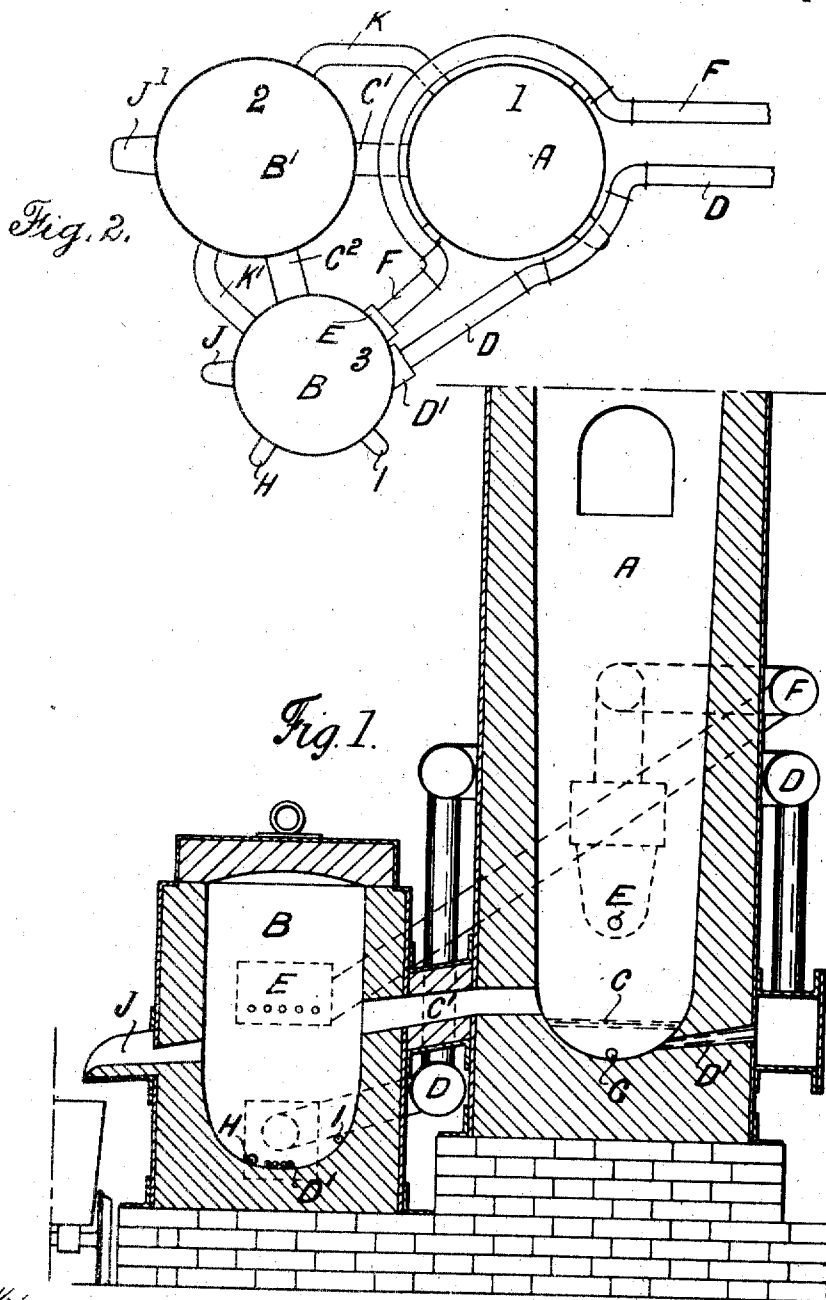


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MANUFACTURE OF STEEL.
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To all whom it may concern:

Be it known that I, THOMAS JAMES HESKETT, engineer and metallurgist, residing at 17 Victoria street, in the city of Westminster, in the county of London, England, have invented certain new and useful Improvements in the Manufacture of Steel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object the conversion of iron into steel by a process analogous to the Bessemer method and has more particular reference to improvements in what may be termed the continuous conversion process. In this last named method the converter is of a stationary type, erected adjacent to or even as part of the cupola, whereby molten cast iron; the product of the cupola is allowed to pass directly from the cupola hearth continuously into the converter through a conduit or connecting passage. The metal accumulates in the converter hearth, to which blast under suitable pressure is applied, causing the carbon, and other metalloids to be oxidized and the heated products of combustion to pass up into the cupola and assist in the reduction and melting of the metal. Thus the process of smelting and converting are carried on simultaneously, the bath of molten steel being constantly fuel enriched by passing over of highly carbonized iron from the cupola, and a sufficiently high temperature maintained to insure the combination of the oxygen in the blast with the carbon of the metal, the converter hearth being tapped intermittently for steel, as the molten metal accumulates and gets deprived of its carbon and other metalloids by the action of the air blast. Hitherto in this method of manufacturing steel, there has been excessive slagging, from the converter and the too free passage of molten metal intermingled with slag from the converter resulting in abnormal losses of metal that pass out with the slag while the converter is in blast. Further, owing to the fact that an ordinary charge such as may be used for this process frequently consists of pig iron, steel scrap, and wrought iron, there is a lack of uniformity in the metal passing into the converter, and the steel is difficult to grade.

Now the object of the present invention is to obtain a purer and more uniform quality of steel. For this purpose I form a bath or well at the bottom of the cupola in which the molten metal accumulates and from which it overflows into the converter attached. This bath is supplied with twyers similar to those in the converter in order to thoroughly agitate and mix the molten metal, and remove by oxidation any excess of silicon, manganese, or other impurities in the metal before it overflows into the said converter. The presence of the coke in the cupola bath prevents any appreciable reduction in the quantity of carbon in the metal, so that the metal overflowing into the converter does not contain more silicon and manganese than is required to be removed before the carbon is reduced to the desired percentage, but if found necessary carbon may be added in any convenient way to the converter or the bath to make up any deficiency.

In the accompanying drawings:—Figure 1. represents a vertical sectional elevation of the furnace and appurtenances constituting this invention. Fig. 2. is a plan of a modification.

In the drawings, A is the cupola which is connected to the converter B in such manner that molten metal in the cupola may flow into the converter and there be converted into Bessemer steel. Instead of the molten metal in the cupola passing directly into the converter, however, it accumulates in a bath or well C of suitable dimensions formed in the base of the cupola, and on overflowing passes through the duct C' into the converter. Connected to the conduit D, which leads blast to the converter B, is a blast box provided with twyers D' leading into the well or bath C, this blast box and connected twyers being similar to the blast box and twyers of the converter. From the foregoing description it will be understood that in operation the molten metal which accumulates in the bath C and overflows continuously into the converter B is treated in said bath for the oxidation of any excess of silicon, manganese, and other matter, so that the metal passing into the converter is more homogeneous and can be made of suitable composition for obtaining any grade of steel required in the converter B by regulating the blast passing through twyers D'.

The blast within the conduit D is at a pressure sufficient to insure its entering the bath of metal, and is in any case of a higher pressure than the blast within the second set
 5 of conduits F which enters the cupola at two or more points E and is also led into the converter above the high pressure blast tuyers D¹ with the object of burning away the carbonic oxid constantly being evolved from
 10 the bath of molten metal below during its conversion into steel.

A tapping hole G is provided in the well of the cupola A for testing and as a metal drain at the end of the operation. Tapping
 15 holes H and I are provided in the converter, the one above the other for testing and for extracting the metal at different levels. A slag hole J is provided at a level above the converter hearth.

20 In Fig. 2 is shown a modification in which the metal is caused to flow from the cupola A into the intermediate receiver B¹, through the conduit C¹. This receiver may be employed with the object of allowing the slag
 25 formed in the cupola A and converter B to separate from the metal and allow the latter to assume a state of tranquil fusion and to further mix the metals before they pass into the converter B, and the slag is driven off
 30 through the slag hole J¹, the slag hole J in the converter B being closed. The passage of the metal from the furnace A to the receiver B¹ is continuous, and in like manner the metal flows from the receiver B¹ into the
 35 converter B, through the conduit C² where it is treated in a like manner as described under Fig. 1. With the object of emptying the furnace and the receiver a drain conduit
 40 K connected from the cupola A to the receiver B¹ is provided, and a similar conduit is provided from the receiver B¹ to the converter B. The cupola A, receiver B¹, and converter B are at different levels so that the

passage of metal from the respective hearths is effected by gravity.

I claim:—

1. The combination, with a converter, of a cupola provided with an outlet passage for metal operatively connected with the said
 50 converter and arranged above the bottom of the cupola and thereby forming a well for metal in the cupola, and means for blowing air into the said well to oxidize its contents before permitting the metal to flow into the
 55 converter.

2. The combination, with a converter, of a cupola provided with an outlet passage for metal operatively connected with the said
 60 converter and arranged above the bottom of the cupola and thereby forming a well for metal in the cupola, means for blowing air into the said well to oxidize its contents before permitting the metal to flow into the
 65 converter, and means for blowing air into the said cupola above the level of the said passage and at a lower pressure than the air blown into the said well.

3. The combination, with a converter, of a cupola provided with an outlet passage for metal operatively connected with the said
 70 converter and arranged above the bottom of the cupola and thereby forming a well for metal in the cupola, means for blowing air into the said well to oxidize its contents before permitting the metal to flow into the
 75 converter, and an intermediate receiver for metal arranged between the said cupola and converter and in which the slag is permitted to separate from the metal.

In testimony whereof I affix my signature,
 80 in presence of two witnesses.

THOMAS JAMES HESKETT.

Witnesses:

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