No. 855,655. PATENTED JUNE 4, 1907.

F. McMAHON.

INGOT MOLD.

APPLICATION FILED JUNE 23, 1906.

Fig. 4.

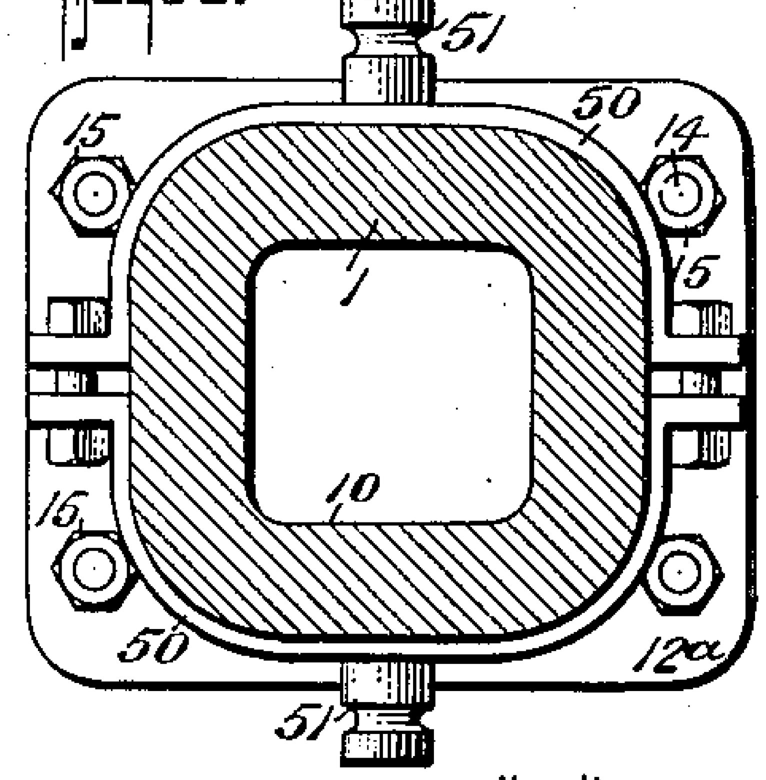


Fig. 5.

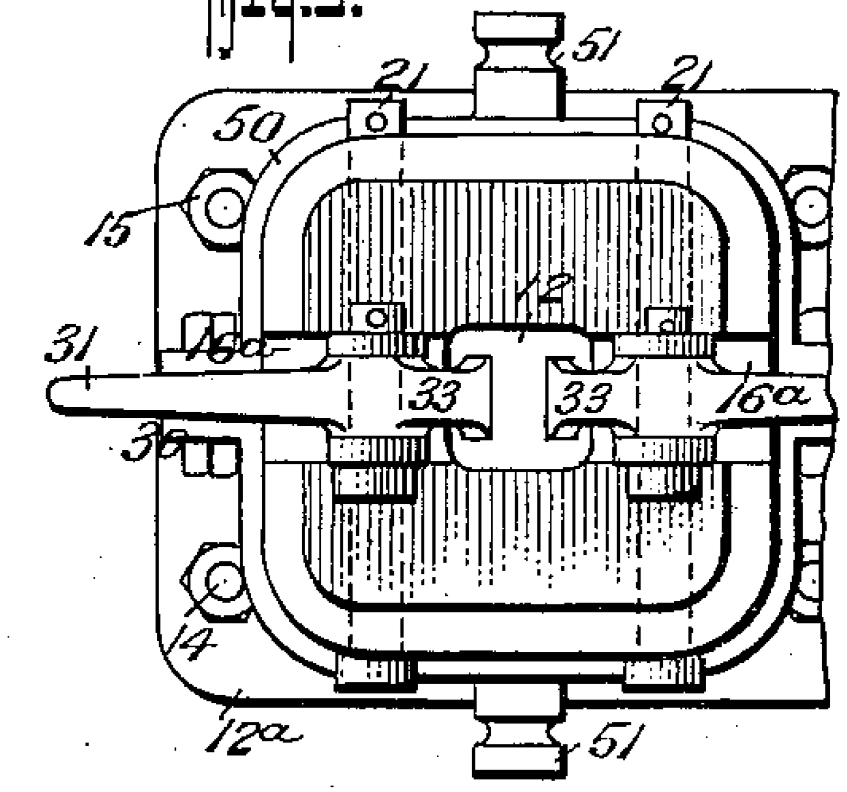


Fig. 1

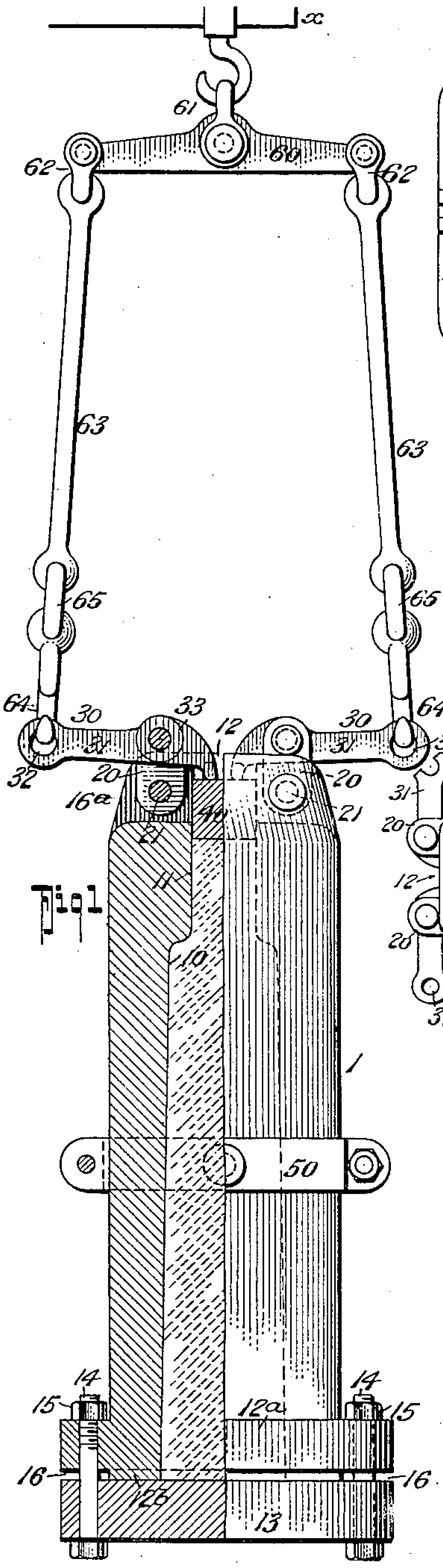


Fig. 2.

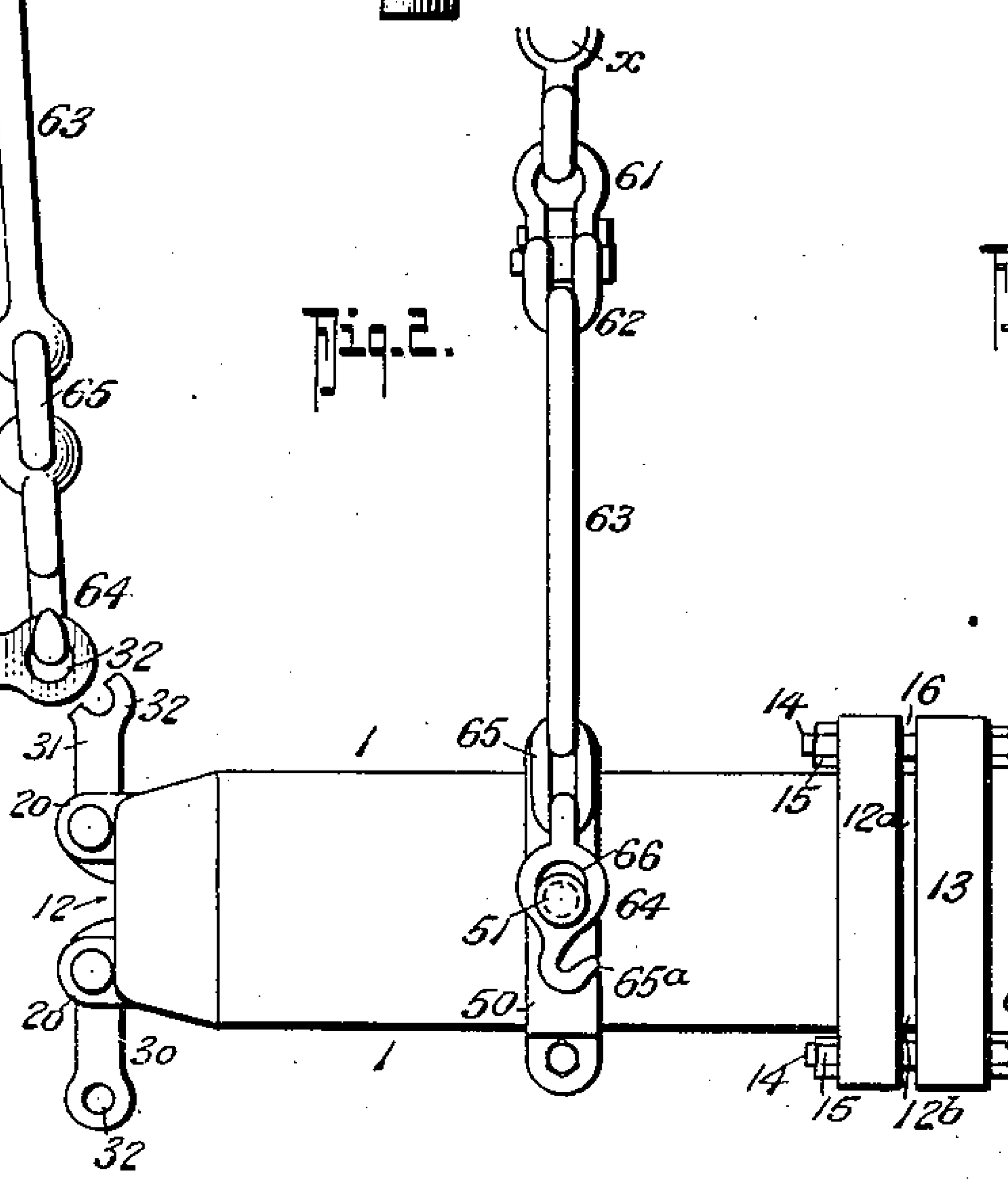


Fig. 3.

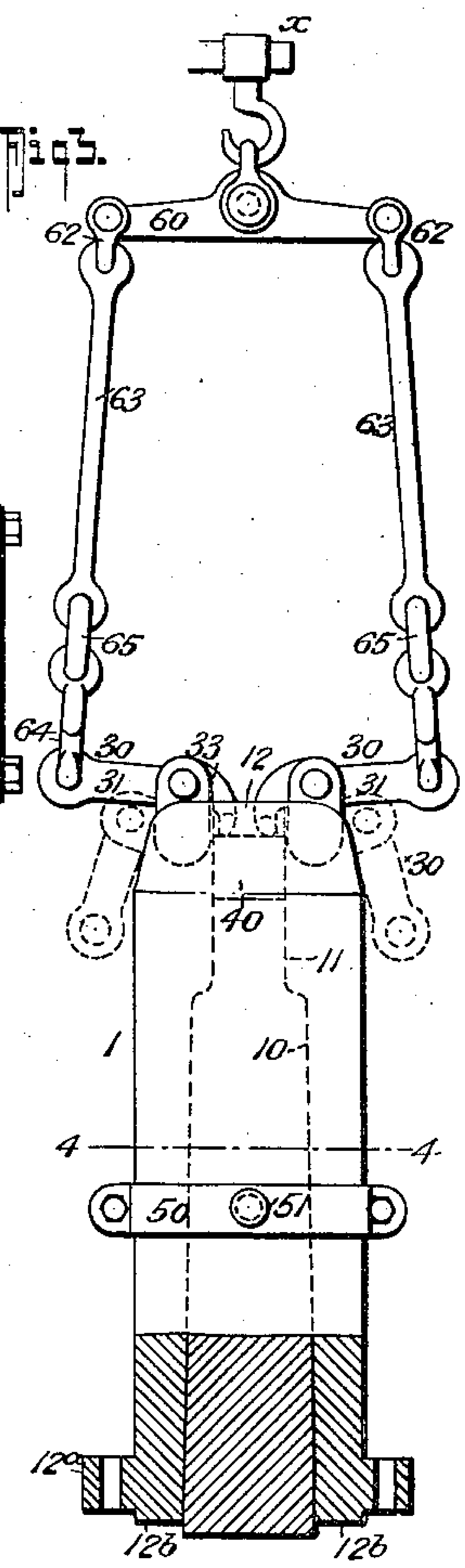
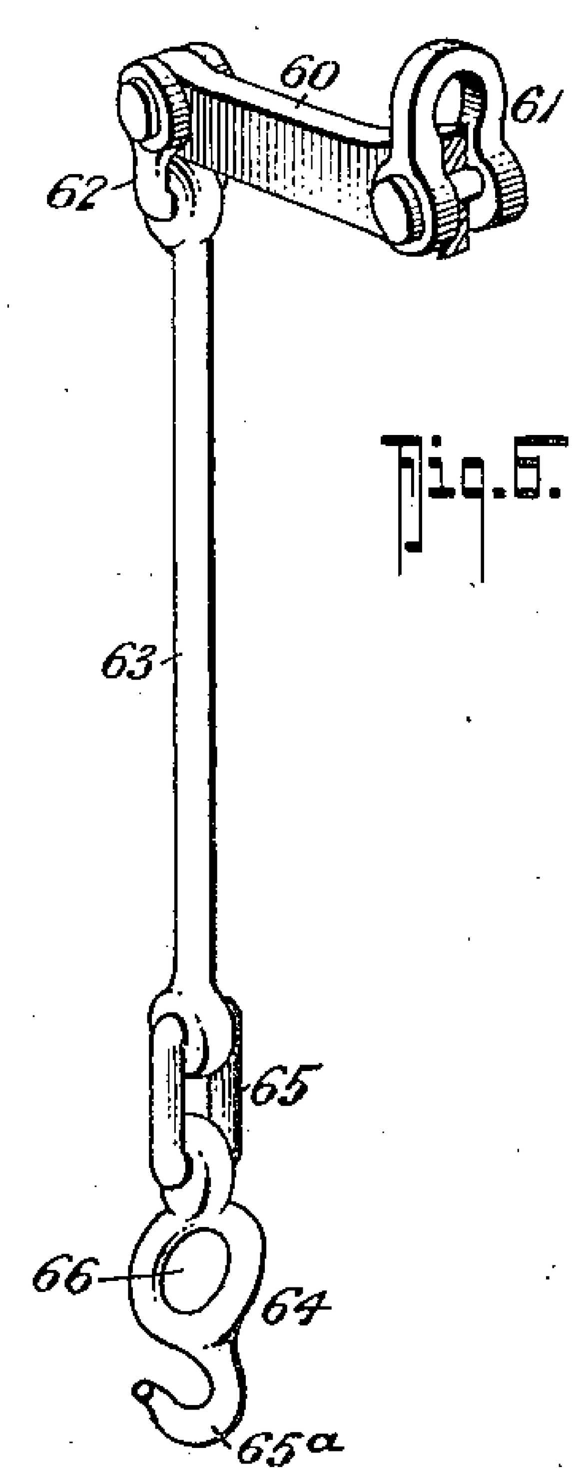


Fig. 6.



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FRANCIS McMAHON, OF CAMBRIDGE, MASSACHUSETTS.

INGOT-MOLD.

No. 855,655. Specification of Letters Patent. Patented June 4, 1907.

Application filed June 23, 1906. Serial No. 323,152.

To all whom it may concern:

Be it known that I, FRANCIS McMAHON, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented a new and Improved Ingot-Mold, of which the following is a specification.

This invention, which relates generally to means for forming steel ingots, more particularly seeks to provide an improved mold having combined therewith a simple and effective mechanism for applying a heavy and continuous pressure on the molten metal as it is congealing.

My invention, in its generic nature, comprehends a mold, and means combined therewith for effecting a constant and powerful pressure on the top of the metal while in its liquid state, said means being actuated by the weight of the molds and the ingot or metal contained therein.

My invention, in its more complete nature, comprises a mold body having a taper metal receiving bore, a bottom detachably connected to the body, compressing lever mechanism connected to the upper end of said body, operable under the weight of the mold and ingot during the process of congealing the ingot, and a sling having means for detachably connecting the sling to the mold to tiltably suspend the said mold.

In its more subordinate features, my invention consists in certain details of construction and peculiar combination of parts, all of which will be hereinafter fully explained, pointed out in the appended claims and illustrated in the accompanying drawing, in which:—

Figure 1, is a side elevation, partially in section, of my improved construction of mold and ingot compressing means, hung on the suspended sling. Fig. 2, is a side elevation, showing the mold with the ingot tiltably suspended on the sling in position to remove the bottom. Fig. 3, is a similar view, showing the mold suspended on the sling, the latter being connected to the compressing levers which now act as ejectors for forcing the ingot out of the mold. Fig. 4, is a horizontal section on the line 4—4 on Fig. 3. Fig. 5, is a top plan view of the mold and the compressing devices. Fig. 6, is a detail view of the sling.

In carrying out my invention, I employed a mold body 1, having the usual external shape and provided with a tapering bore 10, the upper or small end of which terminates in a contracted or neck portion 11 that joins with the reduced throat or pouring opening 12, which, as shown, is square in cross section but may be of any other desired shape. The bottom of the mold is open and the said bottom is formed with a shallow pendent flange or seat 12^b^, that engages the solid bottom piece 13, which, when fitted in place, is firmly held against the seat 12^b^ by the clamp bolts 14 that pass up through the opposite edges of the bottom piece 13 and the lateral base flanges 12^a^ formed on the lower end of the mold body, said bolts 14 being secured by the nuts 15, as shown. By providing the seat portion 12^b^, space 16 is provided between the bottom 14 and the lower end of the mold body for holding packing clay to prevent any outflow of the metal.

At the upper end, the mold body 1 has a transverse socket 16^a^ that bisects the pouring opening, and in the opposite ends of which are mounted the compressing devices, consisting of the short links 20—20 pivotally mounted on the cross bolts 21—21, detachably fitted in the upper end of the mold to cross the socket 16^a^. The links 20 are of sufficient length to extend above the upper end of the mold and to each set of said links 20 is fulcrumed a combined compressing and ejecting lever 30, each of which consists of a long arm 31 having a transverse aperture 32 at the outer end and an inwardly bent cam or crank like end 33, said end 33 being so formed that when the levers are at their operative position, the said ends project down into the pouring opening of the mold.

By reason of the peculiar connection and construction of the compression levers and links, they can be readily swung back out of the way, to the position indicated in dotted lines in Fig. 3 during the pouring of the metal.

40 designates a presser or follower block, which is placed on the upper end of the ingot and against which the levers exert pressure during the operation of cooling and setting the ingot.

50 designates a trunnion band, comprising two ⊓ shaped members, each of which has a trunnion stud 51 and their ends are angled and apertured to receive the clamping nuts and bolts as shown.

The sling or mold suspension means, the construction of which is shown in detail in Fig. 6, consists of a cross bar 60 having a central pivoted hanger 61 and pendent hangers 62—62, each of which supports a rod 63, and each rod carries a grapple 64 swivelly connected thereto by the link 65, and formed with a hook 65^a for engaging the apertured ends of the compressing levers and with transverse apertures 66 for engaging the stud or fulcrum heads of the trunnion band.

The manner in which my invention is used and its advantages is best explained as follows: The detachable bottom being in place and the compressing levers thrown back as shown in dotted lines on Fig. 3 the molten steel is poured from the ladle into the mold or crucible, which, in practice, is filled to within six inches of the top of the small end thereof. As the small end cools and sets quicker than the remainder, the presser block is applied while the bulk of the cast is still in a molten state. The compressing levers and the sling are then adjusted, and then by the aid of the power crane, the mold or crucible with the ingot is lifted and the sling hung upon a rack or other support indicated by x in the drawing, where it remains during the cooling process, thus utilizing the weight of the crucible and the ingot, for acting on the compressing levers for compressing the ingot, which effects a powerful and continuous pressure on the ingot during the time it is congealing in the mold, which expels all the gases from the ingot and practically reduces the danger of blow holes remaining in the finished product to the minimum, and since the bore of the mold is tapering, prevents the steel from binding on the walls of the crucible or mold while shrinking during the cooling process. After the ingot is cooled and set, the crucible or mold is lowered to the floor, when the sling is disconnected from the compressing levers and hooked on to the trunnion frame, when the crane is actuated to lift the mass sufficient to permit of turning the mold to allow for removing the bottom, when it is again lowered to the floor. The sling is now again connected to the compressing levers, and the mass is again raised by the crane, which now causes the lever devices to act as a means for ejecting or starting the ingot from the mold.

By reason of casting the metal through the small end of the mold and holding the mass within the mold while a powerful pressure is applied to the small end of the ingot, an ingot perfect its entire length is produced, thereby effecting a great saving of steel, as the small end will be practically free of blow holes and hence need not be cut off and wasted as is usually necessary in casting ingots by the ordinary methods now employed.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. A means for forming ingots, comprising a closed bottom mold, mechanism for engaging the mold and lifting the same, and compressing devices operated by the weight of the mold and the ingot for compressing the ingot within the mold.

2. A means for forming ingots, comprising a mold, a detachable bottom therefor, mechanism for lifting the mold, and compressing devices operated by the weight of the mold and the ingot adapted to engage the top of the ingot and compress the same while the mold bottom is on, and which act to eject the ingot when the bottom is removed.

3. A means for forming ingots, which comprises a mold open at the top, a bottom therefor detachably connected to the mold, compressing devices for engaging the top of the ingot, lifting devices for detachably connecting with the said compressing devices and arranged to transmit the weight of the mold and ingot to the said compressing devices, and trunnions on the mold substantially midway the ends thereof adapted to detachably connect with the aforesaid lifting devices when they are disconnected from the compression devices, for the purposes described.

4. In an ingot forming means of the character described, in combination with the mold having a transverse socket in its upper end; of oppositely disposed links pivotally mounted in the said socket, levers pivotally mounted on said links, said levers having apertured outer ends and their inner ends formed with cam like portions, a presser block movable in the bore of the mold with which the cam portion engages and a sling having hook portions for engaging the apertured ends of the said levers, as set forth.

5. In an ingot forming means of the character described, the combination with the mold having a transverse socket in its upper end; of oppositely disposed links pivotally mounted in the said socket and adapted to swing outward over the edges of the mold, levers pivotally mounted on the said links, said levers having outwardly extending portions and their inner ends formed with cam like portions adapted to extend down into the bore of the mold and means for applying pressure to the levers, for the purposes stated.

FRANCIS McMAHON.

Witnesses:
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