April 9, 1940. F. K. WEST 2,196,432

DEVICE FOR CASTING INGOTS

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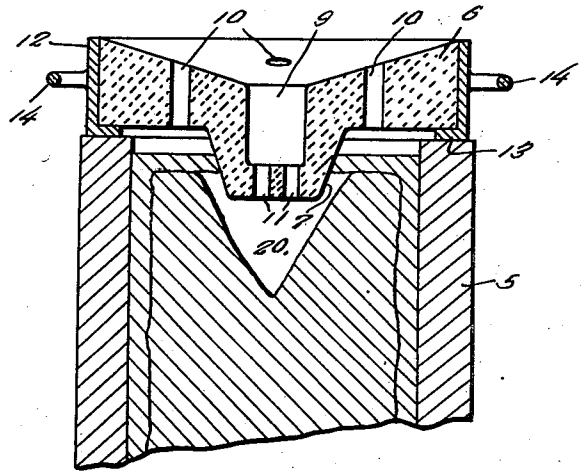
Fig. 1.



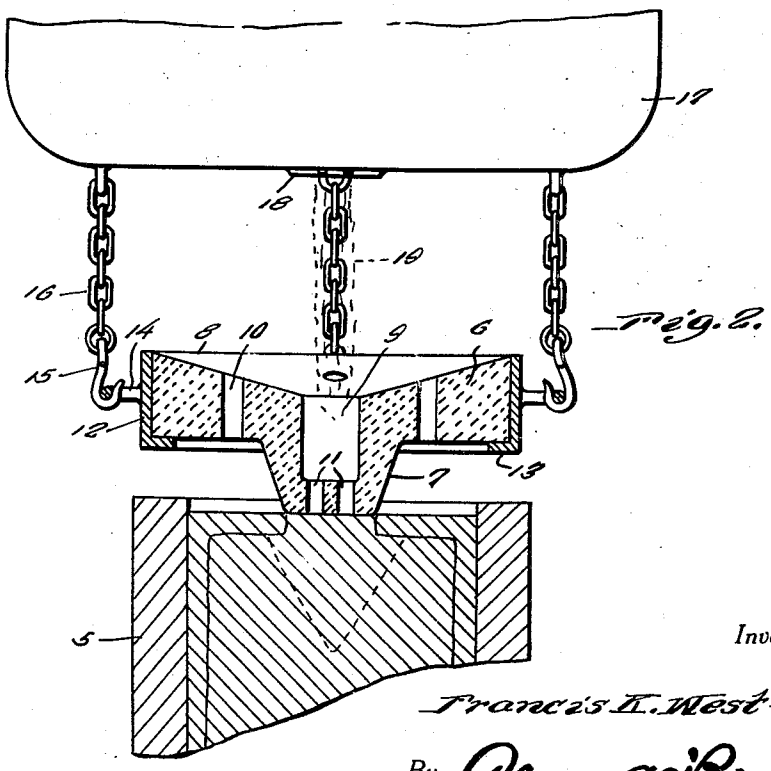


Fig. 2.

Inventor

Francis K. West

By Clarence O'Brien

Hyman Berman

Attorneys

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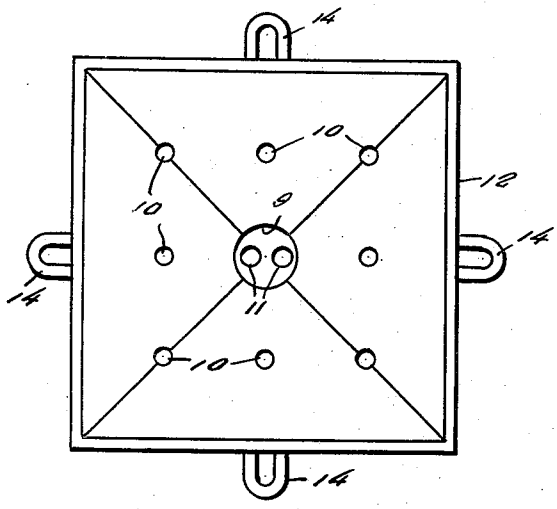
Fig. 3.



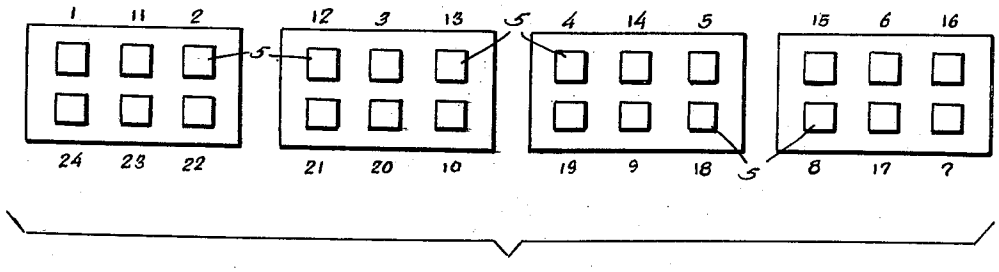


Fig. 4.

Inventor

Francis K. West

By Clarence A. O'Brien

Hyman Berman

Attorneys

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UNITED STATES PATENT OFFICE

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DEVICE FOR CASTING INGOTS

Francis K. West, Portsmouth, Ohio

Application January 18, 1938, Serial No. 185,581

1 Claim. (Cl. 22—147)

This invention relates to the casting of ingots and an object of the invention is to provide an improved apparatus for such work.

Still a further object of the invention is to provide an apparatus for the casting of ingots to the end that there will be a material reduction in segregation, ingotism, blow-holes and piping; and the invention together with its objects and advantages will be best understood from a study of the following description taken in connection with the accompanying drawings wherein:

Figure 1 is a sectional view through an ingot mold with my improved chill basin and pouring well positioned thereon, and showing the condition of the ingot prior to the "back-pouring" operation,

Figure 2 is a view similar to Figure 1 but showing the parts in a position just prior to the removal of the chill basin and pouring well, and immediately upon the completion of the "back-pouring" operation,

Figure 3 is a top plan view of the chill basin and pouring well, and

Figure 4 is a plan view showing an arrangement of molds best suited for carrying out the method of pouring the ingots as comprehended by the present invention.

In carrying out my invention I provide, as shown in Figure 4, four series of ingot molds 5, there being four series of such molds and each series consisting of six molds as shown. For the purpose of identification the molds are numbered 1 to 24 inclusive, the number of each mold being disposed opposite thereto. The purpose of such arrangement will presently present itself.

Further in accordance with the present invention I provide an improved chill basin and integral pouring well, the basin being substantially rectangular in form, and at the center thereof provided with a depending formation forming an integral part of the pouring well, the basin and well being constructed from suitable refractory material. The basin is indicated by the reference numeral 6 and the well by the reference numeral 7. The basin 6 is in the form of a block the upper face of which is concave as at 8 to receive the metal. At the center thereof the block forming the basin 6 and the projection 7 are axially bored as at 9 to form the well.

The basin block 6 is provided with a continuous series of outlet openings 10 through which the metal pours from the basin while the bottom of the well 9 is provided with openings 11 through which the metal flows from the well. By such a provision of openings 10 and 11 uniform distribution of the metal as it is being poured into the mold 5 is assured.

The basin 6 fits within a carrying frame 12 formed of metal or other suitable material and provided at the bottom thereof with an inwardly directed flange 13 forming a seat for supporting the basin 6 within the frame.

Also the frame 12 is provided at each of the several sides thereof with an integral rigid eye 14 to accommodate the hooks 15 on the ends of chains 16 that extend from the bottom of a ladle 17 in the usual manner.

The ladle 17 is of usual construction and is provided in the bottom thereof with a discharge outlet 18.

In accordance with the present invention there are provided chill basins 6 to a number equalling one-half of the number of molds 5. In the present instance twenty-four molds being shown the number of basins 6 will be twelve.

These basins are placed on alternate molds 5 for example, one basin is placed on the top of mold 1, the next basin on the top of mold 2, and so on, on alternate molds to the number of twelve.

The chill basins 6 and associated parts rest on the upper edge of the wall of the mold with the tapered well wall 7 extending downwardly into the mold as clearly shown in Figure 1.

When the basins have thus been positioned on the mold the ladle 17 is first positioned over the first basin, the closure plug for the discharge opening 18 removed and the molten metal poured from the ladle through the opening 18 in a stream 19 into the basin 6. Some of the metal in the basin will pass therefrom through the openings 10 while other of the metal entering the well 9 will pass from the well through the openings 11 into the mold 5 filling the same to a level falling short of the upper end of the mold; after which the ladle 17 is moved to the next succeeding mold 5 having a chill basin 6 thereon.

In connection with the above it will be understood that on the first pouring when the metal in the mold reaches a level considerably below the upper end of the mold the sawdust addition is made in the usual manner just prior to the shutting off of the pouring of the metal into the mold.

As each succeeding one of the twelve molds is being first poured the metal in the poured mold will begin to chill or solidify and the shrinkage cavity 20 forms as clearly shown in Figure 1, and as well-known in the art.

After the first pouring of the twelve molds in the manner just described the "back-pouring" op-

eration is then undertaken. In this "back-pouring" operation the ladle 17 is placed over the first poured mold 5, the plug removed from the opening 18 of the ladle and the metal in the ladle will flow in the form of the stream 19 directly from the ladle into the well 9 and from the well 9 through the openings 11 into the cavity 20 filling the cavity as shown in Figure 2.

In this "back-pouring" operation the hooks 15 are engaged with the eyes 14 so that as the "back-pouring" operation takes place the ladle 17 is slowly raised carrying upwardly with it the chill basin 6 and associated parts, moving the basin from the position of rest on the mold as shown in Figure 1 to the position raised above the mold as shown in Figure 2. When the "back-pouring" of the first mold has been completed the flow of metal to the chill basin is cut off in the usual manner after which the ladle 17 now carrying with it the chill basin 16 suspended therefrom moves, for example, to a position overlying the first of the remaining twelve molds 5, in the present instance the mold 11, when the ladle 17 is lowered so as to position the chill basin 6 on the upper end of the mold 11.

When the chill basin 6 just removed from the mold 1 has, in the manner just described, been positioned on the next succeeding mold, 11, the first pouring of the mold 11 takes place, that is to say the metal is poured into the mold 11, with the usual sawdust addition before shutting off the ladle stream so that the metal in the mold 11 will appear as shown in Figure 1. After this first pouring of the mold 11 has been completed the hooks 15 are disengaged from the eyes 14 of the frame associated with the basin 6 now seated on the mold 11 and the ladle 17 then moved to a position over the mold 2 and the "back-pouring" of the mold 2 takes place. After the "back-pouring" of the mold 2 has been completed the first pouring of the mold 12 is undertaken followed by a "back-pouring" of the mold 3, this alternate first pouring of one mold and "back-pouring" of the next succeeding mold continuing until all of the twenty-four molds have been "back-poured."

In actual practice it has been found that this system of pouring the ingots, namely, "first-pouring" one-half of the total number of ingot molds, then "back-pouring" first one of the "first-poured" molds and then "first-pouring" one of the empty molds, and repeating this "first-pouring" and "back-pouring" in this manner until all of the molds have been "back-poured" has been found to be effective for causing a material reduction in segregation, ingotism, and in the formation of blow-holes and piping with the result that there will be no waste of any of the part of the ingot so cast or poured.

Also, by such a method of cross-pouring the number of chill basins necessary to pour a given number of ingots need equal one-half the number of ingots to be poured. Also by the consequent reduction of segregations a more uniform ingot is obtained since the freezing action of the metal in the ingot mold will be relatively rapid. Also by this increased freezing action a reduction of ingotism or planes of cleavage is obtained, this ingotism, or planes of cleavage often being noted in slow-cooling metals.

Also by the use of a chill basin embodying the features of the present invention "degassifying" or the reduction of the gaseous contents of the poured metal is accomplished without resort to a chemical deoxidizer as is now generally resorted to; the shape and structure of my chill basin being such as to cause a reduction of the head pressure of the ladle stream, this reduction of the head pressure being caused by the spreading of the metal over the chill basin. In substantially the same manner the temperature of the metal will be reduced, the reduction of the temperature of the metal being advantageous since the metal as it reaches its freezing point or point of solidification gives up dissolved gases as is well-known.

It is thought that a clear understanding of the construction, utility, advantages, and method of operation of an invention of this character will be had without a more detailed description.

Having thus described the invention what is claimed as new is:

A chill basin and pouring well for controlling the flow of molten metal from a container to a mold comprising a member formed of refractory material and of cross sectional area greater than that of the opening in the mold, said member having a substantially tapered projection depending from the central portion of its bottom to extend into the mold when the member is located adjacent the top of the mold, the rest of the bottom of the member being substantially flat, with its top face having a concave recess therein for receiving the metal from the container, said member having a well forming opening in its center opening out into the center of the recess and terminating short of the lower end of the tapered portion, said lower end of the tapered portion having small vertically arranged holes therein leading from the bottom of the well forming opening through the lower end of the tapered portion and said member having vertically arranged holes therein opening out through the flat bottom and having their upper ends opening out through intermediate portions of the recess, the last-mentioned holes being spaced from the well forming opening and all the holes acting to discharge molten metal flowing into the recess into the mold.

FRANCIS K. WEST.