

No. 735,795.

PATENTED AUG. 11, 1903.

W. H. MORSE.
MECHANISM FOR STRIPPING INGOTS FROM MOLDS.

APPLICATION FILED NOV. 8, 1901.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.

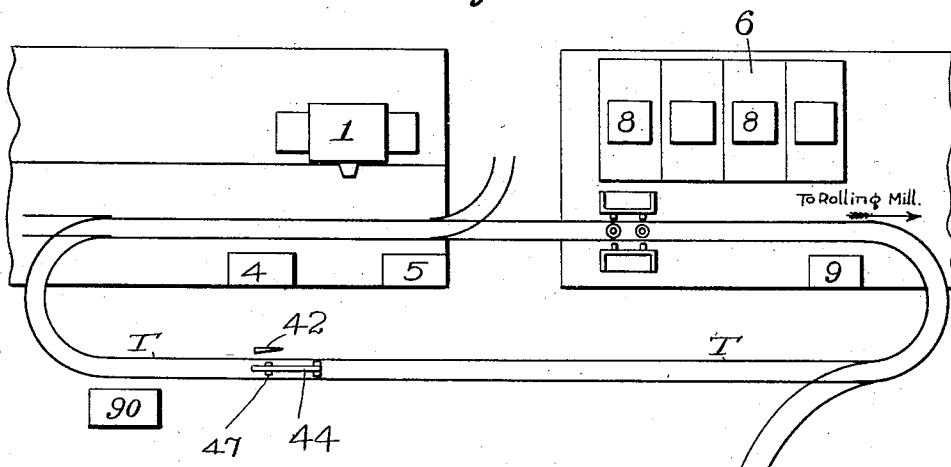


Fig. 3.

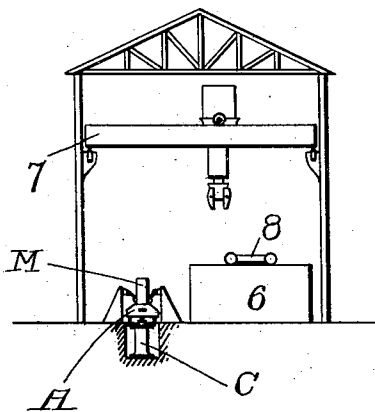
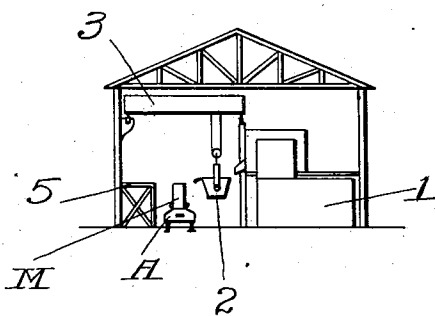


Fig. 2.



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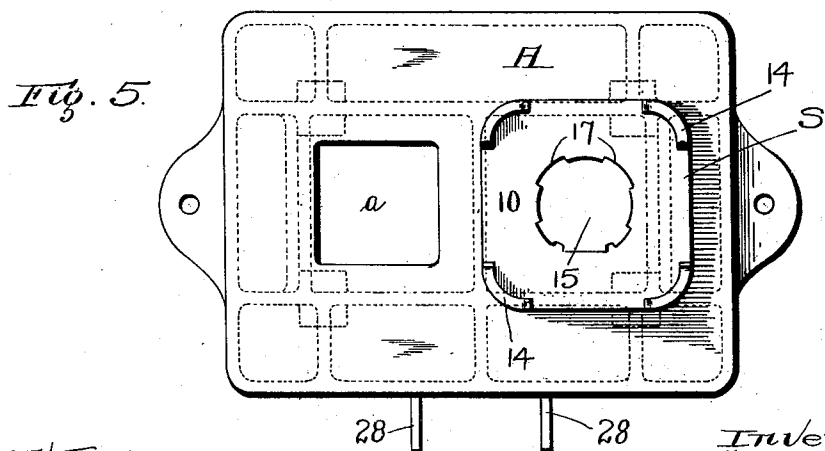
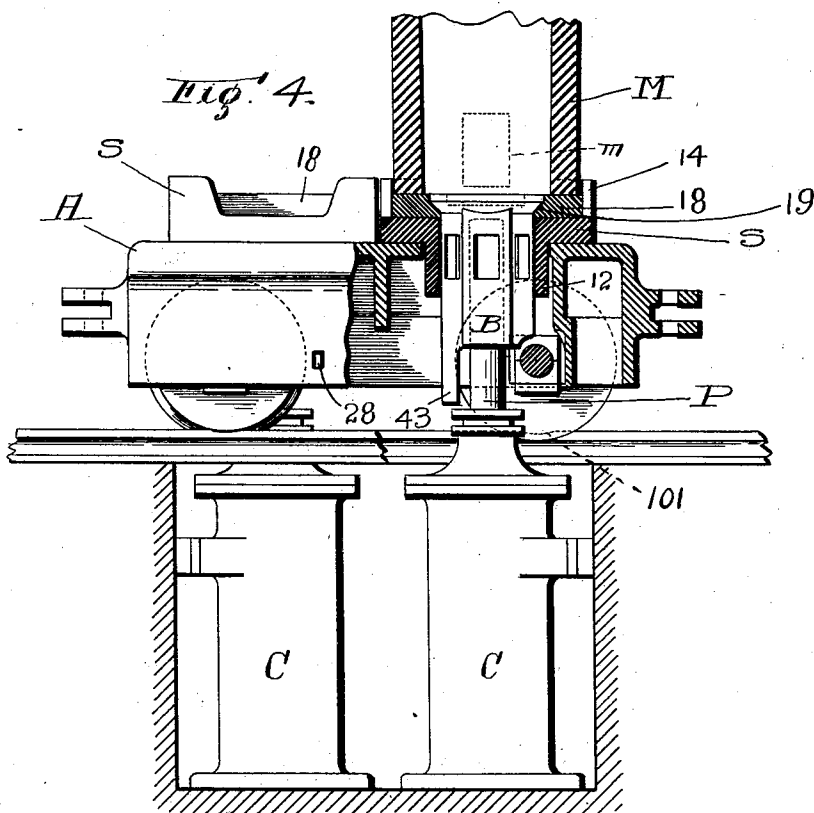
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4 SHEETS—SHEET 2.



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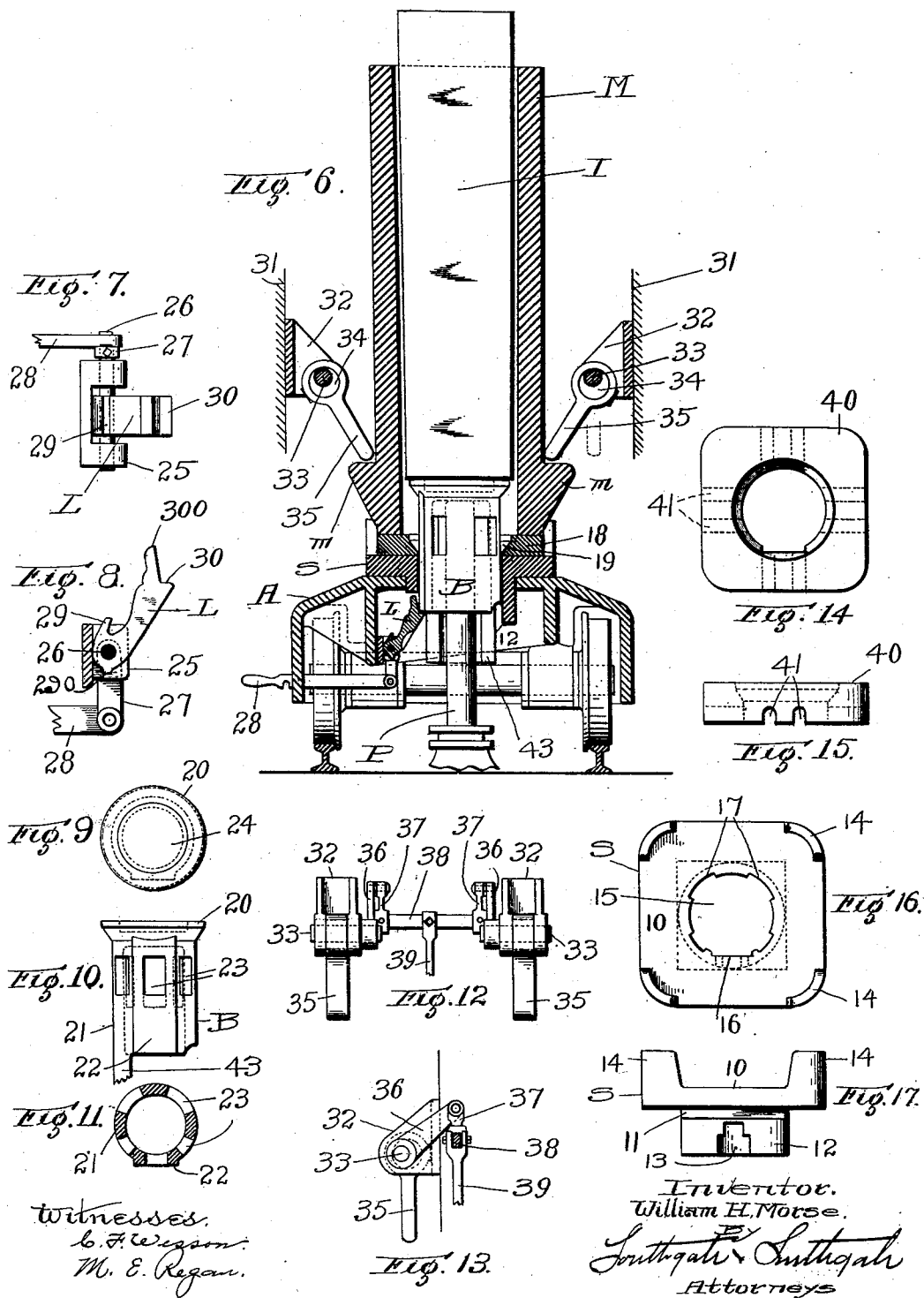
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NO MODEL.

4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

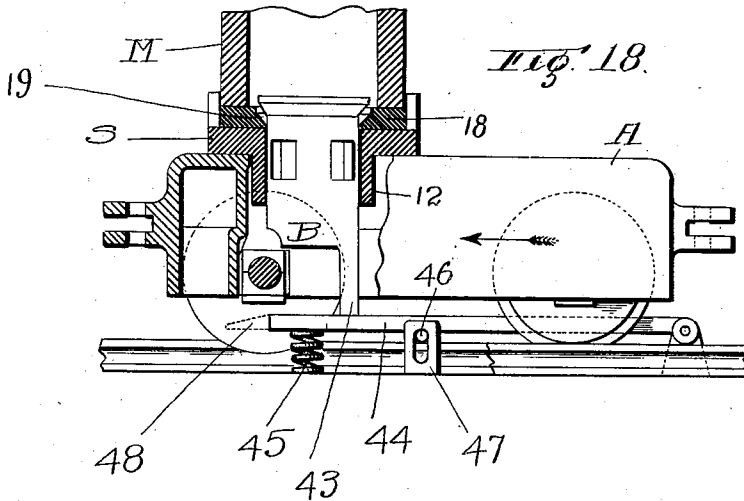


Fig. 19.

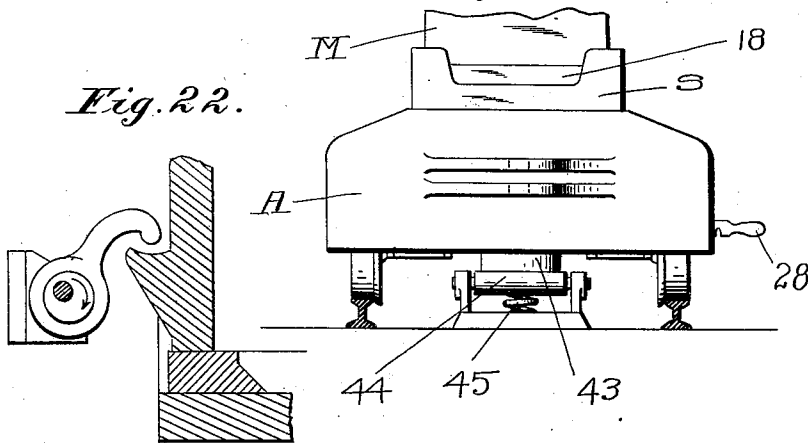


Fig. 20.

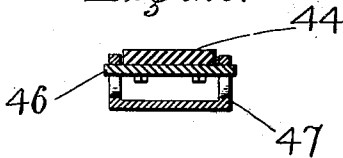
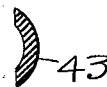


Fig. 21.



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UNITED STATES PATENT OFFICE.

WILLIAM H. MORSE, OF WORCESTER, MASSACHUSETTS.

MECHANISM FOR STRIPPING INGOTS FROM MOLDS.

SPECIFICATION forming part of Letters Patent No. 735,795, dated August 11, 1903.

Application filed November 8, 1901. Serial No. 81,571. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. MORSE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Mechanism for Stripping Ingots from Molds, of which the following is a specification.

In the manufacture of Bessemer or open-hearth steel the ingots ordinarily are cast in tapered molds which are arranged with their small end uppermost. These molds are usually mounted upon cars, and after the ingots have sufficiently solidified each mold is lifted clear of the hot ingot. This way of stripping the molds from the ingots is objectionable for several reasons, among which may be noted that it necessitates the handling of the molds separately from the car, with the consequent wear and tear on the molds and loss of time, as the progress of the cars from the steel-mill and return cannot be absolutely continuous, that an expensive stripper-crane and superstructure must be installed and maintained for intermittent service, and that owing to the large floor-space necessary for these operations considerable time must elapse before the hot ingots are placed in the heating-furnace. To overcome these and other difficulties, I have invented a new and improved apparatus, which is constructed in its principal points as follows: Each mold is arranged with its large end uppermost and is provided with a movable bottom. This bottom preferably has ventilating-apertures through its base. After the casting operation the car carrying the molds is moved into position over a stripping means, which can operate up through the bottom of the car to lift the movable bottom, and thus raise the ingot in the mold to strip or free the same therefrom. Means are provided for holding the mold and the car down to resist the upward thrust of the stripping means. Means preferably are also provided for holding the movable bottom in its raised position after the withdrawal of the stripping means. The ingot is thus held in its raised position partly projecting from the mold. The ingot can now be removed by the furnace-crane or other suitable means and placed in the heating-furnace, or if the car is not in a conven-

ient position for this operation the same can be moved to the proper position.

The means for holding the movable bottom in its raised position accomplishes two functions. First, it supports the ingot until it can be removed by the crane, and, second, as the lifting of the bottom uncovers the ventilating-openings a continuous stream of air will flow up through the mold immediately after the ingot has been lifted, and this circulation will continue after the ingot has been removed to cool the mold properly for the next casting operation. As the pressure exerted by the stripping means is applied to the coldest end of the ingot and is evenly distributed by the movable bottom, there is much less danger of making the ingot "bleed" by fracturing the end thereof as compared with the common practice, and as the greater part of the ingot is protected by the mold until removed to the heating-furnace the ingots arrive at the heating-furnace in the hottest possible condition.

Preferably two molds are mounted on each car and the ingots simultaneously manipulated and stripped at one time. After the ingots have been removed the car is moved around and the molds swept out and prepared for the next casting operation.

Means are provided so that after the molds are cleaned out and cooled the means which holds the movable bottom of each mold in raised position will be released and each bottom allowed to drop to close the mold.

A buffer mechanism is preferably provided to allow each movable bottom to come easily to its seat.

The invention further consists of certain improved details of construction in the mechanism above described, which will be more fully hereinafter pointed out, and particularized in the claims.

The accompanying four sheets of drawings, forming part of this application, illustrate the best form of apparatus now known to me for practicing the invention.

Referring to said drawings, Figure 1 is a diagrammatic view illustrating in outline a plant arranged for practicing my invention. Fig. 2 is a sectional view through the steel-mill. Fig. 3 is a sectional view through the building in which the heating-furnace is ar-

ranged. Fig. 4 is a side elevation, partly in section, of my improved stripping apparatus. Fig. 5 is a plan view of the car with one of the parts I term a "stool" placed in position thereon. Fig. 6 is a cross-sectional view through one of the molds, illustrating the stripping action. Fig. 7 is a plan, and Fig. 8 a side elevation, of a part I term the "latch." Fig. 9 is a plan, and Fig. 10 is a side elevation, and Fig. 11 is a sectional view, of a part I term the "movable bottom." Fig. 12 is a rear, and Fig. 13 an end elevation, of the mechanism for clamping the mold in position. Fig. 14 is a plan, and Fig. 15 a side view, of a modified form of a part I term the "stool-face." Fig. 16 is a plan, and Fig. 17 a side elevation, of a part I term the "stool." Fig. 18 is a side elevation, partly in section, illustrating the action of the buffer mechanism. Fig. 19 is an end view of the same. Fig. 20 is a sectional view through the buffer mechanism, and Fig. 21 is a sectional view of the lug on the movable bottom which is arranged to cooperate with the buffer mechanism. Fig. 22 is a side elevation of a modified form of clamping-arm.

Referring to said drawings and in detail, 1 designates an open-hearth or Bessemer-steel furnace. These furnaces are usually arranged in series, one being shown for the purpose of illustration. The molten metal from the same is poured into a large ladle 2, which is manipulated by a crane 3. The car hereinafter described, which carries the molds, is brought into position, and the hot metal is poured from the ladle into the molds carried thereby.

4 designates a platform on which the operators stand who control the pouring, and 5 a platform on which the operator stands who removes the caps which are placed on top of the molds in the usual manner, if that practice is followed.

Suitable tracks T are arranged for the ingot-cars to travel on.

To follow the operation of my improved stripping means, the detailed construction of the car and such means will now be described.

A designates the car, which is usually made of a size to carry two molds. The body of the car is provided with square holes *a*. After the ingots are cast in the molds the car is moved to a position over the stripping apparatus and "spotted" in such position. This spotting or accurate positioning of the car is usually done by providing the rails with small recesses or notches 101, so that the wheels will drop therein and hold the car in accurate position.

The stripping means consists of a mechanism for raising the ingot vertically. One form of this mechanism which may be employed to good advantage consists of two cylinders C C, in which are arranged pistons P P. These pistons are operated or controlled by any of the usual hydraulic mechanisms employed for the purpose of actuating pistons. While the hydraulic form of apparatus is

preferred, of course mechanical or electrically-operating rack and pinion or other mechanism can be employed to good advantage.

M designates one of the molds. The mold is tapered and is arranged on the car with its large end uppermost. The mold has lugs *m m* cast thereon to afford steps or projections for the clamps hereinafter described. The mold may also be provided with the usual lugs to aid in handling the same in making repairs and with the usual lugs which are commonly employed for holding the caps in position, it not being necessary to show these parts in this case.

I designates the ingot.

S designates a part I term the "stool" or "base," which part forms a support for the mold. This base consists of a plate 10, having a square projection 11, shaped to fit into one of the holes *a* in the car-body. Projecting from this square projection is a hollow cylindrical section 12, which is notched or cut away, as at 13, to allow the latch to operate therethrough. The stool is provided with corners 14 for guiding and holding the mold in position. The plate 10 has a hole 15 of peculiar shape—that is, this hole has an enlargement or key-seat 16 and grooves 17. Fitting on top of the stool is a stool-face 18, which has a cylindrical hole with a seating edge 19.

B designates a part I term the "movable bottom." The same consists of a plate or valve 20, projecting from which is a hollow cylinder 21. This cylinder has a key 22 formed thereon and has slots 23 cut through the shell thereof. This cylindrical projection is adapted to fit into the hole in the stool, the key 22 thereof engaging the key-seat 16 of the stool to keep the bottom B from turning. The bottom is provided with a face 24, covering the whole or part of the upper surface of the movable bottom. This piece 24 is arranged so that it can be easily removed. This construction is adopted so as to provide a means for repairing that part of the movable bottom which receives the impact or wash of the stream of molten metal.

L designates a latch. The latch is arranged in a bracket 25, secured in the inside of the car, as shown. This bracket has a shaft 26 journaled therein, to which said latch is secured. A lever 27 is also secured on said shaft and is connected to an operating-handle 28. Said latch is provided with an ear 29, arranged so as to prevent the latch from swinging back so far that it will not fall by gravity toward the movable bottom and is also provided with an engaging ear 30 and a projecting ear 300, the construction being such that when the latch engages under the movable bottom the ear 30 will engage under the same and the ear 300 will engage the bottom laterally, so that the pressure will come on the shaft 26. An additional ear 290 is provided to limit the motion in the other direction. This latch is arranged in position to

bear on the key or flat portion 22 of the movable bottom. I contemplate in some instances using a plurality of latches.

The previous description applies to one mold, and the other mold is a duplicate thereof.

A clamping mechanism is provided for holding the molds and the car against the upward thrust of the stripping means. This clamping mechanism consists of supports 31 31, which may be I-beams, brackets, or part of the mill structure.

A clamping mechanism is preferably provided for each side of the molds, and each of said clamping mechanisms is constructed as follows: Brackets 32 32 are secured to the support 31. Journaled in each of said brackets is a short shaft 33. Fitted on each of said shafts is a bushing 34, each shaft 33 being eccentrically arranged in said bushing and said bushings being rigidly held on said shaft. Fitting on each of said bushings is a locking-arm 35. Secured on the end of each of the shafts 33 is a lever 36. Projecting from each lever 36 is a link 37, which links are connected by a rod 38, depending from which is an operating-rod 39.

The stripping operation in connection with one mold will now be described, it being understood that the operation may be the same and simultaneous in other molds and that the same takes place after the ingots are cast and after the car is brought to accurate position over the stripping mechanism, as before described. The rod 39 of each clamping mechanism is now pulled down. This will turn the shaft 33 and will swing the locking-arms 35 over against the sides of the mold above the lugs *m*, as the locking-arms are purposely made to fit so tightly on the eccentric bushings 34 that the former will rotate with these bushings as if rigidly attached to them until their rotation is in some way arrested. When the locking-arms strike on the sides of the molds, the continued rotation of the shafts 33 will cause the eccentric bushings to revolve in the locking-arms, forcing the same downward with great pressure against said lugs *m*. This will hold the molds and the car rigidly against the upward thrust of the plungers. It is to be understood that I do not confine myself to this method of holding the mold and car down to resist the upward thrust of the stripping means. It would be entirely possible, of course, to fasten the molds permanently to the car and to apply the locking-arms directly to lugs fastened to the car. The rod 38 and the links 37 are loosely secured together and to the levers 36, so that said rod 38 forms an equalizing means, whereby the necessary variations in the movements of the two clamping mechanisms will be obtained. The hydraulic means is then operated so that the plungers will move upwardly under heavy pressure. Each plunger will move into a movable bottom and force the same upward with great pressure. When the movable bot-

tom has been lifted to the position shown in Fig. 6, the latch *L*, which has been resting against the key 22 on said bottom, will move by gravity to the right, as shown in Fig. 6, so that its ear 30 will engage under the movable bottom and hold the same in raised position. The said movable latch is hung so that its center of gravity will be in position to operate in this manner. The upward movement of the movable bottom will lift the ingot vertically and will thus strip and force the same upwardly in the mold. As the large end of the mold is arranged uppermost, the ingot will be moved so that it will be substantially clear of the mold and will be held in this position on the removal of the plunger. The clamping mechanism is then relieved by pushing upward on the operating-rods 39. This upward movement of the rods will turn the eccentric bushings 34 to raise the locking-arms 35 from the lugs *m*, and the continued rotation of said shafts will swing said locking-arms free of the mold. By making the arm 35 in the form of hooks and reversing them the clamping devices can be made to operate by tension instead of by compression. Such a device is shown in Fig. 22. If the car is now in position near a heating-furnace or soaking-pit 6, the ingots can be taken by the furnace-crane 7 and lowered therein, the covers 8 of said furnace being removed for this purpose. From here the ingots are taken to the rolling-mill or other suitable machinery by said crane or other mechanism. If the car is not in the proper position for the crane to manipulate the ingots in this manner, the car can be shifted to such proper position, as the ingots are held by the latch mechanism before described in their partly-raised position. It will be seen that the ingots are protected by the molds until the last minute before they are put into the heating-furnace, and hence they are kept as hot as it is possible. The car is then moved forward and passes a platform 9, at which point it can be swept out or cleaned. As the car moves forward it will be seen that the bottom in each mold is kept in its lifted or raised position, so that there will be a strong circulation of air up through the same by means of the ventilating-orifices before described, and in this way each mold will be quickly cooled and brought to a condition where the casting operation can be repeated, and hence the use of the mechanism made practically continuous.

Each mold is preferably cleaned by being swept or blown out, and as this is done the residue or loose particles which remain in the mold will fall out through the stool by reason of the grooves 17 or will fall out through the hollow bottom through the slots 23. After each mold has sufficiently cooled its handle 28 is pushed in to allow the movable bottom to drop to normal position. This may be done by hand, but is preferably done by the movement of the car. A cam

projection 42 is provided in position, so that the handles 28 will strike on the same as the car passes.

- Each movable bottom B is provided with a
- 5 projection 43 to engage a buffer mechanism which will prevent the movable bottoms from striking with much force on the stool-face. This buffer mechanism consists of an arm 44, mounted on suitable pivots between the
 - 10 tracks, as shown in Fig. 18, and held up by springs 45. The arm 44 is provided with a guiding-piece 46, which works in slotted brackets 47. As each movable bottom is released the projection 45 will strike on the
 - 15 arm 44 and the bottom will be allowed to easily come to its seat. The end of the arm 44 is preferably shaped so as to allow a slight momentum or blow to the bottom as the same seats to insure a tight closing of the mold,
 - 20 but may be tapered off, as at 48, to allow a gradual seating. Each handle 28 is provided with a notch, into which a hook may be inserted if it is desired to control the latch by hand. After the molds have been restored
 - 25 to their normal positions in this way they may be brought opposite a platform 90 and clay-washed or treated in the ordinary ways to make them ready for the next casting operation.
 - 30 The caps which are often placed on the molds are preferably removed just before the stripping action.

- By the foregoing mechanism it will be seen that each mold is practically part of the car
- 35 and is never removed therefrom or from its normal vertical position thereon.

- The foregoing mechanism not only effects a considerable saving in time and furnishes hotter ingots, but it also effects a considerable saving in floor-space, as separate handling of the molds and the use of cooling-racks and a second train of cars are avoided.
- 40

- By the foregoing means the process is practically a continuous one and the mechanism
- 45 can be kept practically in continuous use.

- In some instances I contemplate ventilating the stool-face. This construction is shown in Figs. 14 and 15. With this construction a thick stool-face 40 is provided and holes or
- 50 grooves 41 are formed through the same, so that the air will circulate through the same when the movable bottom is raised. The bottom of the mold is cast or shaped to fit said stool-face and is guided and held in position
 - 55 thereon by the corners 14 of the stool S.

- The stool-face is preferably made a separate casting from the stool proper, as shown, for the purpose of easy manufacture and repair, although it may be made with the stool.
- 60

- The means and apparatus herein described may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.
- 65

- Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—
1. The combination of a car, an ingot-mold

mounted thereon in vertical position, means for raising the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

2. The combination of a tapered ingot-mold arranged in vertical position with its large end uppermost, means for raising the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

3. The combination of a car, a tapered ingot-mold arranged in vertical position thereon, with its large end uppermost, means for raising the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

4. The combination of a car, a tapered ingot-mold arranged in vertical position thereon, with its large end uppermost, means for raising the ingot vertically in the mold so as to project part way out of the same, and means for holding the ingot in this position after the withdrawal of the elevating means.

5. The combination of a car, a tapered ingot-mold arranged in vertical position thereon, with its large end uppermost, means operating from below and up through the car to raise the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

6. The combination of a tapered ingot-mold arranged in vertical position, with its large end uppermost, means for clamping the mold against upward thrust, means for raising the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

7. The combination of a car, a tapered ingot-mold arranged vertically thereon, with its large end uppermost, means for clamping the car and the mold against upward thrust, means operating from below and up through the car to raise the ingot vertically in the mold and means for holding the ingot in its raised position after the withdrawal of the elevating means.

8. A tapered ingot-mold having a movable bottom arranged at its small end, means for raising the movable bottom to strip the ingot from the mold and means for holding the ingot in its raised position within the mold after the withdrawal of the elevating means.

9. The combination of a car, an ingot-mold mounted vertically thereon and having ventilating-orifices near its bottom, connecting with the interior or wash side of the mold, and means for opening said orifices without disturbing the vertical position of the mold on the car, to allow a vertical circulation of air through the mold to cool the same.

10. The combination of a car, an ingot-mold mounted vertically thereon and having ventilating-orifices near its bottom, connecting with the interior or wash side of the mold,

means for opening said orifice and keeping the same open after the ingot has been wholly or partly removed from the mold without disturbing the vertical position of the mold on the car.

11. A tapered ingot-mold having a movable bottom arranged at its small end, means for moving the bottom to strip the ingot from the mold, means for holding the bottom in raised position with the ingot partly projecting from the mold; and a ventilating-orifice to permit a circulation of air through the mold.

12. The combination of the hollow stool, an ingot-mold resting thereon, with its large end uppermost, a movable bottom fitted in said stool, means for elevating said movable bottom in the mold, and means for holding said bottom in its raised position after the withdrawal of the elevating means.

13. The combination of a car, a stool fitted therein, an ingot-mold resting on said stool, and a movable bottom having an extension projecting through said stool and independent of the elevating means.

14. The combination of a stool, an ingot-mold resting thereon, a movable bottom fitted in said stool, means for raising said movable bottom in the mold, and means for holding said bottom in its raised position after the withdrawal of the elevating means.

15. The combination of the stool, an ingot-mold resting thereon, a movable bottom fitted in said stool and having a projection extending through the same, and ventilating-holes in said projection to allow a circulation of air through the mold.

16. The combination of the stool having an irregular-shaped opening, an ingot-mold resting on the stool, and a movable bottom having an extension fitted in the irregular opening in the stool.

17. The combination of the stool having an irregular-shaped opening, an ingot-mold carried by the stool, a movable bottom fitted to the stool and having an extension projecting into the irregular opening in said stool, and slots or openings communicating with the mold whereby a circulation of air is allowed up through the mold, and whereby foreign or waste matter can escape through the bottom of the mold.

18. The combination of a car, a tapered ingot-mold arranged thereon with its large end uppermost, a movable bottom, a latch for holding the bottom in raised position, and means for releasing the latch to allow the bottom to fall back to its original position.

19. The combination of a car, an ingot-mold mounted thereon, lugs on said ingot-mold, clamping means for holding the mold and car against upward thrust, a movable bottom for said mold, means for raising the bottom in the mold, and means for holding the bottom in its raised position after the withdrawal of the elevating means.

20. The combination of a car, a tapered in-

got-mold, arranged thereon with its large end uppermost, a movable bottom for said mold, a latch for holding said movable bottom in its raised position, and an ear projecting from said latch and engaging the lower end of said movable bottom to take the thrust thereof.

21. The combination of the stool, a ventilated stool-face arranged thereon, an ingot-mold supported thereby, and a movable bottom fitted in said stool.

22. The combination of a car, an ingot-mold arranged thereon with its large end uppermost, means for forcing the ingot upwardly in the mold, and means for locking the mold against the upward thrust, consisting of lugs on said mold, locking-arms, and an operating-shaft carrying eccentric bushings fitted in said locking-arms.

23. The combination of the car, an ingot-mold mounted thereon with its large end uppermost, means for forcing the ingot upwardly in the mold, lugs on said mold, and clamping means for engaging said lugs, comprising brackets, shafts fitted in said brackets, eccentric bushings arranged on said shafts, locking-arms fitted on said bushings, levers projecting from said shafts, links depending from said levers, a rod connecting said links, and an operating-rod connecting to said rod.

24. The combination of a car, an ingot-mold arranged thereon, with its large end uppermost, a movable bottom for said mold, means for raising said bottom to strip the ingot from the mold, means for holding the bottom in its raised position, and a cam or projection for releasing this means by the movement of the car.

25. The combination of a car, an ingot-mold arranged thereon, with its large end uppermost, a movable bottom for said mold, means for raising said bottom to strip the ingot from the mold, means for holding the bottom in its raised position, mechanism for releasing this means by the travel of the car, and a buffer mechanism for allowing the bottom to easily seat itself.

26. The combination of a car, an ingot-mold arranged thereon, with its large end uppermost, a movable bottom for said mold, means for raising said bottom to strip the ingot from the mold, means for holding the bottom in its raised position, mechanism for releasing this means by the travel of the car, and a buffer mechanism consisting of a spring-actuated arm having a tapered end for allowing said bottom to properly seat itself.

27. A mold, a mold-bottom, provided with an extension projecting through and so fitting the seat for said bottom as to serve as a guide to the movable bottom in its descent to said seat, and outside means for raising the casting from the mold, said guiding part and said elevating means being independent of one another.

28. The combination of a car, a stool fitted therein, an ingot-mold resting on said stool, and a movable bottom having an extension

projecting through said stool and acting as a guide to said bottom.

29. The combination of a car, a stool fitted therein, an ingot-mold resting on said stool, and a movable bottom having an extension projecting through and so fitting said stool as to guide the movable bottom to a secure seat in its descent from its raised position.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM H. MORSE.

Witnesses:

LOUIS W. SOUTHGATE,
M. E. REGAN.