Dec. 14, 1926. 1,611,020

E. GATHMANN

INGOT MOLD

Filed Nov. 9, 1925

Fig. 1.

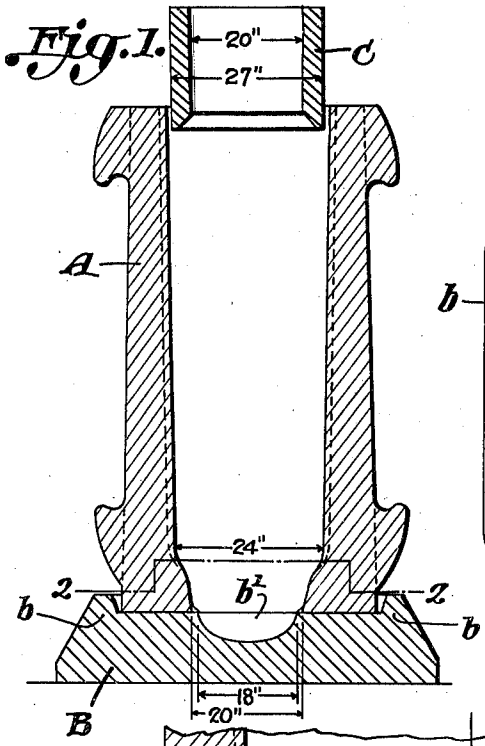



Fig. 2.

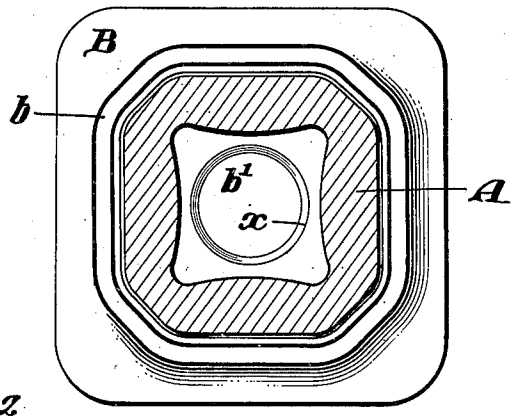
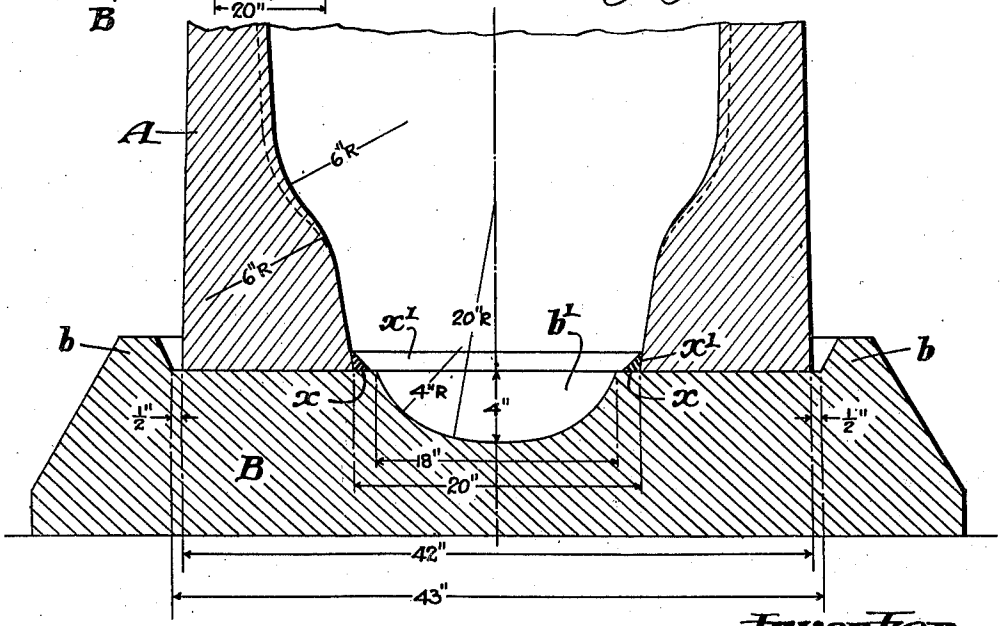



Fig. 3.




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# UNITED STATES PATENT OFFICE.

EMIL GATHMANN, OF BALTIMORE, MARYLAND.

## INGOT MOLD.

Application filed November 9, 1925. Serial No. 67,770.

This invention relates to certain improvements in the construction of ingot molds of the kind described in my U. S. Patent No. 1,188,751 issued June 27, 1916. Molds of this kind are usually supported on a stool or supporting plate during the pouring and solidification of the ingot and such tools have heretofore usually been provided with a short projection, which entered the opening in the bottom of the mold. Such a projection, as shown in my U. S. Patent No. 1,019,244 issued March 5, 1912, has heretofore been used for centering the mold on the stool and for assisting in preventing lateral fins from forming between the horizontal bottom of the mold and the upper horizontal face of the stool. Slurry or other sealing device has usually been applied in the annular opening between the inner mold walls and the outer walls of the said projection to insure a perfect seal.

The object of my present invention is to not only efficiently seal the bottom portion of the mold chamber, but to so construct the stool that the initial impact of the steel as it is being teemed into the mold will be received within a recess located in the stool which recess constitutes a part of the mold chamber.

In this class of molds, known as the big-end-up type, where the mold is usually made in one vertical piece, it is necessary in stripping the ingot from the mold to lift it therefrom or to push it upwardly out of the mold. If molten metal leaks from the bottom of the mold in such a manner as to form a lateral fin at the junction of the mold and the stool, the stripping of the ingot is prevented or made difficult. Furthermore, if the walls of the mold cavity are not properly formed, the ingot frequently sticks or binds to the lower part of the mold, which further impedes or prevents the stripping operation. Therefore, it is important that the mold cavity should be free from reentrant angles which would tend to impede the stripping operation or the removal of the ingot from the mold.

According to my present invention, I employ a separable stool which, instead of having a projection adapted to enter the mold cavity, has a recess or cavity which registers approximately with the bottom opening of the mold. In order to assure of this recess or cavity approximately registering with the bottom opening of the mold, the stool is formed with a bead or ridge, which by contact with the outer lower vertical walls of the mold centers the mold on the stool in such a manner that the bottom opening of the mold will always be properly located with reference to the recess or cavity in the stool. The width or diameter of the recess or cavity in the stool at its upper edge is somewhat less than the width or diameter of the opening of the mold at its lower extremity, thereby forming a ledge on the stool. This ledge is surrounded by the walls of the bottom opening of the mold, and the ledge thus surrounds the recess in the stool. On this ledge a collar or gasket of suitable sealing material may be fitted to contact with the vertical walls of the mold bottom opening and with said ledge. The arrangement is such that the formation of fins on the ingot bottom edges, such as would be produced by lateral leakages under the bottom of the mold when seated on stools of the old type heretofore known in the art, is entirely avoided.

I preferably embody my invention in big-end-up molds of the Gathmann type, such as shown in my patents above mentioned in which the lower portion of the mold chamber is necked-in or inclined downwardly and inwardly towards a bottom opening, and I preferably employ refractory shrink head casings or feeders fitted to the upper part of the mold chamber to centralize the pouring of the molten metal metal as well as to assist in preventing or reducing the formation of pipe in the solidifying ingot. The shrink head casing or mold top is preferably considerably less in interior diameter than the diameter of the mold chamber at its lower end where the necked-in portion commences, so that in pouring the ingot the narrow stream of liquid steel will not impinge against the vertical mold walls.

My improvements are illustrated in the accompanying drawings, in which—

Figure 1 is a vertical central section through a mold, its stool and its shrink head casing.

Figure 2 shows a section on the line 2—2 of Figure 1.

Figure 3 is a sectional view on an enlarged scale of the stool and the lower portion of the mold.

The mold A rests on a stool B, which is

of novel construction, the details of which will be hereinafter described. The stool is formed with a ridge or bead $b$ on its upper face, which is preferably shaped as shown in Figure 2 and is preferably continuous although the bead $b$ need not necessarily be of a continuous formation. This bead of ridge $b$ serves to locate the mold base and thus center the bottom opening of the mold chamber in its relation to the recess $b^1$ located in the stool when the mold is seated upon the stool. The recess or cavity $b^1$ is formed in the upper side of the middle portion of the stool and is of a smaller diameter than the diameter of the lower end of the bottom opening of the mold. For instance, if the diameter of the bottom opening of the mold is 20″, the diameter of the top of the cavity in the stool should preferably be about 18″, or at least sufficiently less than the diameter of the bottom opening in the mold so that when the mold is seated on the stool, being located in this seating by the ridge or bead $b$, a ledge $x$ will be formed within the walls of the bottom opening of the mold, said ledge $x$ then surrounding the cavity or recess in the stool. Sealing material $x^1$ of any suitable kind may be fitted to seat on this ledge and contact with the inner walls of the bottom opening of the mold, but such sealing material is not always necessary.

The relative dimensions employed for different parts of the mold and stool are those preferred and to carry out my invention to the best advantage, are preferably, approximately such as indicated on the drawings. Particular attention is called to the fact that the diameter of the bottom opening of mold chamber is larger than the diameter of the top of the stool recess for the purpose hereinbefore mentioned. As indicated in Figure 3 of the drawings, when the width of the mold at its lower end or bottom portion is 42″, the diameter of the space between the beads or ridges on the stool is preferably as shown 43″, approximately 1″ clearance being allowed as a margin for seating the mold base on the stool. This margin may be somewhat less or somewhat more, but the relative dimensions of the base of the mold and the space between the beads or ridges on the stool must be such that when the mold base is seated on the stool between the ridges or beads thereon, there will always be a ledge $x$ surrounding the recess $b^1$ in the stool even through the mold is shifted sidewise so that its lower vertical walls bear against one or another of the inner faces of the ridge or bead of the stool.

It is highly desirable in my construction that the base of the mold and the upper face of the stool be made smooth by machining or other means so as to insure a smooth unbroken contact between the mold bottom and the upper face of the stool. When such a mold is mounted on a stool constructed as shown, there is small chance for lateral leakage of any molten metal and consequent fin formation. To prevent undue wear of the ledge of the stool and of the bottom of the mold chamber walls, I may employ sealing material of any desired kind and shape and apply it at the junction of the inner walls of the mold bottom and the annular ledge $x$ of the stool.

Due to the recess in the stool, the ingot will be formed with a projection extending below the bottom of the mold A, so that when the mold is lifted from the stool B, the ingot may be loosened from the mold walls by merely lowering the mold with its contained ingot onto an abutment or suitable stripping device, which will engage the projection and thus lift the ingot in the mold sufficiently to loosen it from the mold walls in case it should tend to adhere thereto. The ingot can then be entirely removed from the mold by suitable tongs or other appliance engaging the upper end thereof, in a manner shown in my U. S. Patent No. 1,059,668 of April 22, 1913.

The shrink head casing C is preferably made of refractory material and is adapted to enter the upper portion of the mold cavity, as shown. Its interior diameter is considerably less than the diameter of the greater portion of the mold cavity and is approximately the same as or less than the bottom opening of the mold. By this construction, when the narrow stream of molten metal is poured into the mold the side walls of the mold cavity will be protected, the impact of the metal being confined to the stool and particularly to the chambered part of the stool. When the stool is worn away or impaired it may be readily replaced by another for use with the same mold at comparatively small cost.

Thus by employing a chambered stool of the kind shown in connection with a necked-in mold of the sort illustrated and with a shrink head casing of the construction described I am enabled not only to prevent injury to the mold walls while pouring but I prevent the formation of fins at the bottom of the mold which would impede the stripping of the ingot from the mold and I facilitate the stripping operation by reason of the necked-in contour of the mold cavity and by the formation of a projection on the lower end of the ingot which extends below the bottom of the mold.

I claim as my invention:

1. A metallic mold provided with an ingot-forming chamber open at top and bottom having a necked-in portion above the bottom opening and merging thereinto, in combination with a mold stool having a recess in communication with said necked-in portion and which recess is surrounded by

an unbroken ledge for supporting sealing material.

2. A metallic mold provided with an ingot forming chamber open at top and bottom, in combination with a mold stool having a recess in communication with the bottom opening of the mold which recess is surrounded by an unbroken ledge and a ring of sealing material resting on said ledge and making contact with the side walls of the bottom opening of the mold.

In testimony whereof, I have hereunto subscribed my name.

EMIL GATHMANN.