Feb. 17, 1931. H. BLACKWELL 1,792,801

CORE BAR EXTRACTOR

Filed June 5, 1929 2 Sheets-Sheet 1

Fig. 1.

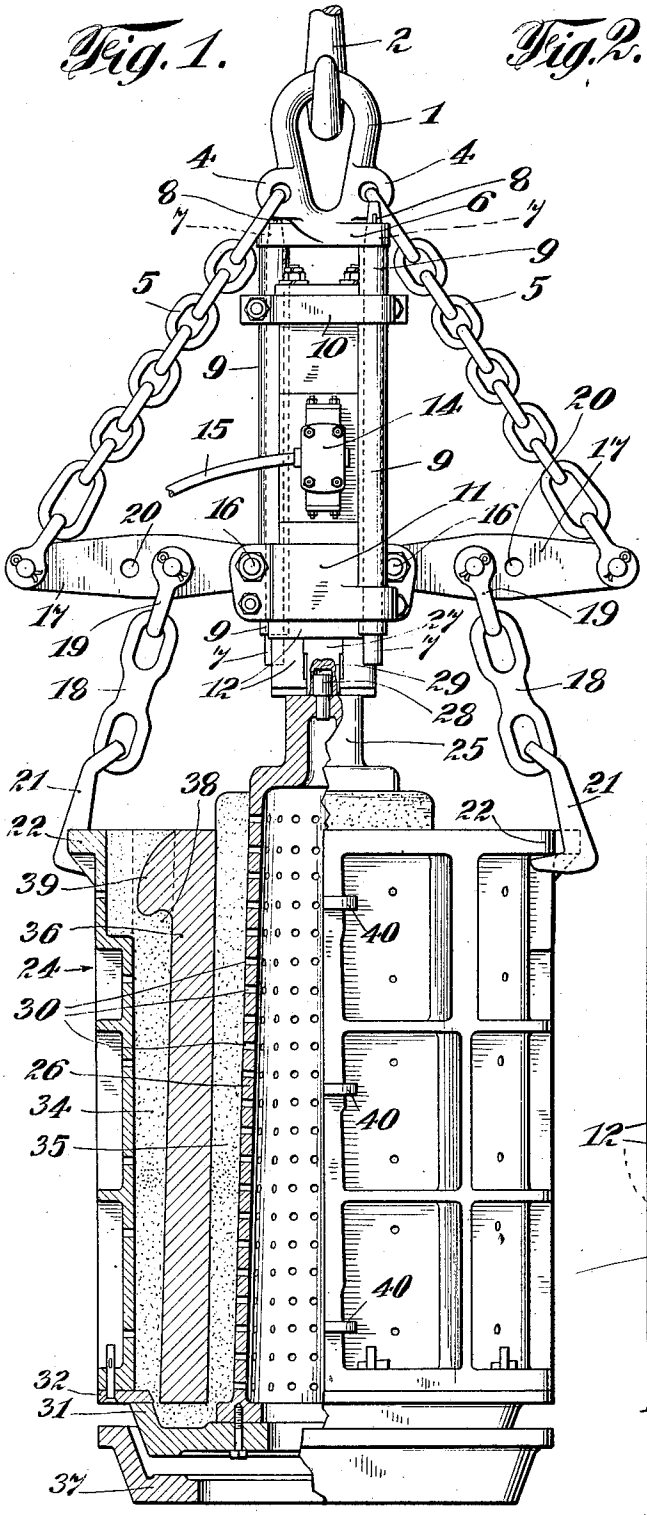
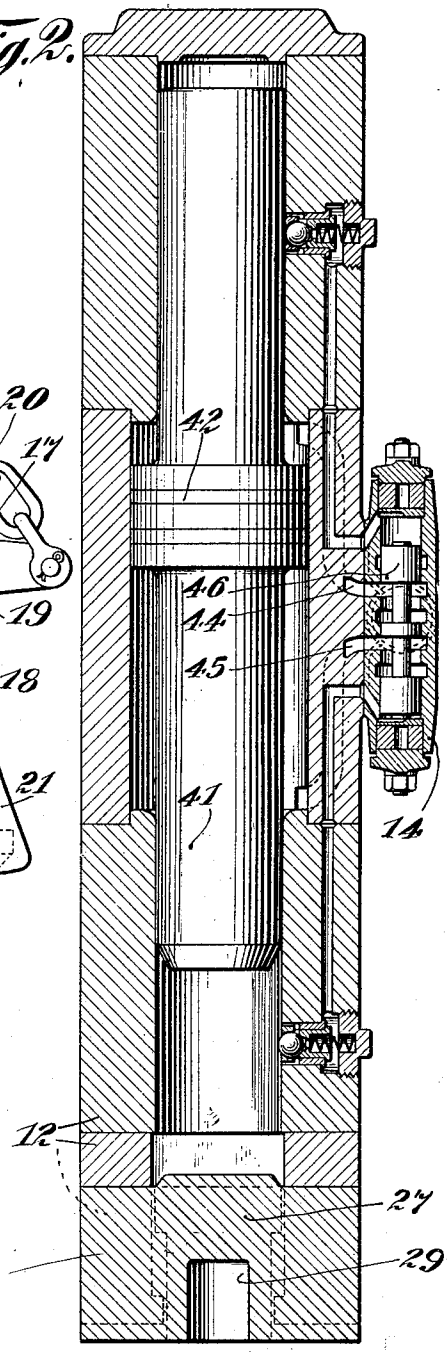


Fig. 2.



INVENTOR
Howard Blackwell
BY
George Ramsey
his ATTORNEY

Feb. 17, 1931. H. BLACKWELL 1,792,801

CORE BAR EXTRACTOR

Filed June 5, 1929 2 Sheets-Sheet 2

Fig. 3.

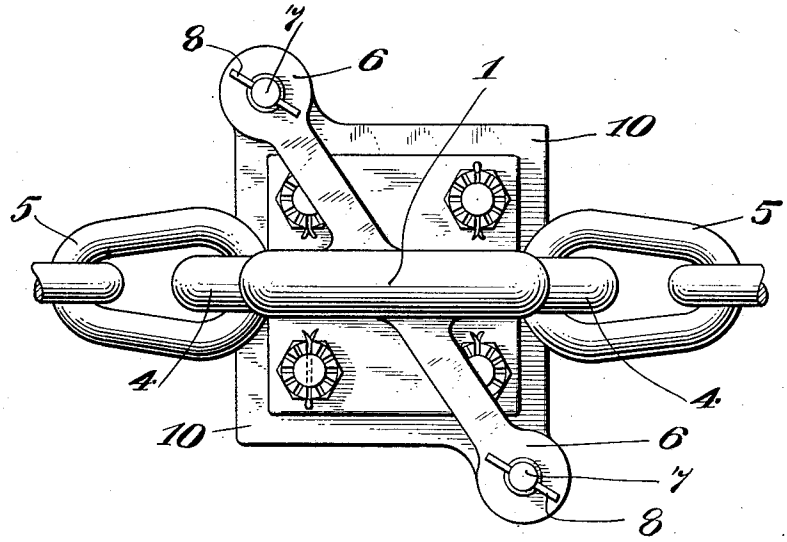
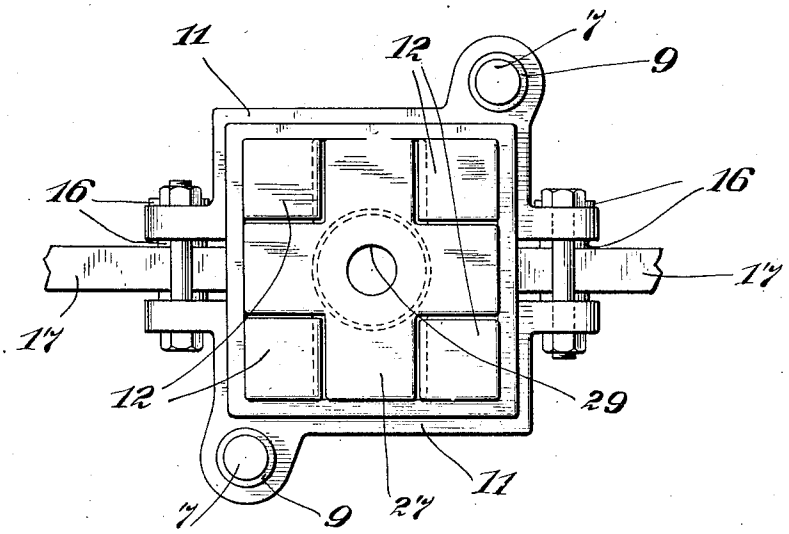


Fig. 4.



INVENTOR
Howard Blackwell
BY
George Ramsey
his ATTORNEY

Patented Feb. 17, 1931 1,792,801

UNITED STATES PATENT OFFICE

HOWARD BLACKWELL, OF HUBBARD, OHIO, ASSIGNOR TO VALLEY MOULD AND IRON CORPORATION, OF HUBBARD, OHIO, A CORPORATION OF NEW YORK

CORE-BAR EXTRACTOR

Application filed June 5, 1929. Serial No. 368,548.

The present invention relates broadly to metallurgy and more especially to an extractor for core bars used in the manufacture of ingot molds.

Ingot molds are cast within a flask having a sand face determining the exterior of the mold and around a core bar which is usually also provided with a sand face to determine the matrix of the mold. Ingot molds are large castings which weigh several tons and frequently are several feet long and in accordance with modern practice, the matrix of these molds often have a relatively small taper. The sand facing around the core bars is compacted tightly to form a relatively hard sand surface. As the molten metal forming the ingot mold is poured into the set-up, this hot metal tends to bake or burn the adjacent sand on the core bar to a substantial degree of hardness. The greatest degree of sand hardness is adjacent the ingot mold and the sand adheres very tightly to the inner surface of the mold. However, the sand also very tightly sticks to the core bar. This is due to several reasons, one of which is that the core bar is usually provided with vent openings into which the sand is forced both during the ramming operation and also during the casting operation of the ingot mold itself. As the molten metal freezes it contracts and very tightly binds the sanded core bar within the mold. It is particularly desirable that when the core bar is stripped from the mold after the mold is frozen, that the sand layer between the core bar and the mold shall be stripped from the core bar and remain in contact with the matrix walls of the mold until the mold has cooled down. This prevents air currents from unevenly chilling the matrix walls of the mold and at the same time provides a heat insulating layer which permits the heat adjacent the matrix side wall of the mold to be dissipated gradually thereby relieving casting strains. It is necessary, however, in practice to remove the core bar from the mold after it has been frozen and while it is hot in order to release the core bar equipment for further manufacturing uses.

Under the above conditions, it is not unusual for the core bar to stick tightly within the set-up after casting so as to require substantial force to release the core bar.

Various types of pressure devices have heretofore been utilized to release the core bar from the set-up after casting, but under the modern practices of providing the matrix wall of the mold with a narrow taper, the pressure devices of the prior art have not been satisfactory to remove the core bars without danger of breaking the core bars or of tearing the sand wall from the mold and at times injuring the hot mold itself.

The present invention overcomes the difficulties of the known prior art by providing the combination of pressure devices and mechanism for delivering hard sharp repeated impact blows longitudinally of the core bar to loosen the core bar from the sand, and to extract the core bar after casting operation has been completed.

There are two types of core bars in general use, one known as a collapsible core bar and the other as the rigid core bar. The molds of the modern practice with the narrow taper require great accuracy in the set-up particularly as to the core bar, and this is best secured by the use of rigid core bars which are the most difficult to strip after casting.

More specifically, the present invention comprises a pressure device wherein the element of the device which presses upon the head of the core bar is provided with a power hammer, preferably of the compressed air type, which delivers a series of sharp impact blows to the head of the core bar during the time when pressure is being applied longitudinally of the core bar to drive the same out of the sand within the mold.

The disclosure herewith comprises a preferred form of the present invention, but it is to be understood that this disclosure is illustrative and is not to be considered in the limiting sense in view of the fact that other specific mechanisms of carrying out the present invention will be apparent to those skilled in the art.

Throughout the several figures of the drawings, like parts are indicated by like characters.

Fig. 1 is an elevational view showing the present invention in operative relation to an ingot mold cast in an ingot mold set-up, with a portion of the set-up shown in section.

Fig. 2 is a view illustrating a section through a preferred form of pneumatic hammer or pile driver.

Fig. 3 is a plan view portion of the top of the mountings for the hammer.

Fig. 4 is a plan view looking upwardly at the bottom face or anvil of the hammer.

Referring now to the drawings and more especially to Figs. 1, 3, and 4. The preferred embodiment of the invention comprises a crane hook ring 1 adapted to receive a crane hook 2. This crane hook ring is provided with chain eyelets 4 through which toggle chains 5 are anchored. This crane hook ring is also provided with a head 6 in which guide rods 7 are securely anchored by the guide rods being provided with tapering heads that pass through tapering openings in the head 6 and are wedged in the position by wedge keys 8. Tubular guide pipes 9 are mounted to slide on the guide rods 7 and these guide pipes 9 carry an upper frame 10 and a lower frame 11 in which a body 12 of an air hammer is carried. This air hammer is provided with a valve casing 14 to which an air supply hose 15 is suitably attached so that by the application of compressed air, from a suitable source of compressed air, the air hammer is operated when and as is desired. The lower frame 11 carries pivot bolts 16 in which the inner ends of the toggle arms 17 are pivotally anchored with the toggle chains 5 being anchored to the other end of these toggle arms 17. Hook chains 18 are pivotally secured to toggle arms 17 by means of key bolt clevises 19, which may be adjustably set in different positions on the toggle arms 17 to change the effective pressure of the device on the core bar, by passing the key bolts through openings 20 or by permitting the key bolts to remain as illustrated in openings near to the pivot bolts 16. The lower end of the hook chains 18 are provided with hooks 21 adapted to engage the top flange 22 of a flask 24. The lower end of the body 12 of the air hammer is adapted to be positioned over and rest upon the head 25 of the core bar 26. The air hammer is provided with an anvil 27 that also bears on head 25 of the core bar. The head 25 of the core bar may be constructed with a small opening in which a shouldered pin 28 is adapted to set. Likewise the anvil 27 of the air hammer is provided with a centrally located opening 29 adapted to receive the head of the shouldered pin 28 and thereby centrally locate the air hammer over the end of the core bar without danger of the hammer slipping from the said core bar head, when the device is in use. This core bar 26 may be of any well known type, collapsible or rigid, but as illustrated comprises a rigid member provided with vent openings 30 and is mounted upon a core bar base 31, which extends beneath the stripping plate 32 carried by the flask 24. The flask 24 carries a sand facing 34 and the core bar 26 carries a sand facing 35. An ingot mold 36 is shown in Fig. 1 as having been cast and frozen between the sand facings 34 and 35.

It will be observed that when the extractor is in place as illustrated in Fig. 1, the crane hook 2 engages the crane hook ring 1 and through the connected parts lifts the set-up from the casting bottom 37. This result is brought about by the fact that the ingot mold sticks to the hardened sand in the flask, supported by the stripping plate 32, and by the sand in the lug pockets 38 of the flask that extends beneath the lugs 39 on the ingot mold. The sand 35 around the core bar has also been tightly compacted and slightly burned during the casting operation so that, as previously explained, when the crane hook lifts, the flask core bar and ingot mold are all raised a short distance from the casting bottom. While in this slightly raised position, air is admitted through the air hose 15 and the air hammer begins to operate by striking the anvil 27 sharp quick blows. The weight of the parts causes the toggles, comprising the toggle chains and toggle arms, to exert a strong pressure through the bottom of the body 12 of the air hammer upon the head 25 of the core bar. As the quick, sharp blows of the air hammer strike the anvil 27 and deliver the shock directly to the core bar, the core bar is loosened gradually and gently from the sand and as the core bar drops out of the sand, the base of the core bar drops back into place on the casting bottom 27. The crane may then vertically lift the mold, with the sand lining in the matrix of the mold, off the core bar thereby stripping the core bar from the cast ingot mold which remains in the flask. This operation as previously explained is accomplished by pressure plus the combined effect of rapid impact blows on the core bar and the effect has been to remove the core bar without injury to any of the several parts. As this operation takes place, the guide pipes 9 have slid downwardly on the guide rods 7 so that the air hammer follows up the movement of the core bar until it is entirely loosened from the core bar sand. The crane now lifts the flask and mold to a suitable place in the plant where the C-clamps 40 are knocked loose from the flask, thereby opening the flask and permitting the hot mold with the sand thereon to be stacked in a hot pile to cool.

The air hammer is of a common type well known in the art, but in order that the disclosure herewith shall be entirely complete, a brief description of the air hammer preferred will now be given. The body 12 of the air hammer may be composed of different

units, the assembly of which is unimportant for the present description, and as previously stated comprises an anvil 27 located in the lower part of the body portion in such manner as to be normally retained therein and having a limit of vertical motion therein sufficient to permit effective blows through the anvil to be delivered to the core bar. A piston hammer head is mounted to reciprocate in said body portion and comprises a cylindrical body 41 provided with a piston portion 42 adapted for reciprocation within suitable cylinders in the body 12. The valve casing 14 is attached to the side of the body portion 12 and connects with suitable conduits 44 and 45 adapted to control the compressed air through a control valve 46 so that when compressed air is admitted through the air hose 15, the hammer head is rapidly reciprocated within the body 12 in such manner that the impact end of the cylindrical portion of the hammer head 41 strikes the anvil 27 to deliver the blows to the core bar as previously described.

Other forms of impact members may be utilized such as mechanically operated hammers or electrically operated hammers, but in accordance with the present disclosure, the air hammer is the preferred form of impact device.

Having thus described my invention, what I claim is:—

1. In a device of the class described comprising a body member, toggle members cooperating with said body member, means connected with said toggle members and adapted to engage a flask to enable a crane to lift said flask with the body member pressing upon the head of the core bar, and means to deliver rapid impact blows to the head of said core bar.

2. In a device of the class described comprising a body member, toggle members cooperating with said body member, the body member being slideably mounted between said toggle members, means connected with said toggle members and adapted to engage a flask to enable a crane to lift said flask with the body member pressing upon the head of the core bar, and means to deliver rapid impact blows to the head of said core bar.

3. In a device of the class described comprising a body member, toggle members cooperating with said body member, means connected with said toggle members and adapted to engage a flask to enable a crane to lift said flask with the body member pressing upon the head of the core bar, and a power hammer to deliver rapid impact blows to the head of said core while said body member is pressing upon said core bar.

4. In a device of the class described, a crane hook ring, toggle members carried by said crane hook ring, a pressure member adapted to cooperate with the head of a core bar, engaging means secured to said toggle members and adapted to engage a flask whereby a crane may lift the flask with the pressure member applying pressure to said core bar head, and means to deliver sharp impact blows to said core bar head.

5. In a device of the class described, in combination, means to lift a flask and simultaneously apply pressure to a core bar head, and devices carried by said means and adapted to deliver sharp impact blows to said core bar head.

6. In a device of the class described, in combination, means to lift a flask and simultaneously apply stripping forces to a core bar head, and a power hammer carried by said means and adapted to deliver sharp impact blows to said core bar head.

7. A device for stripping core bars from ingot molds cast in a flask comprising means to lift the flask and apply pressure to the head of the core bar in the direction of its length, and devices to apply sharp impact blows to the head of said core bar in the direction of its length.

8. A device for stripping core bars from ingot molds cast in a flask comprising means to lift the flask with the ingot mold and core bar in the mold, and devices to apply sharp impact blows to the head of said core bar in the direction of its length while the flask is lifted.

9. A device of the class described comprising an apparatus for extracting sanded core bars from an ingot mold cast within a sand lined flask comprising means to apply pressure to said core bar in the direction of its length, and devices to deliver sharp impact blows to said core bar while the same is under pressure to loosen the core bar from the sand surrounding the same.

10. An extractor for sanded core bars for ingot molds cast in a sanded flask comprising means to apply an extracting force lengthwise of said core bar to remove same from said mold, and devices to apply sharp impact blows to said core bar while said extracting force is effective.

11. An extractor for sanded core bars within an ingot mold cast in a sanded flask comprising means to apply an extracting force to said core bar in the direction of its length tending to remove the same from said mold, and an automatic hammer operable to deliver sharp impact blows to said core bar to loosen the same from the sand surrounding said core bar while said extracting force is effective.

12. A core bar extractor for extracting sanded core bars from ingot molds cast in a sanded flask comprising a crane hook ring, guide members carried by said crane ring, a pair of toggle chains connected to said crane hook ring, a pair of toggle arms con-

nected to the lower ends of said toggle chains, a pneumatic hammer slideably mounted upon said guide members, pivots for said toggle arms carried by said pneumatic hammer, and hook chains carried by said toggle arms.

HOWARD BLACKWELL.