

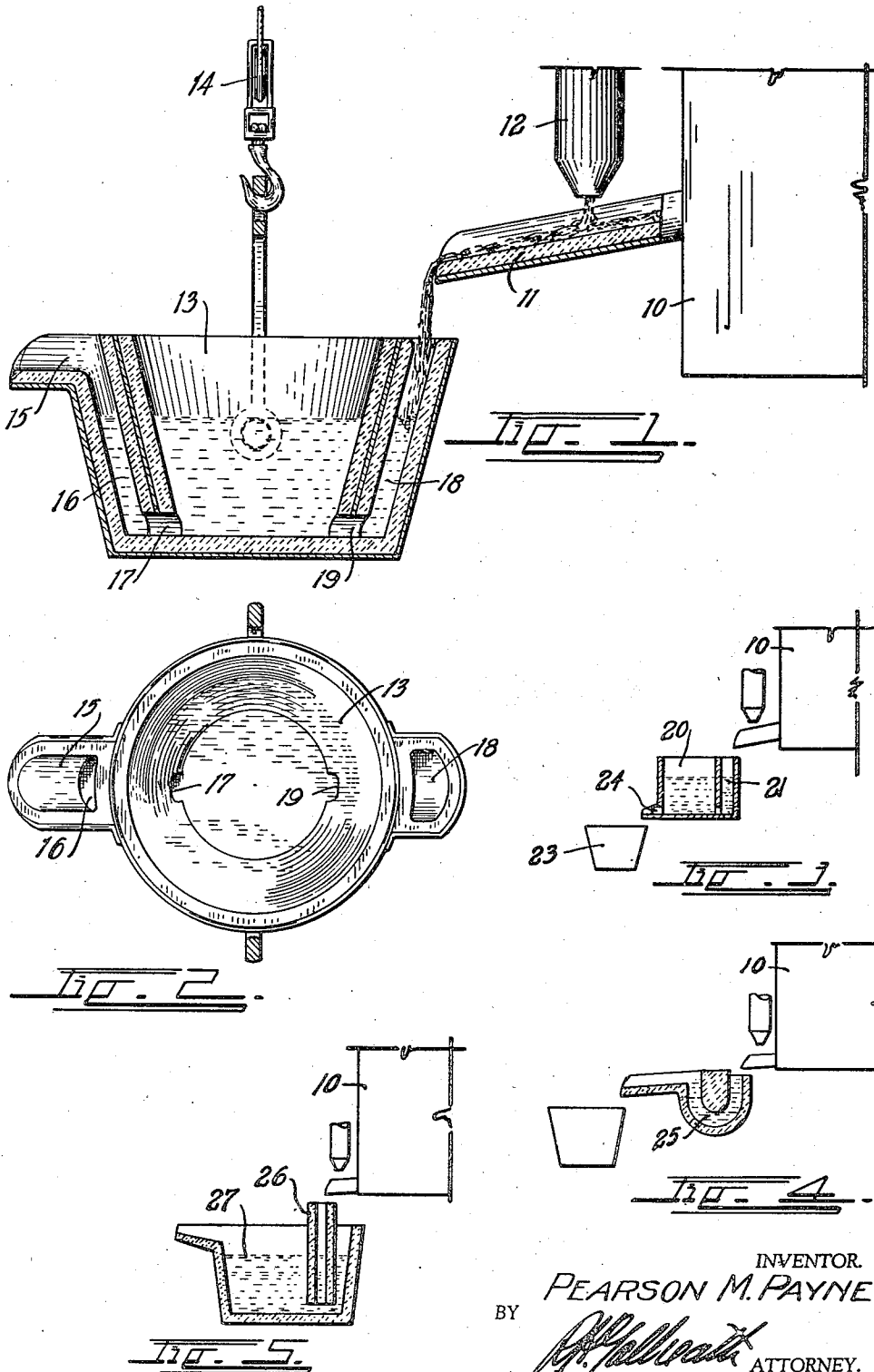
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FERRIC ALLOY PROCESS

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FERRIC ALLOY PROCESS

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8 Claims. (Cl. 75-122)

This invention relates to a process and means for adding alloys to iron or steel.

It has long been a problem in foundry practice to uniformly intermix various alloys in definite formula amounts with the iron or steel. Attempts to add the alloys in the cupola have been unsatisfactory, due to an oxidation of the alloys and to the fact that the slag and coke hold the alloys in suspension and prevent them from entering the metal in definite uniform amounts. Attempts have been made to glow the alloys into the molten metal in the cupola. These attempts have been unsatisfactory and uncertain in operation due to the adherence of the alloys to the slag and furnace lining.

The most common practise is to add crushed or granulated alloys in a pre-determined amount to the stream of metal flowing from the cupola. This method is unsatisfactory due to the fact that some of the alloys will oxidize on the surface of the stream; other portions will float along on the stream to the surface of the ladle and there become suspended in the slag or attached to the ladle lining. Those portions which float upon the iron in the ladle may act to alloy only the upper portion of the molten metal in the layer, and do not mix with the remainder of the metal therein.

The only satisfactory way so far of even approximating a uniform predetermined mixture of the alloys is to place them either in the stream from the cupola or in the receiving ladle, thence pour the metal back and forth from one ladle to another to obtain a complete intermixture. This is a tedious, time consuming, expensive operation and the final results are not always uniform due to the fact that all of the metal is not poured from either of the ladles and to the adherence of the alloys to the gummy slag in the ladles and on their linings.

The principal object of the present invention is to provide a process or method for adding alloys whereby an absolute and positive intermixture of the alloys is obtained to produce iron or steel of a definite analysis.

Another object of the invention is to provide efficient means for carrying out the above process.

Other objects and advantages reside in the improved process and in the means employed in the process. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like nu-

merals refer to like parts in all views of the drawing and throughout the description.

In the drawing:—

Fig. 1 is a sectional view illustrating the process in operation with what will be herein termed a digesting ladle.

Fig. 2 is a plan view of the ladle employed in Fig. 1.

Figs. 3, 4, and 5 are diagrammatic views illustrating alternate means for carrying out the improved process.

Briefly, the process comprises allowing the metal and the alloys to fall or flow into a comparatively narrow receiving channel from the bottom of which the combined metal and alloys will be forced, by the weight of the column of metal in the receiving channel, into a receiving chamber below the surface of the metal therein.

The impact of the falling stream of metal and the velocity of the flow in the relatively restricted vertical channel immediately submerges the alloy particles as they melt, and forces them downward with the stream of incoming metal. The melting alloys are immediately submerged, have no opportunity for surface floating or stratifying, and become intimately mixed with the metal in the receiving compartment below the surface of the metal in the latter. Hence, the alloy particles are made to pass, submerged, through a long distance of hot metal, clear of slag, so that they are completely melted by the time that they reach the receiving chamber. The swirling action of the metal entering the receiving chamber serves to efficiently mix the alloys with all of the metal in the latter. Convection currents in the receiving chamber still further intermix the metal and the alloys.

The process may be carried out with any means which provide the restricted vertical receiving channel; the submerged outlet; and the receiving chamber for submerging the outlet.

Several such means are indicated on the accompanying drawing.

In Fig. 1, a typical cupola is indicated at 10, its spout at 11, and any desired alloy feeder at 12. A ladle 13 of special construction, is suspended from a hoist 14 before the spout 11.

The ladle 13 is provided with a pouring spout 15 of the "tea pot" type having an outlet passage 16 communicating with a bottom outlet 17. Such a pouring spout is common foundry practice and acts as a skimmer to skim the slag from the ladle metal.

On the opposite side of the ladle a vertical

receiving channel 18 is formed communicating with the ladle 13 below the surface of the metal therein through a submerged inlet 19.

It can be readily seen that the alloys entering from the feeder 12 will fall with considerable velocity with the iron into the channel 11 where they will be forced below the surface of the metal and violently agitated by the falling iron so that they will quickly become fluid and intermix there-
10 with. They will then flow through the inlet 19 into the ladle 13, completely below the surface therein so that they can not become stopped by any floating surface materials such as slag, etc.

When the ladle is poured, the iron must flow 15 completely across beneath the surface which still further intermixes the alloys. Thus a perfect mixture having the analysis desired is uniformly delivered from the spout 15.

In Fig. 3, the process is illustrated applied to 20 a forehearth. In such cases a stationary forehearth 20 is placed before the cupola and provided with a vertical receiving channel 21. The metal is drawn to a receiving ladle 23 by the removal of a plug 24. The same principle of op-
25 eration is embodied herein.

In Fig. 4, the invention is applied to a continuous flow spout of the "skimming arch" type having a relatively deep U-shaped channel 25 which provides a vertical receiving channel and
30 a reservoir, similar to the other types. The action of the process in this type is similar to the other types.

In Fig. 5, still another means of carrying out the process is illustrated in which a vertical refrac-
35 tory tube 26 is inserted into a ladle 27 to receive the metal from the cupola spout. It can be readily seen that this will accomplish the same results as the other methods.

Still another method of employing the process
40 is to use an ordinary "tea-pot" ladle and to turn the pouring spout around beneath the cupola spout so that it becomes temporarily a receiving spout. After filling, the ladle is turned to use the filling spout for a pouring spout.

45 In all the above means for carrying out the

process, the same principle or process is involved, that of allowing the metal and the alloys to flow into a restricted, substantially vertical, receiving channel, thence forcing the mixture to a receiving chamber through a submerged passage.

While preferred forms of the invention have been described in some detail together with the theories which it is believed to best explain its success, it is to be understood that the invention is not limited to the precise procedure described
10 nor is dependent upon the accuracy of the theories which have been advanced. On the contrary, the invention is not to be regarded as limited except in so far as such limitations are in-
15 cluded with the terms of the accompanying claims in which it is the intention to claim all novelty inherent in the invention as broadly as it is per-
missible in view of the prior art.

Having thus described the invention, what is claimed, and desired, secured by Letters Patent 20 is:—

1. A process of intermixing alloys with metal comprising: flowing the molten metal and the alloys into a comparatively restricted vertical pas-
25 sage, thence flowing the mixture from a point adjacent the lower extremity of said passage into a receiving chamber below the fluid surface thereof.

2. A process of intermixing alloys with metal comprising: allowing the molten metal and the alloys to fall together into a receiving passage and thence allowing the mixture to rise from a point below the surface in an adjacent compart-
30 ment.

3. A process of intermixing alloys with metal 35 comprising: allowing the metal to flow from a cupola spout into a substantially vertical, comparatively restricted passage; adding alloys to the stream of metal prior to its entry into said passage; simultaneously forcing the mixture of
40 alloys and metal from the bottom of said passage into an adjacent compartment below the fluid surface therein, so that said mixture will rise in said compartment from a point below the surface.

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