June 27, 1933. E. GATHMANN 1,915,729

INGOT MOLD CLOSURE

Filed Oct. 17, 1932

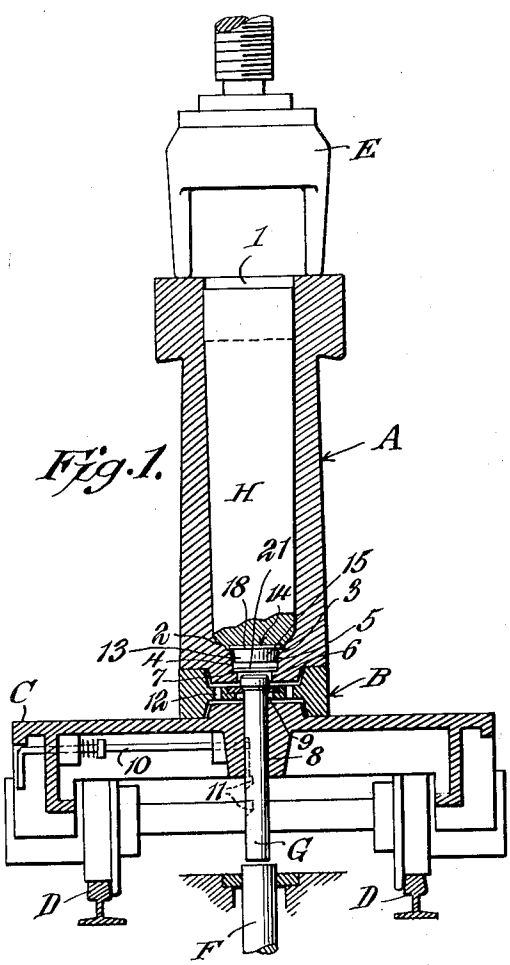


Fig. 1.

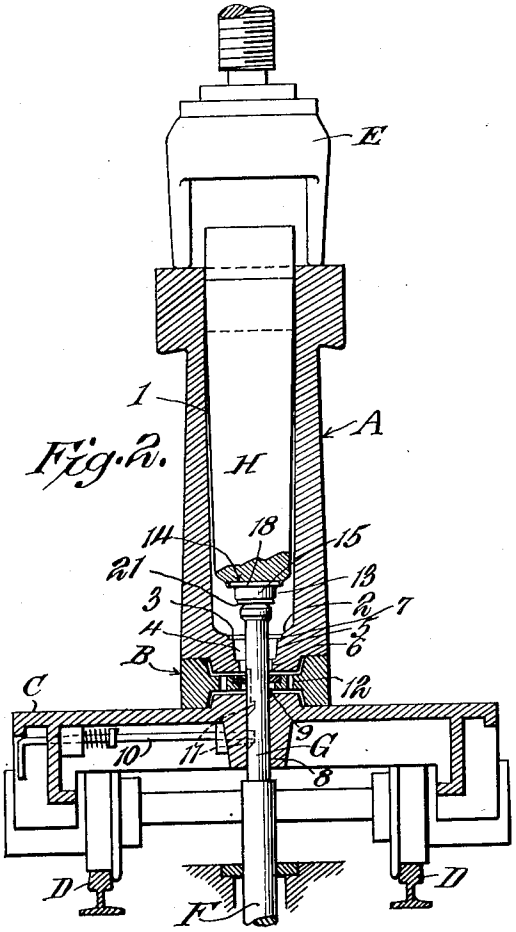


Fig. 2.

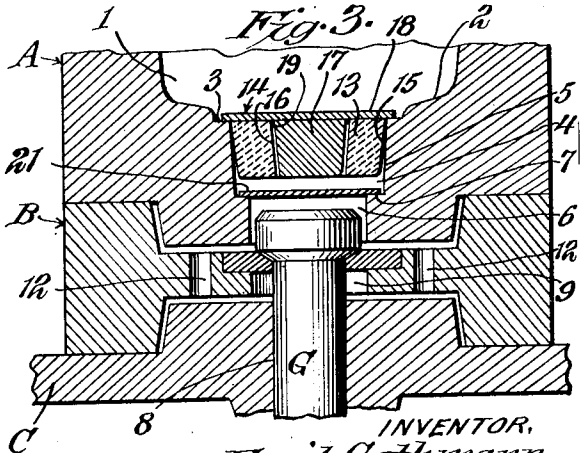


Fig. 3.

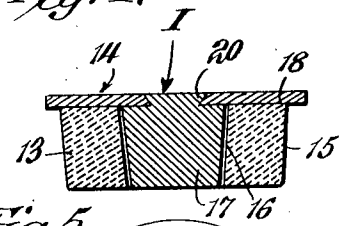


Fig. 4.

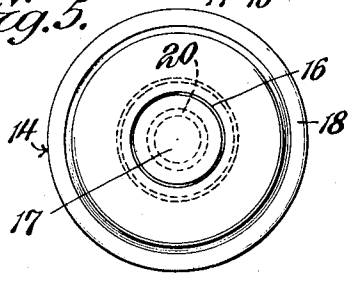


Fig. 5.

INVENTOR.
Emil Gathmann.
BY Baldwin & Wight
ATTORNEYS.

Patented June 27, 1933 1,915,729

UNITED STATES PATENT OFFICE

EMIL GATHMANN, OF BALTIMORE, MARYLAND

INGOT MOLD CLOSURE

Application filed October 17, 1932. Serial No. 638,208.

This invention relates to ingot mold closures and more particularly to closures which are adapted especially for use in big-end-up molds from which solidified ingots are stripped by means of a stripper rod or the like movable vertically through openings in the bottoms of the molds.

In order to facilitate the removal of ingots from big-end-up molds it has become universal practice to provide the molds with bottom openings fitted with removable closure plugs, the arrangement being such that after an ingot has solidified a stripper rod or the like may be projected into contact with the closure plug and partially through the mold to strip the ingot from the mold. Stripping apparatus of this nature is shown for example in my copending applications Serial Number 567,281, filed October 6, 1931, and Serial Number 619,807, filed June 19, 1932. It is very important that the mold closures seal the mold bottom opening effectively in order to prevent molten metal's leaking through the opening and damaging the stripping apparatus and/or causing a "sticker", i. e., an ingot stuck within the mold so as to render difficult its removal or stripping. Experience has shown that the mold bottom openings can be sealed most effectively by means of tapered plugs of bonded refractory material adapted to seat snugly within the openings and to be adjustable to irregularities in the contour of the walls of the openings so as to have uninterrupted sealing engagement with the walls around the entire circumference of the plugs. A closure of this general description is shown, for example, in my prior Patent 1,660,037, of February 21, 1928.

One difficulty often experienced when using sealing means of the general character referred to above has been due to the fact that the stripper rod or the like employed for raising the ingot through the mold has had to transmit the stripping force through the refractory plug, resulting in crumbling of the latter. with consequent uneven operation of the stripping mechanism and fouling of the mechanism with bits of crumbled refractory material.

An object of the present invention is to provide a mold closure adapted both to seal a mold bottom opening efficiently and to provide for the smooth and uninterrupted transmission of stripping force from a stripper rod or the like to an ingot in the mold. A further object is to provide a closure possessing the above named advantage and including a sealing plug of refractory material and a stripping plug of substantially rigid material, the arrangement of the two being such as to prevent crushing of the refractory sealing plug during the stripping operation. Other objects will become apparent from a reading of the following description, the appended claims, and the accompanying drawing, in which:

Figure 1 is a vertical sectional view of a car-supported ingot mold equipped with a bottom closure constructed and arranged within the mold in accordance with the invention, an ingot being shown in its lower position within the mold, and stripping apparatus being shown in cooperative relation with the mold, ingot, and closure;

Figure 2 is a view similar to Figure 1 with the ingot shown in stripped or elevated position;

Figure 3 is an enlarged fragmentary vertical sectional view of an ingot mold and shows one form of my improved closure in operative position;

Figure 4 is a vertical sectional view of a modified construction; and

Figure 5 is a bottom plan view of the closure shown in Figure 4.

A practical embodiment of the invention is illustrated in the accompanying drawing, which shows a big-end-up ingot mold A of the Gathmann type supported upon a stool B which in turn is supported upon a transfer car C adapted to run on tracks D for moving the supported mold or molds from the pouring station to the stripping station. A holding device E is shown in engagement with the top face of the mold A for holding the latter against vertical movement during the stripping operation, while a hydraulic plunger F, mounted below the level of the car and in line with the holding device E, is adapted

to move a stripper rod G upwardly to effect stripping of an ingot H from the mold A. The general arrangement of the parts thus far described does not in itself constitute the present invention, it being claimed in my copending application Serial Number 567,281, filed October 6, 1931.

The mold A is provided with a vertically extending ingot-forming chamber 1 the walls of which are necked in near the bottom as at 2, the necked-in portion 2 terminating in an annular seat 3 at the top of and surrounding a bottom opening generally designated 4 comprising a tapered upper part 5 and a straight lower part 6. The straight part 6 of the opening 4 is somewhat smaller in diameter than the tapered part immediately above it, thereby providing a second annular seat 7, this latter seat being disposed near the bottom of and within the opening 4.

The stripper rod G is mounted for vertical movements within an opening 8 in the car and is adapted to be moved upwardly through an opening 9 in the stool B and through the mold bottom opening 4 for stripping the ingot from the mold. As disclosed in detail in my copending applications referred to above, a latch rod 10 adapted to cooperate with notches 11 in the stripper rod G may be employed for maintaining the ingot in raised position after the stripping operation has been performed. The stool B is shown as being provided with openings 12 extending through its horizontal web portion for permitting air to pass up through the mold when the ingot has been raised so as to promote cooling of the ingot in accordance with the method of producing ingots disclosed and claimed in my copending application Serial Number 621,100, filed July 6, 1932.

It will be understood that the primary purpose of providing an opening in the mold bottom is to make possible the movement of a device such as the stripping rod G upwardly to push the solidified ingot partially through the mold and upwardly relative to the latter, this being necessary because of the taper of the mold chamber walls. Before molten metal can be poured into the mold, the opening 4 must be closed in such a way as to prevent a leak or "run-out" and yet to permit proper functioning of the stripping mechanism, and the present invention has to do more particularly with the construction of the closure device I and its novel arrangement relative to the mold itself.

In accordance with the invention the closure I is of a composite nature and comprises a sealing plug 13, which primarily serves purely as a sealing means, and a stripping member generally designated 14. Preferably the sealing plug 13 is of annular shape and has its outer wall 15 tapered inwardly from top to bottom so as to engage the wall of the tapered part 5 of the mold bottom opening and thus to seal the opening against leakage of molten metal. In order to obtain the most effective sealing it is preferable to make the sealing plug of bonded refractory material adapted to wear away slightly when the plug is turned within the opening so as to adapt itself to any irregularities present in the shape of the opening. For a purpose to be set forth later, the plug is formed with a central opening 16 which tapers inwardly from top to bottom.

The stripping member 14 comprises a rigid and preferably metallic stripping plug 17 adapted to be positioned concentrically within the opening 16 in the annular sealing plug for transmitting force from the stripper rod to the ingot during the stripping operation to lift the ingot without crushing the refractory sealing plug. Preferably the plug 17 is of a size to fit somewhat freely within the opening in the sealing plug, and to provide for a free fit without undue clearance the plug may be tapered, as shown, to conform to the taper of the opening.

In order to prevent metal being poured from cutting away the refractory plug 13 I prefer to construct the stripping member to include a plate 18 adapted to overlie the sealing plug and to project beyond the margin of the sealing plug so as to rest on the upper seat 3, the plate being connected to the stripping plug 17 to support the latter as well as to serve as a splash plate for protecting the sealing plug from the cutting action of the falling liquid metal. The plate 18 and plug 17 may be made integrally or may be connected in any suitable manner, such as by welding them together as at 19 in the form shown in Figure 3, or by providing the plug with a dove tail projection 20 cast into an opening in the plate as in the modification shown in Figures 4 and 5.

To insure still further against the leakage of molten metal and to prevent the sealing plug from crumbling and falling down onto the stripping mechanism I prefer to provide a metal plate 21 which conveniently may be supported on the seat 7 below and out of contact with the sealing plug.

In use, the plate 21 first is inserted from above and placed upon the seat 7. Then the sealing plug 13 is inserted in the tapered upper part of the opening 4 and is rotated slightly so as to produce a grinding effect on its outer wall resulting in a snug fit despite slight irregularities in the wall of the opening. The stripping member 14 then is lowered so that the stripping plug 17 will be positioned concentrically within and will extend vertically through the sealing plug, the plate 18 being rested upon the seat 3. The mold is then ready to be poured.

After the ingot metal has solidified, the car is moved to position the mold under the holding device E and over the plunger F, the

holding device is moved down into engagement with the mold, and the plunger F and stripper rod G are raised. The rod will engage and lift the plate 21 into contact with the stripping plug 17 and will transmit lifting force through the latter to the ingot. In this way, the stripping force is transmitted to the ingot through rigid connections so that smooth stripping operation, free from shocks heretofore due to failure of the conventional refractory closure, is assured. Furthermore, my arrangement prevents the fouling of the stripping mechanism with bits of refractory material.

Although the invention has been disclosed herein in a practical and the preferred form various modifications may be employed without departing from the spirit of the invention as set forth in the claims.

I claim:

1. A composite closure for an ingot mold comprising an outer annular sealing plug of bonded refractory material whose marginal wall tapers inwardly from top to bottom; and a stripping member comprising a plate overlying said sealing plug and projecting beyond the margin thereof, and a metallic stripping plug connected to said plate and being tapered inwardly from top to bottom concentrically within said sealing plug.

2. The combination with a big-end-up ingot mold having a bottom opening and a seat at the top of said opening; of a composite closure for said opening comprising an annular sealing plug of refractory material disposed within said opening and having its outer wall in engagement with the wall of said opening, and a stripping member comprising a plate overlying said sealing plug and having its marginal portion rested upon said seat and a stripping plug connected to said plate and extended vertically through said sealing plug.

3. The combination with a big-end-up ingot mold having a bottom opening, an upper seat at the top of said opening and surrounding the latter, and a lower seat at the bottom of said opening and within the latter; of a composite closure for said opening comprising an annular sealing plug disposed within said opening and having its outer wall in engagement with the wall of said opening, a stripping member comprising a plate overlying said sealing plug and having its marginal portion rested upon said seat and a stripping plug connected to said plate and extending vertically through said sealing plug, and a second plate positioned on said lower seat and disposed below and out of contact with said sealing plug and stripping member.

4. A closure for a big-end-up ingot mold having a bottom opening and a seat at the top of said opening, said closure comprising an annular sealing plug of refractory material adapted to be positioned within the opening in said mold with its outer wall in sealing contact with the wall of said opening; and a stripping member comprising a plate adapted to overly said sealing plug with the marginal portion of the plate resting upon said seat, and a stripping plug connected to said plate and extending vertically through said sealing plug.

5. A closure for a big-end-up ingot mold having a bottom opening through which an ingot stripping rod is adapted to be moved for stripping an ingot from said mold, an upper seat at the top of said opening and surrounding the latter, and a lower seat at the bottom of said opening and within the latter, said closure comprising an annular sealing plug of refractory material adapted to be positioned within the opening in said mold with its outer wall in sealing contact with the wall of said opening; and a stripping member comprising a plate adapted to overly said sealing plug with the marginal portion of the plate resting upon said seat, and a rigid stripping plug connected to said plate and extending vertically through said sealing plug, and a second plate positioned on said lower seat and disposed below and out of contact with said sealing plug and stripping member and above the normal position of a stripper rod when said mold is in stripping position relative thereto.

6. A closure for the vertically extending bottom opening of a big-end-up ingot mold comprising a plug of relatively fragile refractory material, and a rigid metallic stripping plug extending vertically and substantially completely therethrough.

7. A composite closure for a big-end-up ingot mold having a vertically extending bottom opening comprising a relatively fragile outer member of bonded refractory material adapted to engage the walls of the mold bottom opening, and an inner rigid metallic stripping member extending vertically and substantially completely through said outer plug and fitting freely within the latter.

In testimony whereof, I have hereunto subscribed my name.

EMIL GATHMANN.