No. 695,670. Patented Mar. 18, 1902.

F. C. CREAN.

PROCESS OF MANUFACTURING IRON AND IRON ALLOYS.

(Application filed Aug. 27, 1901.)

(No Model.)

FIG. 1.

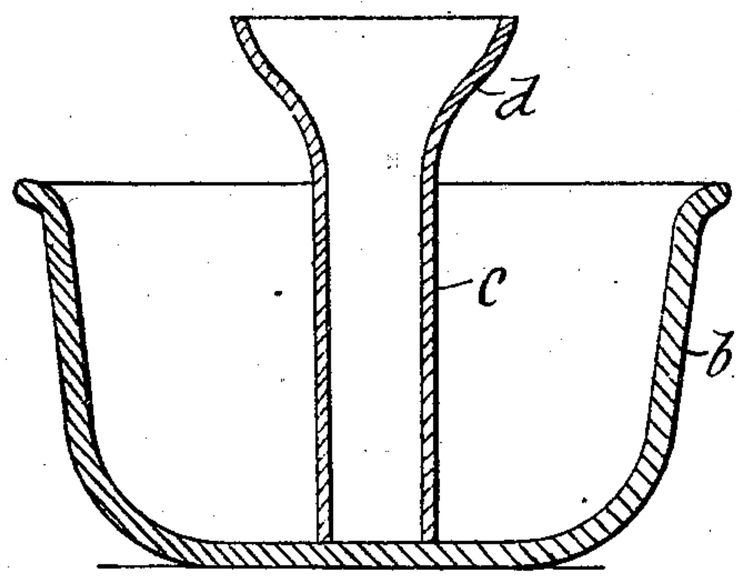


FIG. 2.

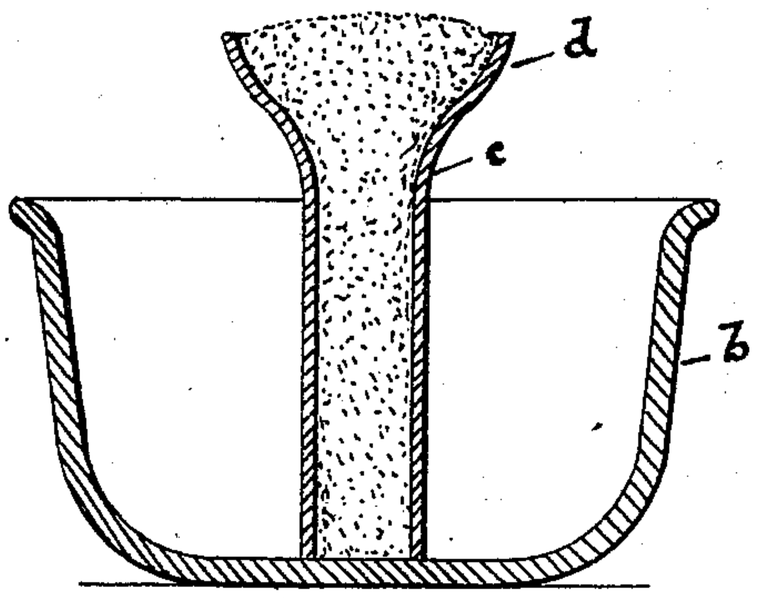


FIG. 3.

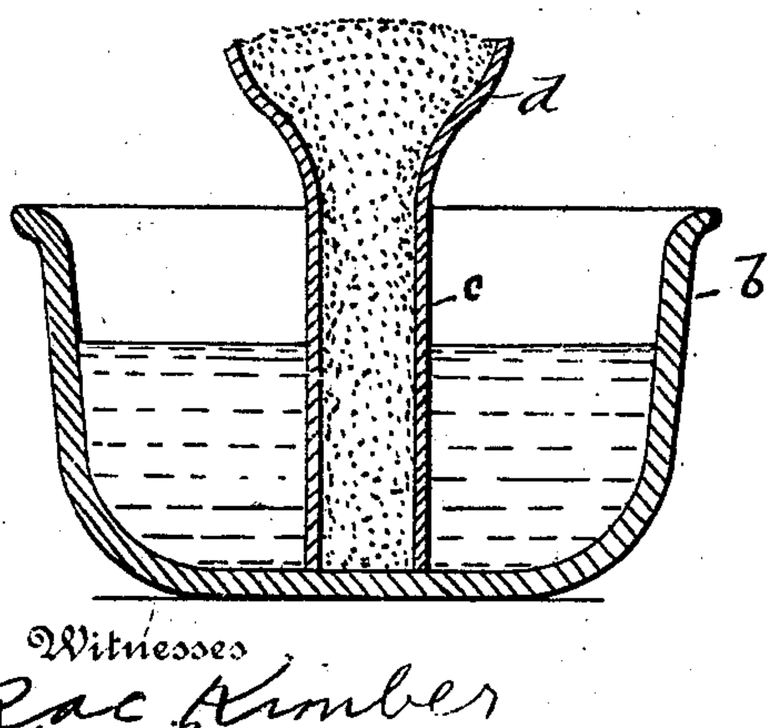


FIG. 4.

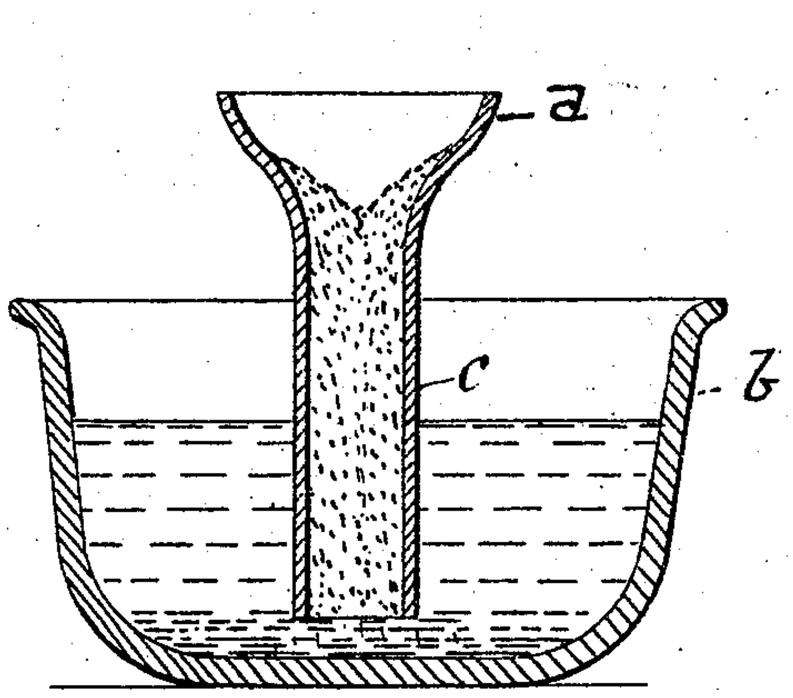
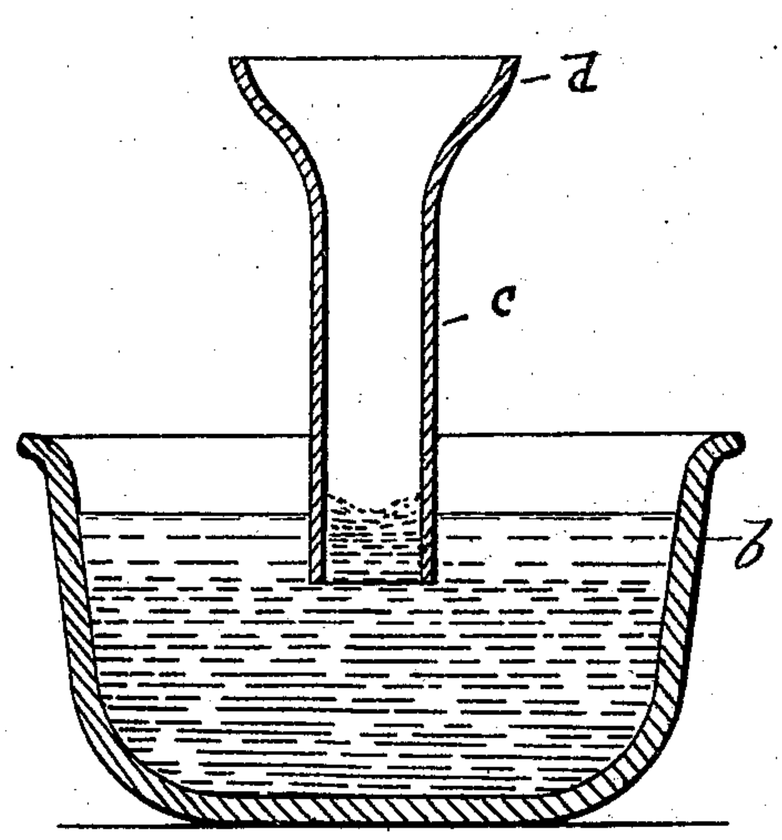


FIG. 5.



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UNITED STATES PATENT OFFICE.

FRANCIS CHARLES CREAN, OF MONTREAL, CANADA.

PROCESS OF MANUFACTURING IRON AND IRON ALLOYS.

SPECIFICATION forming part of Letters Patent No. 695,670, dated March 18, 1902.

Application filed August 27, 1901. Serial No. 73,505. (No specimens.)

To all whom it may concern:

Be it known that I, FRANCIS CHARLES CREAN, mining engineer, of the city of Montreal, in the district of Montreal and Province of Quebec, Canada, have invented certain new and useful Improvements in Processes of Manufacturing Iron and Iron Alloys; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates particularly to the manufacture of iron and alloys; and it has for its object primarily to utilize loose granular magnetite, or what is known as "black sand," for the manufacture of cast-iron, steel, nickel-steel, and any alloy including iron the component parts whereof have an affinity for iron.

The invention may be said, briefly, to consist in mixing loose granular magnetite, such as black sand, with molten metal having an affinity therefor in proportions dependent upon the grade of hardness required in the product. To this end an ordinary foundry ladle or crucible is charged with the molten metal to be mixed with the black sand, and the black sand which has first been cleaned of silica, titanium, and other foreign substance is then added thereto, the proportion of such cleansed black sand varying according to the grade of hardness required in the product.

As an instance, I will describe the specific method of producing an iron having a breaking strength of seventy-eight thousand four hundred pounds in bars of twelve inches length and 2.99 inches by 2.93 inches cross-section. In the production of these bars a foundry-ladle is charged with molten pig-iron, sixty-six per cent., to which is added, immediately the pig-iron is poured from the furnace, thirty-four per cent. cleaned loose granular magnetite or black sand at its natural temperature. This mixture is stirred a few times, and the iron is then complete. A test of this iron and of iron with different proportions of pig-iron and magnetite in bars of different dimensions gave the following results:

Composition.		Bars.		
Molten pig-iron.	Magnetite.	Length.	Cross-section.	Breaking strength.
Per cent.	*Per cent.*	*Inches.*	*Inches.*	*Pounds.*
84	16	12	3.02×2.98	68,000
80	20	12	3.01×2.98	73,800
76	24	12	3.00×2.98	75,600
66	34	12	2.99×2.93	78,400

I have found that in treating large quantities as above and in alloying the iron particles of loose granular magnetite and a metal having an affinity therefor according to my improved process a difficulty has been experienced in causing the molten metal and loose granular magnetite to mingle. The molten metal, if the magnetite were placed in the crucible first, would run over the top of and combine with only a small proportion of the magnetite, and the same would be the case if the molten metal were first poured into the crucible and the loose magnetite poured on top of it. To obviate this difficulty and cause the motel metal and loose granular magnetite to mingle thoroughly and combine with one another, I supply a predetermined quantity of, say, the loose granular magnetite through a tube to a predetermined quantity of the molten metal in the crucible, the tube being caused to traverse the mass of metal in the crucible while the magnetite is being fed therethrough, thereby causing the magnetite to be thoroughly distributed throughout the metal in the crucible, or, if desired, the molten metal can in a similar manner be fed through the tube into and distributed through a body of loose granular magnetite in the crucible. For full comprehension, however, of this latter feature of my invention reference must be had to the accompanying drawings, forming a part of this specification, in which like symbols indicate the same parts, and wherein—

Figure 1 is a transverse vertical sectional view of a crucible and feeding-tube in position to be charged. Fig. 2 is a similar view,

but with the tube charged with loose granular magnetite or black sand. Fig. 3 is a similar view to Fig. 2, but with the crucible charged with molten metal. Fig. 4 is a similar view to Fig. 3, but with the feeding-tube commencing to distribute the loose granular magnetite through the molten metal; and Fig. 5 is a similar view to Fig. 4, but with the feeding-tube just finishing distributing the loose granular magnetite through the molten metal.

The crucible *b* is, as usual, constructed of refractory material, and the feeding-tube *c* is of the same material and preferably has its upper end *d* flared to facilitate pouring the substance to be distributed or fed thereinto.

I prefer to distribute the loose granular magnetite through the molten metal, and to this end I first stand the tube upon the bottom of the crucible and then fill it with the magnetite. The required quantity of molten metal, pig-iron, either alone or mixed with manganese, nickel, or other metal having an affinity for iron, is then poured into the crucible, and the tube is then and immediately raised gradually until the required proportion of magnetite has passed therefrom into the molten metal, which will fuse it as quickly as it is fed. When the required proportion of magnetite has been fed, the mixture is stirred with a rabble or other mechanical device for a short time, and the iron or iron alloy will then be complete and ready to be poured into molds. In this construction the magnetite in the tube above the level of the molten metal and the fusing of said magnetite as it comes in contact with the molten metal will prevent the molten metal rising in the tube, and although the granular magnetite is of less specific gravity than the molten metal the excessive pressure of the said amount thereof above the level of the molten metal will cause same as the tube is lifted and swung about in the molten metal to distribute itself completely therethrough.

If desired, the crucible or foundry-ladle can be first charged with the loose granular magnetite and the required proportion of molten metal subsequently poured through the tube or direct thereupon if a small quantity is to be mixed, the tube, if used, being raised, as above described, to distribute the molten metal through the magnetite, or the temperature of the magnetite be previously raised without departing from the spirit of my invention.

By my improved method a saving of fuel and wear and tear upon the furnace is effected in proportion to the quantity of magnetite used, and as the instances above given show a much superior iron is produced.

Although I illustrate and describe herein the apparatus I prefer to use in carrying out my improved process, I do not claim same herein, as said apparatus forms the subject-matter of an application constituting a divisional part hereof and filed by me on the 28th day of December, 1901, under No. 87,637.

What I claim is as follows:

1. In the process of manufacturing iron or iron alloy by mixing iron particles and a molten metal, feeding one of the ingredients first to the bottom of a vessel containing the other ingredient and then changing the point of feeding.

2. In the process of manufacturing iron or iron alloy by mixing iron particles and a molten metal, feeding one of the ingredients first to the bottom of a vessel containing the other ingredient and then changing the point of feeding gradually from the bottom to the top, substantially as described and for the purpose set forth.

3. In the process of manufacturing iron or iron alloy by mixing iron particles and a molten metal, feeding the iron particles first to the bottom of a vessel containing the molten metal and then changing the point of feeding.

4. In the process of manufacturing iron or iron alloy by mixing iron particles and a molten metal, feeding the iron particles first to the bottom of a vessel containing the molten metal and then changing the point of feeding gradually from the bottom to the top, substantially as described and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRANCIS CHARLES CREAN.

Witnesses:

FRED. J. SEARS,

FRANK H. DENMAN.