No. 609,671. Patented Aug. 23, 1898.

F. HARDY.

CASTING APPARATUS.

(Application filed Oct. 11, 1897.)

(No Model.) 4 Sheets—Sheet 1.

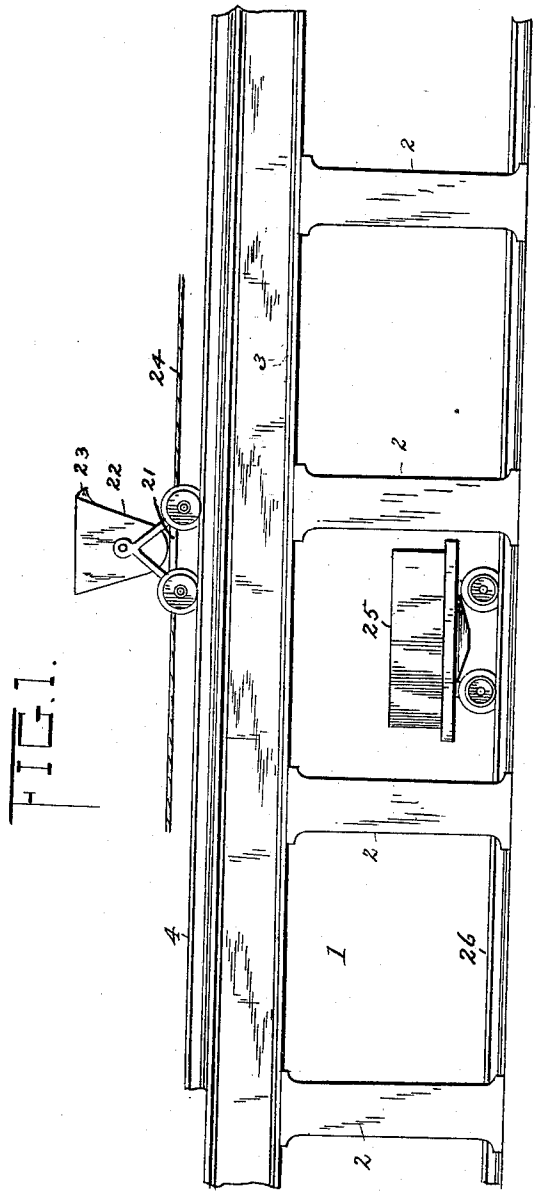



FIG. 1.

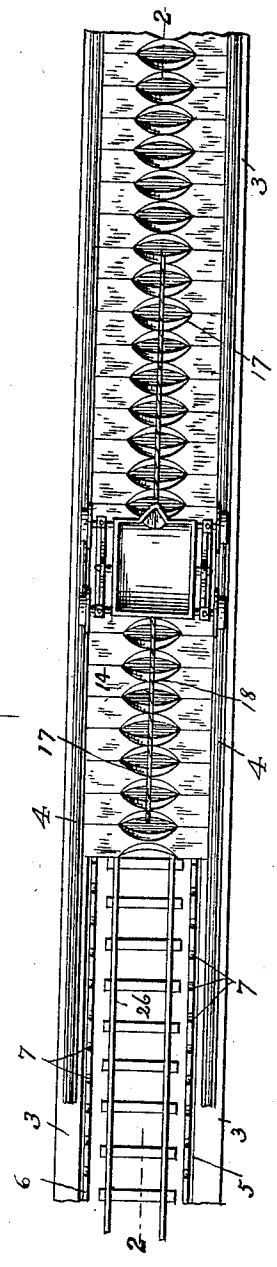



FIG. 2.

WITNESSES

Saml R. Turner

C. B. Hines.

INVENTOR

Frederick Hardy.

By R. H. Rector

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 609,671. Patented Aug. 23, 1898.

# F. HARDY.

## CASTING APPARATUS.

(Application filed Oct. 11, 1897.)

(No Model.) 4 Sheets—Sheet 2.

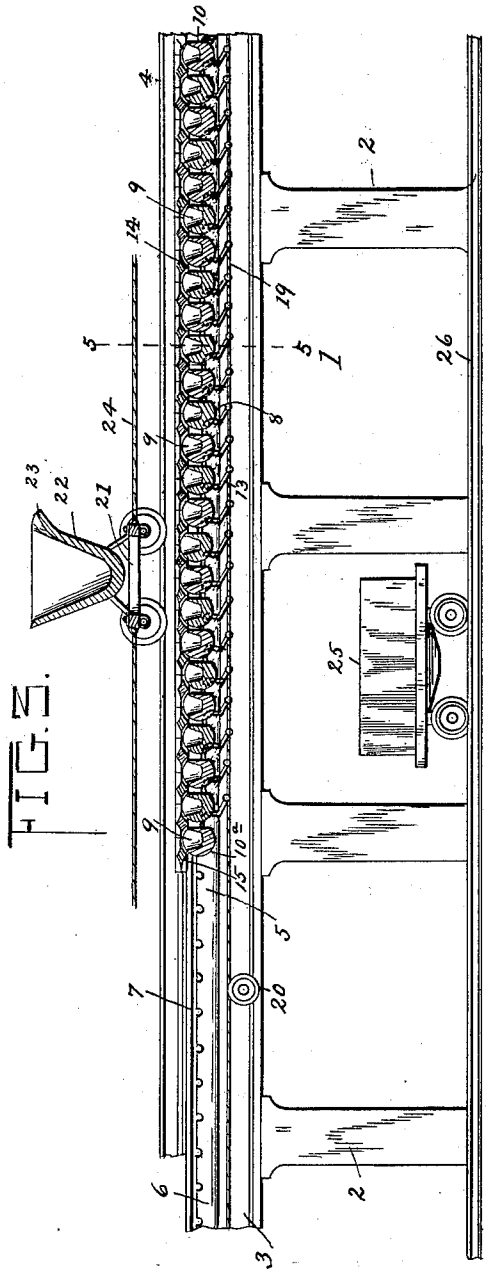


FIG. 3.

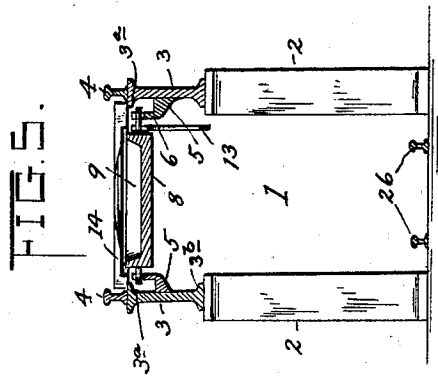


FIG. 5.

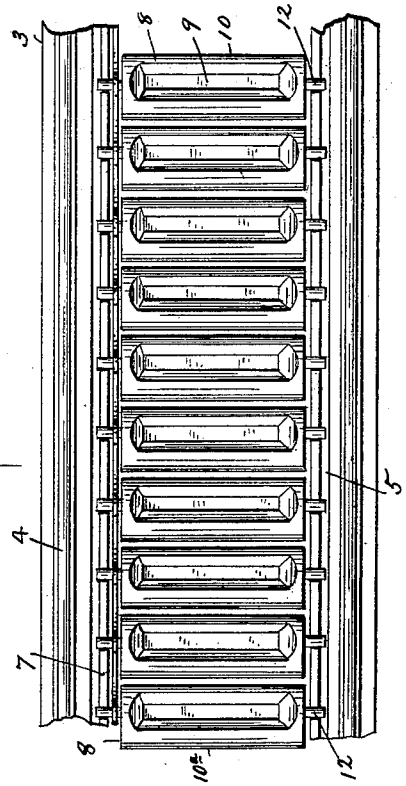


FIG. 4.

WITNESSES

Saml R. Turner

C. B. Hines

INVENTOR

Frederick Hardy.

By R. W. B. Kacey,

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 609,671.

Patented Aug. 23, 1898.

# F. HARDY.

## CASTING APPARATUS.

(Application filed Oct. 11, 1897.)

(No Model.)

4 Sheets—Sheet 3.

FIG. 6.

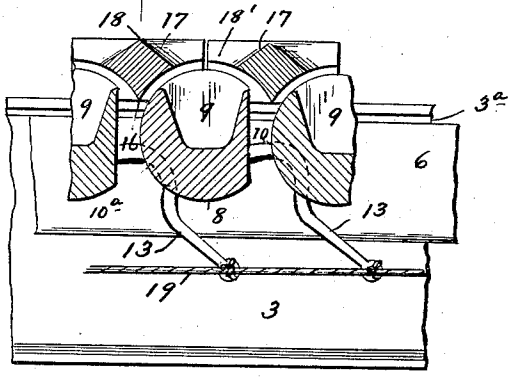



FIG. 7.

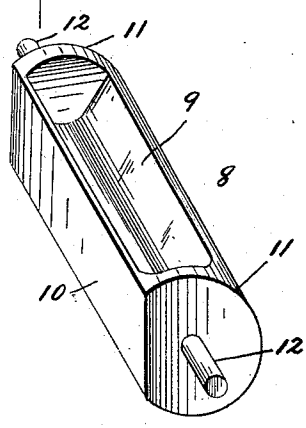



FIG. 8.

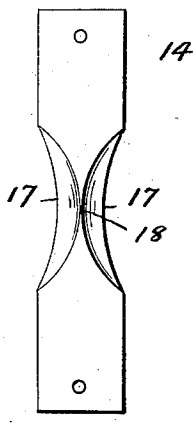



FIG. 9.

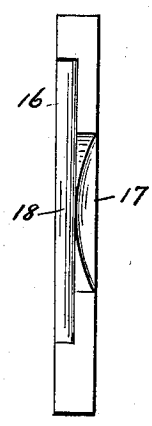
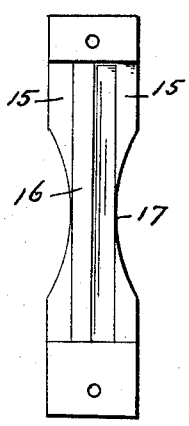



FIG. 10.




WITNESSES

Saml R. Turner

C. B. Stines.

INVENTOR

Frederick Hardy

By Church & Lacey,

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 609,671. Patented Aug. 23, 1898.

F. HARDY.

CASTING APPARATUS.

(Application filed Oct. 11, 1897.)

(No Model.) 4 Sheets—Sheet 4.

FIG. 11.

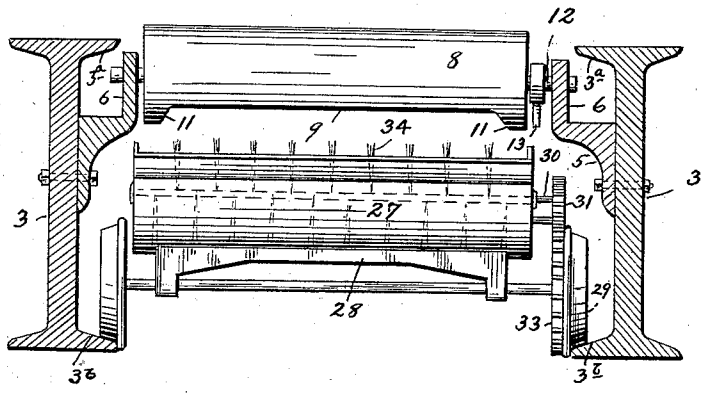
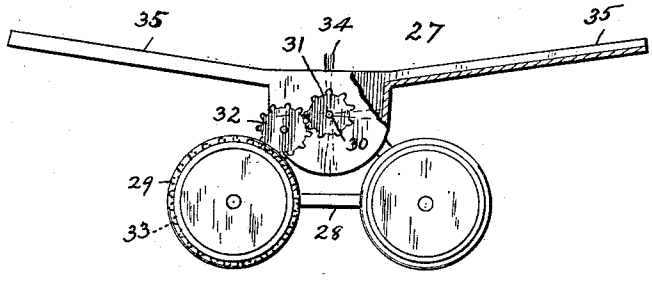



FIG. 12.




WITNESSES

David R. Turner

C. C. Hines

INVENTOR

Frederick Hardy.

By R. M. & R. Lacey,

Attorney's.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

FREDERICK HARDY, OF BIRMINGHAM, ALABAMA, ASSIGNOR OF ONE-HALF TO JOHN H. MEANS, OF SAME PLACE.

## CASTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 609,671, dated August 23, 1898.

Application filed October 11, 1897. Serial No. 654,771. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK HARDY, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Casting Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in apparatus for casting metal into pigs, its object being to simplify the construction of such apparatus and to provide an improved apparatus by means of which the operation of casting on a large scale may be simplified, the amount of castings produced within a given period increased, and the cost of production greatly reduced.

With this and other objects in view the invention consists in the novel constructions, combinations, and arrangements of parts hereinafter more fully described, and particularly set forth in the appended claims.

In the accompanying drawings hereto annexed and forming part of this specification, Figure 1 is a side elevational view of a casting apparatus embodying my invention; Fig. 2, a top plan view showing some of the molds and guide-plates removed; Fig. 3, a longitudinal sectional view on line 2 2 of Fig. 2; Fig. 4, a plan view similar to Fig. 2, but showing the metal guide-plates removed to expose the molds; Fig. 5, a cross-sectional view on line 5 5 of Fig. 3. Fig. 6 is an enlarged detail sectional view showing the arrangement of three molds and two adjoining guide-plates. Fig. 7 is a detail perspective view of one of the molds. Figs. 8, 9, and 10 are detail views of a metal guide-plate, showing top plan, side elevational, and bottom plan views of same. Fig. 11 is a cross-section of the I-beams and mold-supporting plates, showing the refractory-material-applying device in position to spray refractory material upon the inverted molds; and Fig. 12 is a side elevational view of the refractory-material-applying device with parts broken away to expose the construction.

Referring now more particularly to the accompanying drawings, 1 represents a trestle comprising in its construction two parallel series of pillars or columns 2, rising from the ground on a base of masonry, two parallel longitudinal girders or I-beams 3, one mounted on each of said pillars or columns, and track-rails 4, resting on and suitably secured to said girders or beams. This trestle will preferably be located in a cast-house sufficiently close to the furnace or furnaces to facilitate the operation of casting, and may be made of any suitable length, according to the capacity of plant desired.

Bolted or otherwise suitably secured to each I-beam is a longitudinal mold-supporting plate or bar 5, formed at its upper end with a vertical flange 6, which is disposed in close relation to but out of vertical alinement with and below the inner web $3^a$ of said I-beam. These vertical flanges of the mold-supporting plates are provided at proper intervals with alined series of recesses or notches 7 to receive the trunnions of the molds, as will be hereinafter described.

The molds 8 are nearly cylindrical in cross-section, the circular outline being broken by the metal-receiving opening 9 and a flat side 10. The upper edges 11 of the molds are curved, as shown, and project above the sides thereof, and the side $10^a$ is rounded and thickened, so that this side will serve as a counterbalance to cause the mold to normally assume a horizontal position when upright to receive the molten metal or when inverted to dump the pig. Each mold is provided at its opposite ends with trunnions 12, to one of which is secured a crank-arm 13, and said trunnions are adapted to fit in two alined notches or recesses 7 in the mold-supporting plates 5, so that the mold will extend transversely of the trestle, as shown. These molds may extend from end to end of the trestle, so as to form a continuous stationary mold-bed.

Transverse metal guide or deflecting plates 14 are arranged above the molds, with their ends resting upon the upper inner webs $3^a$ of the side girders or I-beams. These plates are formed on their under side with two open-sided longitudinal recesses 15, corresponding

in length to the molds and separated by an intermediate rib 16. The upper surface of each guide-plate is also provided with recesses 17 at each side thereof and is beveled from the outer side edges to the center, so as to form a sharp guiding ridge 18, and when two of these guide-plates are arranged with their side edges abutting it will be seen that the two corresponding recesses form in conjunction an elongated pouring-opening 18′, through which the molten metal may be poured into the mold, as clearly shown in Fig. 6, the metal being guided by the said beveled portions and "shed" and divided by the guiding-ridge 18. Clinging or cold setting of the metal to the guide-plate is thus prevented, as there are no surfaces exposed on which the metal can lodge.

In practice and as shown in the drawings each guide-plate is arranged immediately in line above the adjoining sides of two contiguous molds, with its recesses 15 inclosing one-half of each mold, said molds being separated by the ribs 16, so that the pouring-opening 18′, formed by the recesses 17 of two adjoining plates, will be above the mold-opening 9. By this construction it will be seen that the entire bed of molds will be covered at the top by the guide-plates, and that therefore all liability of loss or wastage of the molten metal by splashing will be avoided.

In addition to their function as guides or deflectors for the metal and shields to inclose the molds the plates 14 form a platform along the trestle, on which an attendant may walk to inspect or remove any one of the molds or to repair the trestle.

The crank-arms 13 of all the molds may be connected by an endless cable 19, passed over pulleys 20 and connected with suitable driving mechanism, so that said molds may be inverted simultaneously to dump the pigs and also restored to their normal positions to be refilled.

21 represents a wheeled truck which traverses the rails 4, and mounted on this truck is a tilting ladle 22, having a pouring-lip 23. This truck may be drawn by a cable 24 or a locomotive, and in operation the molten metal from the ladle is poured continuously and successively into the molds, the quantity of metal discharged being regulated by checking its flow and varying the speed of the truck. After the molds have been filled and the metal cooled sufficiently the pigs are dumped into tram-cars 25, running on track-rails 26, arranged between the pillars or columns 2 and below the molds by inverting said molds, as hereinbefore described. While the molds are inverted after dumping the pigs they may be washed or sprayed with puddled clay, graphite, or other suitable refractory material to prevent the metal from adhering to them, and in making "Fortimolite" iron, for which my improved apparatus is peculiarly adapted, the molds may be washed or sprayed with the compound used in this process instead of the clay or graphite. For this purpose I provide a semicylindrical trough or tank 27 to contain the refractory mixture carried by a truck or carriage 28, mounted on wheels 29, which traverse the inner lower webs or flanges $3^b$ of the I-beams 3 below the molds, as shown in Fig. 11. A shaft 30 has bearing in the ends of said trough and has one end projecting exteriorly thereof and carrying a pinion 31, which meshes with a gear-wheel 32, journaled on the end of the trough. This gear-wheel meshes in turn with a toothed master-wheel 33 on one of the wheels 29, whereby when the truck is moved said shaft will be revolved. The shaft is also provided with paddles or brushes 34 on the interior of the casing, which serve to stir up the refractory mixture and throw or splash up the same against the inverted molds when the carriage is moved, the water being evaporated by the heated molds, so as to leave a coating of the solid material adhering thereto. The thickness of this coating can by this method be readily controlled. This thickness will depend upon the fluidity of the mixture, and this device will apply a mixture of any consistency from one having the fluidity of water to one that would be too thick or stiff to be pumped through a sprinkler.

In order to catch the drippings of surplus refractory material from the molds, I provide the trough with upwardly-inclined flanged plates 35, projecting from the side edges thereof, down which the drippings run back into the trough, as will be readily understood.

The carriage 28 may be moved by an endless driven cable or other suitable means.

From the above description, taken in connection with the accompanying drawings, the operation of my improved casting apparatus and its advantages will be readily understood by those skilled in the art to which it appertains.

I desire it understood that I do not limit my invention to the specific construction and arrangement of parts herein shown and described, but reserve to myself the right to make such changes and modifications as fairly fall within the spirit and scope of my invention.

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

1. In casting apparatus, the combination of a pair of track-rails, fixed bearings mounted on the inner sides of the rails and a series of transversely-arranged molds mounted to tilt in said bearings, a truck adapted to traverse said rails, and a ladle carried by the truck adapted to deliver a continuous stream of molten metal to the molds as the truck travels over the same, substantially as described.

2. In casting apparatus, the combination of a pair of parallel beams 3, track-rails 4 mounted thereon, a bearing-plate 5 secured on the inner side of each beam below the rails, a series of molds mounted to tilt in said bear-

ing-plates, a truck adapted to traverse said rails, and a tilting ladle carried by the truck adapted to deliver a continuous stream of molten metal to the molds as the truck travels over the same, substantially as described.

3. In casting apparatus, the combination of a pair of parallel beams 3, track-rails 4 mounted thereon, a bearing-plate 5 secured on the inner side of each beam below the rails, a series of molds each provided with trunnions journaled in said bearing-plates and a crank-arm, a connection between the crank-arms of all the molds, and a metal-reservoir adapted to traverse said rails, substantially as described.

4. In casting apparatus, the combination of the I-beams 3 carrying track-rails 4, the supporting-plates 5 secured on the inner side of the beams and provided with vertical flanges 6 having bearings, molds provided with trunnions journaled in said bearings, and a metal-reservoir adapted to traverse said track-rails, substantially as described.

5. In casting apparatus, the combination of the I-beams 3 carrying the track-rails 4, the supporting-plates 5 secured on the inner sides of the beams and provided with vertical flanges 6 having bearings, molds provided with trunnions journaled in said bearings, transverse guide or deflecting plates resting on said beams above the molds, and a metal-reservoir adapted to traverse said track-rails, substantially as described.

6. In casting apparatus, the combination of a pair of parallel supporting-beams carrying fixed bearings arranged on the inner sides thereof, a continuous series of molds between said beams and mounted to tilt in said bearings, track-rails mounted on said beams, guide or deflecting plates resting upon the beams and supported thereby independent of the molds so as to leave the latter free to tilt, and a metal-reservoir constructed and arranged to traverse said trackway, substantially as described.

7. In casting apparatus, the combination of supporting-beams carrying fixed bearings, a series of molds extending transversely between the beams and mounted to tilt in said bearings, and a series of guide or deflector plates arranged above said molds and forming a platform between the beams, said plates being supported independent of the molds with their side edges abutting and provided with recesses, whereby the recesses of two adjoining guide-plates form a feed-opening for admission of metal into a mold below the same, substantially as described.

8. In casting apparatus, the combination of a series of molds, and guide or deflector plates mounted above the same, said plates being formed on their under side with recesses separated by a rib to receive one-half of a mold and on their upper side with side recesses beveled from the center to form a shedding-ridge, whereby the side recesses of two adjoining guide-plates form a feed-opening for entrance of metal into the mold and the bottom recesses a chamber to inclose the upper portion of said mold, substantially as described.

9. In casting apparatus, the combination of I-beams carrying bearings, a series of molds mounted to tilt in said bearings, and a device for applying refractory material to the inverted molds and arranged to traverse the lower webs of the beams below said molds, substantially as described.

10. In casting apparatus, the combination with a stationary bed of molds mounted in bearings to tilt and dump the castings, of a refractory-material-applying device adapted to be moved below said molds and comprising a trough mounted on a carriage, a shaft journaled in the walls of the trough and carrying paddles or blades, and means for driving said shaft.

11. In casting apparatus, the combination with a stationary bed of molds mounted in bearings to tilt and dump the castings, of a refractory-material-applying device adapted to be moved below said molds and comprising a wheeled carriage having one of its wheels provided with a toothed wheel, a trough mounted on said carriage and provided with flanged drip-plates and a shaft journaled in the walls of the trough and carrying at one end a pinion meshing with said toothed wheel and provided on the interior of the trough with paddles or blades, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK HARDY.

Witnesses:
S. E. THOMPSON,
S. D. COLE.