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MEANS FOR PLUGGING CRUCIBLES

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Fig. 1

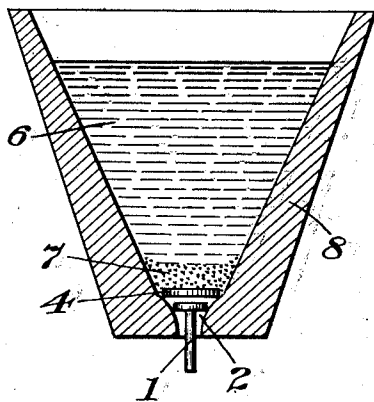
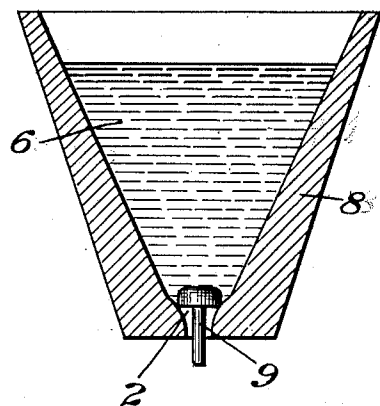


Fig. 2



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MEANS FOR PLUGGING CRUCIBLES.

Application filed January 29, 1923. Serial No. 615,499.

To all whom it may concern:

Be it known that I, EDWARD F. BEGTRUP, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Means for Plugging Crucibles; 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.

The invention relates to means for plugging or stopping the tap-holes of crucibles, and is particularly adapted to crucibles in which hot liquid metal is held until it is desired to tap or empty such metal therefrom, and has for its object to provide means for closing the tap-hole and opening the latter at any desired or predetermined time, the closing means being of such character that it does not add any impurities or contaminating effects to the molten metal, but is preferably of metallic material which may be taken up and incorporated with the molten metal.

The invention is illustrated in the accompanying drawings, in which,—

Fig. 1 is a sectional elevation of a crucible containing molten metal and provided with one form of plugging means;

Fig. 2 is a similar view showing a modification of the plugging means.

Inasmuch as the invention is most useful in tapping from a crucible hot liquid steel produced by the aluminothermic process, the invention will be described with particular reference to the use of such superheated metal.

In plugging the tap-hole of crucibles of this general character, it has been the general practice to apply a pin having a relatively large head in the opening to practically close the latter, and above the pin is placed, first, an asbestos washer, then a flat steel disk, and over the latter is distributed a shallow body of refractory sand, ground slag, or the like. When the crucible has been plugged, the hot liquid steel therein is retained until the pin is driven upward by a sharp blow, which displaces the composite plugging means and permits the liquid to flow out, necessarily carrying with it the refractory sand, ground slag, or other

subdivided heat resisting material, which impairs and contaminates the liquid steel. It has been regarded as necessary to use a highly refractory material to separate the superheated steel from the other plugging means to prevent the molten steel fusing or melting the plugging material and thereby prematurely tapping itself from the crucible. According to the present invention, the plugging means includes no impurities or contaminating material, but on the contrary, includes only such material, which, if taken up by the molten metal, will effect no impairment of the latter, but will serve merely as an addition thereto.

In the form of the invention illustrated in Fig. 1, the plugging means comprises a pin 1 having an enlarged head substantially closing the tapping opening 2 of the crucible 8, the stem of said pin extending through the tap-hole, as illustrated. Preferably, above the pin is located a disc 4, and superposed on the latter is a body 7 of subdivided metallic particles, which may be in the form of slugs or punchings or the like. All of the elements of the plugging means are of solid metal, and preferably metal of the same character as the body of molten metal in the crucible 8. When the crucible is plugged by means of the subdivided metallic material, such as 7, the tendency is for the hot molten metal to melt the upper strata of the subdivided material, and in melting this upper strata, a chilling action takes place and, therefore, the progressive melting downward of the material is arrested or retarded. By using a sufficient quantity of the subdivided metallic plugging material, it is possible to retain the molten metal within the crucible indefinitely, and the metal may be tapped from the crucible, whenever desired, by striking the pin 1 a sharp blow to unseat the head thereof and the disc, together with the superposed subdivided plugging material, thereby permitting the hot molten metal to flow out of the tap-hole. It will also be apparent that, by properly proportioning the quantity of the subdivided plugging material, it will be possible to cause the molten metal in the crucible to automatically tap itself from the latter at any desired or predetermined time. Under such conditions, the pin 1 may be eliminated if desired.

The disc 4 is primarily used as a seal to prevent the subdivided metallic material falling through the tap-hole, and the pin 1 is of special utility in unseating the disc when the tapping operation is not automatic. Obviously, the disc 4 may be dispensed with, provided the head on the pin is made of sufficient size to effect the closing of the tap-hole.

It is to be noted that the particular object of my invention is to provide plugging means which will not contaminate the molten metal in the crucible, but which may, under certain conditions, be incorporated with said molten metal. Obviously, therefore, instead of employing the subdivided metallic material 7, the same desirable effects may be obtained by providing a pin having a head of sufficient size to withstand the effect of the superheated molten metal, for at least a predetermined time, said pin preferably being made of metal of the same character as the molten metal in the crucible. Such a construction is illustrated in Fig. 2, in which the pin 9 comprises a relatively large head, completely closing the tap-hole, and a stem extending through the latter. Any melting of the pin 9, by contact with the molten metal, will serve only to add to the latter. Obviously also, by properly proportioning the head of the pin 9, the latter may be completely melted by contact with the metal in the crucible, within a certain predetermined time, thereby rendering the device self-tapping. In the ordinary use of the apparatus, however, the molten metal will be tapped from the crucible by merely unseating the pin by means of a sharp blow delivered on the end of the stem thereof.

It will be noted that in the various applications of the invention, the objection to the use of plugging material which introduces impurities in the form of foreign and extraneous matter into the metal in the crucible, is entirely overcome, and by employing plugging means consisting of solid metal, preferably of the same character as the molten metal in the crucible, any melting and incorporation of the plugging material by and with the molten metal constitutes a mere increase of the quantity of the latter.

What I claim is:

1. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material in calculated amount to insure melting thereof by the molten metal in a predetermined time.

2. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material of the same character as the molten metal in calculated amount to insure melting thereof by the molten metal in a predetermined time.

3. Means for plugging the tap-hole of a crucible containing hot molten metal, said means comprising solid metallic material partly in comminuted form and in sufficient quantity to insure a progressive melting of said metallic material by the molten metal in a predetermined time.

4. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material comprising a disc overlying the tap-hole and comminuted metal above the disc.

5. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material comprising a disc of the same character as the molten metal overlying the tap-hole, said disc containing metal in sufficient quantity to insure melting thereof by the molten metal in a predetermined time.

6. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material comprising a disc overlying the tap-hole, and a stem associated with said disc extending through the tap-hole.

7. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material in comminuted form overlying the tap-hole, and a pin having an enlarged head extending through the tap-hole.

8. Means for plugging the tap-hole of a crucible containing hot molten metal, said means consisting of solid metallic material comprising a disc overlying the tap-hole, and a body of subdivided metal above said disc.

In testimony whereof I affix my signature.
EDWARD F. BEGTRUP.