interest here to explain the cause and process of oxidation of iron. Iron does not oxidize in dry air, nor even in dry oxygen, at common temperatures, but in moist air, it becomes coated with a scaly covering of black oxide or rust. The presence of carbonic acid in the air greatly assists the operation, for the iron becoming changed into the carbonate of the protoxide, absorbs a new portion of oxygen, and is thus transformed into the hydrate of the peroxide of iron. The carbonic acid dis-