

May 13, 1930.

L. A. CAMEROTA

1,758,883

APPARATUS FOR FREEING AND EXTRACTING CASTINGS FROM MOLDS

Filed June 7, 1928

3 Sheets-Sheet 1

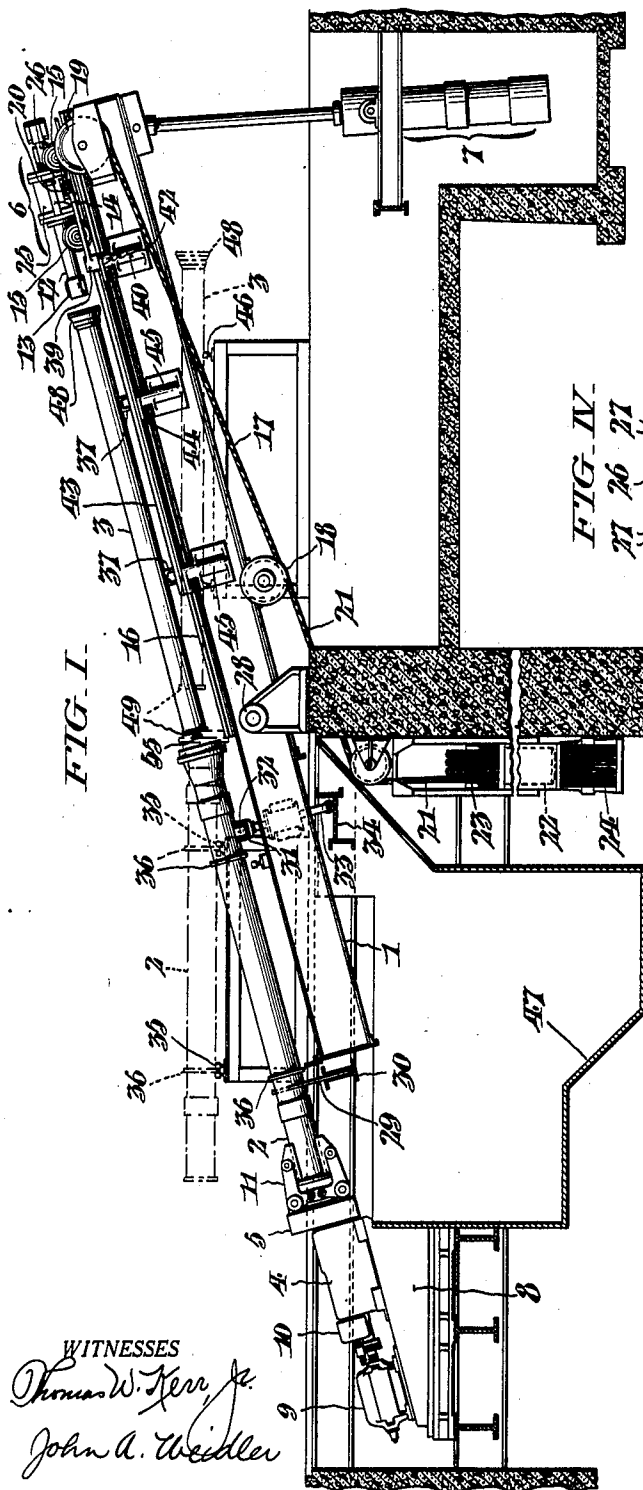


FIG. IV.

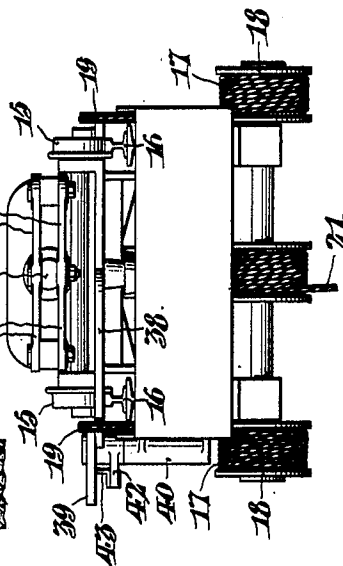
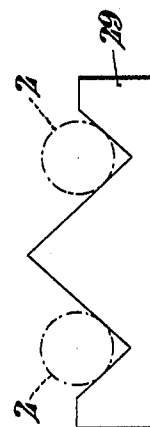


FIG. V.



WITNESSES

Thomas W. Kerr Jr.
John A. Weidler

INVENTOR:

Louis A. Camerota
BY Tracy & Paul
ATTORNEYS.

May 13, 1930.

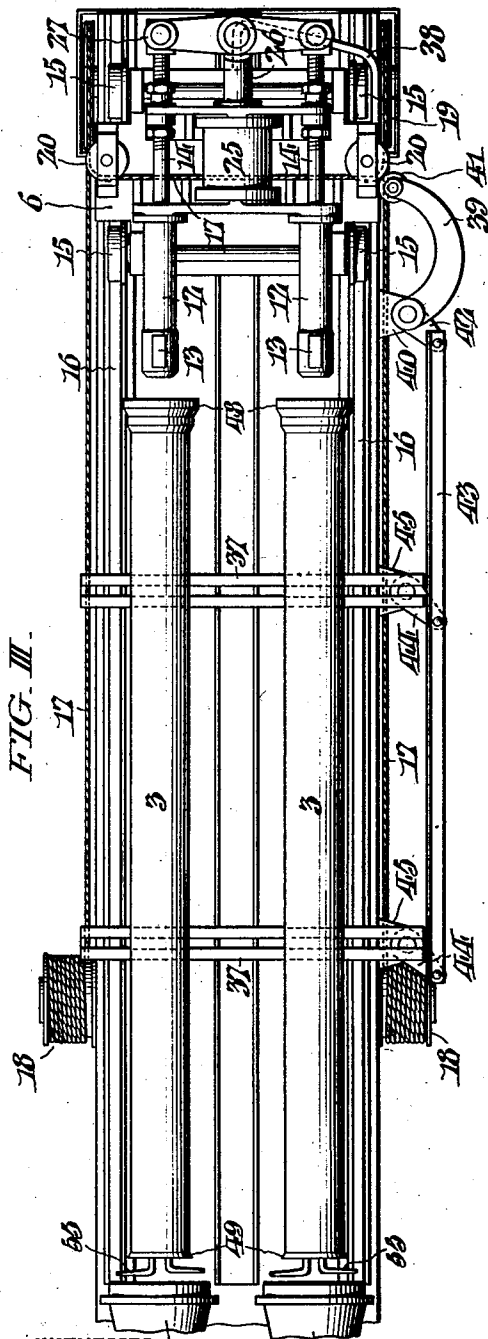
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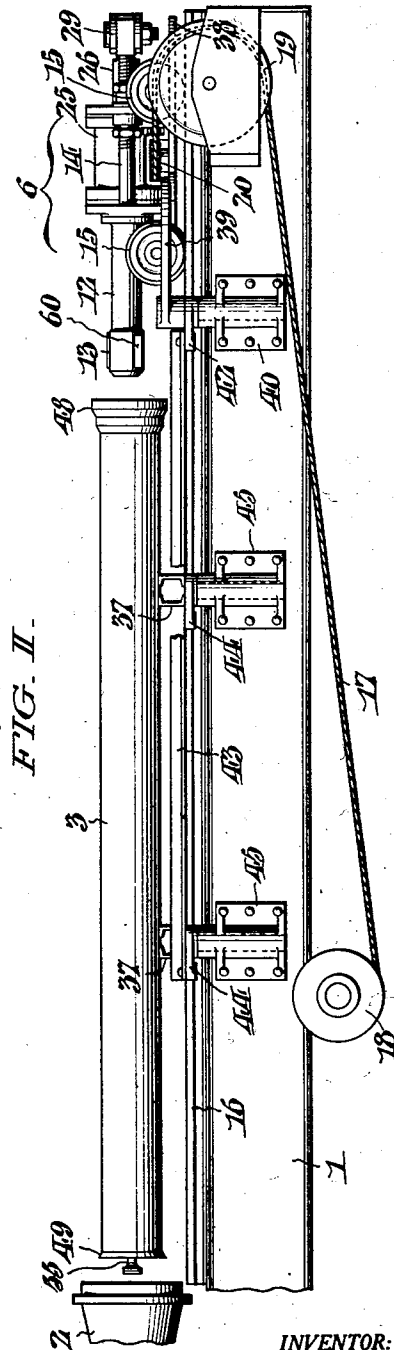
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3 Sheets-Sheet 2



WITNESSES

Thomas W. Ferry, Jr.
John A. Weidner



INVENTOR:

Louis A. Camerota,
BY Tracy & Paul
ATTORNEYS.

May 13, 1930.

L. A. CAMEROTA

1,758,883

APPARATUS FOR FREEING AND EXTRACTING CASTINGS FROM MOLDS

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3 Sheets-Sheet 3

FIG. VI.

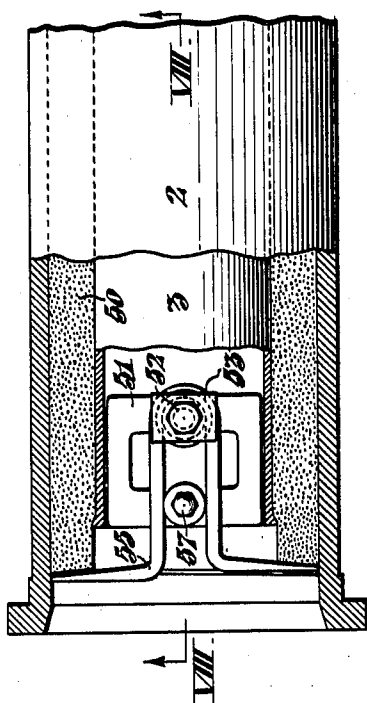


FIG. VII.

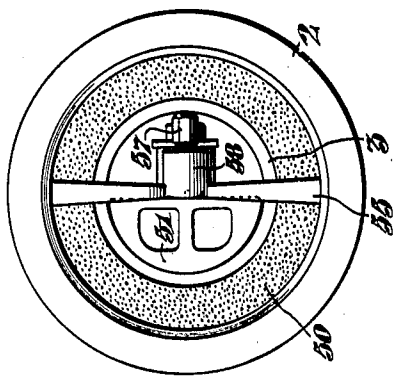


FIG. IX.

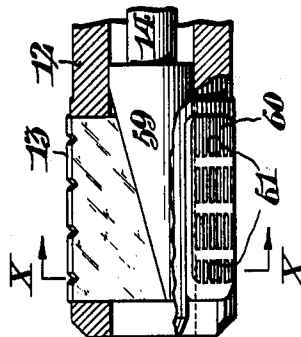


FIG. VIII.

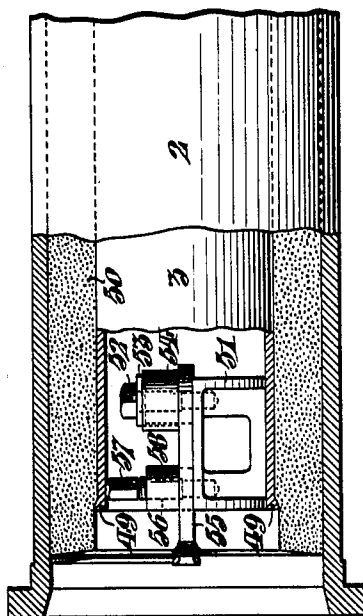
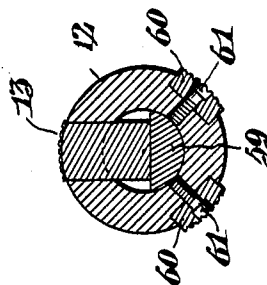


FIG. X.



WITNESSES
Thomas W. Kerr, Jr.
John A. Weddler

INVENTOR:
Louis A. Camerota
 BY *Fraleigh Paul*
 ATTORNEYS.

UNITED STATES PATENT OFFICE

LOUIS A. CAMEROTA, OF BURLINGTON, NEW JERSEY, ASSIGNOR TO WALTER WOOD,
OF PHILADELPHIA, PENNSYLVANIA

APPARATUS FOR FREEING AND EXTRACTING CASTINGS FROM MOLDS

Application filed June 7, 1928. Serial No. 283,527.

My invention relates to the art of freeing and extracting a casting from a refractory mold by mechanical means, and has particular reference to a method and apparatus for thus extracting hollow metal bodies, such as pipes which have been cast centrifugally, from sand lined flasks of the unitary type.

Pipes are ordinarily cast with a bell shaped flange at one end and a bead at the other end. When cast by the centrifugal process in a closed flask, a pipe cannot be freed from its mold by pressure appliances exerting a straight pull or push upon the pipe without danger of damaging the flask or casting, for, as the bell end of the pipe is drawn from the flask, the bead compresses the mold ahead of it until the pipe finally jams in the mold. Mechanical means have been devised for jolting a flask on end, that is, subjecting it to a series of violent vibrations to disintegrate the mold and thus free the casting. Means have also been devised for cutting out the sand mold by mechanical cutters adapted to be progressed through the sand mold without disturbing the position of the casting in the flask.

While it is possible by the jolting method to disintegrate the mold, the time expended in the operation, the labor in handling the flasks, and the very severe shock to the machine foundations are such that a quicker and more efficient method is desirable. With the use of mechanical cutters of the type mentioned for cutting out the sand mold, the presence of scabs or other defects in the casting interferes with the operation of the cutter and frequently makes it very difficult to remove the casting. Furthermore, the vent holes or perforations in the flask are not cleared of sand so that an additional operation is necessary to open these holes before using the flask again. To obviate these and other difficulties, I have invented an apparatus for mechanically extracting the casting from the mold in one operation, an apparatus which is characterized by its positive stripping operation even when the casting is defective and by its safety in that the casting is removed without the danger of injury to either the casting or the flask.

Supplementing the advantages already described are those derived from the use of a tilting apparatus so that the sand from the disintegrated mold is automatically dumped into a storage bin beneath the apparatus.

For a better understanding of the invention, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter, in which I have illustrated and described a preferred embodiment of the invention.

Of the drawings:

Fig. I is side view of the entire apparatus, showing the position of the various parts at the completion of the extracting operation.

Fig. II is a side view of a part of the frame on which the pipe carrier is situated.

Fig. III is a plan view of the apparatus shown in Fig. II.

Fig. IV is an end view of the apparatus shown in Fig. II.

Fig. V is a view of the flask centering plate.

Fig. VI is a cross-sectional view of one end of a flask illustrating the supplementary cutting apparatus.

Fig. VII is an end view of the apparatus shown in Fig. VI.

Fig. VIII is a cross-sectional view of the flask shown in Fig. VI, taken along the lines VIII—VIII.

Fig. IX is a detailed view, partly in section, of the pipe chuck; and,

Fig. X is a sectional view of the pipe chuck taken along the lines X—X of Fig. IX.

The apparatus shown in the drawing is designed to simultaneously extract the castings from two flasks in one operation. It comprises generally a tiltable frame 1, carrying the flasks 2 and their pipe castings 3, head stocks 4 for driving a pair of rotary chucks 5, the movable carriage 6 for extracting the pipe castings 3, and the hydraulic tilting mechanism, comprehensively designated by the numeral 7.

The head stocks 4 are mounted on a stationary platform 8 and are inclined to an angle equivalent to the angle of maximum elevation of the frame 1. Separate electric reversible motors 9 are utilized to drive the rotary

chucks 5. Each chuck 5 carries a pair of jaws 11 which close and open to grasp and release the ends of the flasks 2, these jaws being operated by a hydraulic cylinder 10.

At the other end of the frame 1 and mounted thereon, there is the carriage 6 which carries a pair of cylindrical chucks 12 fitted with expanding jaws 13 which are operated by plungers 14 as hereinafter described, and which are adapted to grip interiorly the pipe castings 3, to hold them against rotation. The carriage 6 is provided with wheels 15, which engage the tracks 16 mounted on the frame 1, and is driven by a cable 17 which is operated by a drum 18, there being a pair of sheaves 19 on the end of the frame 1 and a second pair of sheaves 20 beneath the carriage 6 over which the cable 17 passes. The drum 18 in turn is driven by an additional cable 21 which is actuated by a hydraulic cylinder 22, through the medium of two sets of pulleys 23, 24 which are drawn apart or together by the operation of the cylinder 22 so as to take up or release the cable 21. Accordingly, the movement of the carriage 6 along the tracks 16 is governed by the operation of the cylinder 22.

On the carriage 6 there is a hydraulic cylinder 25 which actuates a plunger 26 on the end of which there is a cross-arm 27, carrying on its ends plungers 14 used for forcing the jaws 13 outwardly of the chucks 5 to grip the pipes 3.

The frame 1 is pivoted in bearings 28 so that it may be inclined from horizontal position by means of the tilting mechanism 7 to align with the platform 8. To properly position the flasks 2 on the frame 1 concentric with the chucks 5, a flask-centering plate 29 of the configuration shown in Fig. V is attached to the floor beam 30 adjacent the chucks 5, and a steady rest 31 is provided for the free ends of the flasks 2. The steady rest 31 carries two pairs of rollers 32 which are flush with the surface of the frame 1 when it is in horizontal position, but which upon the inclination of the frame 1, are moved upwards by reason of the lugs 33 striking the beam 34.

The flasks 2 are customarily handled in horizontal position and are rolled to and from the stripping apparatus along skids 35 which engage annular flanges 36 on the flasks 2 so as to properly position them for admission to and discharge from the stripping apparatus. The pipe castings 3 are supported on swinging skids 37 which are positioned by the movement of the carriage 6 along the frame 1. At the rear of the carriage 6 there is a cam 38 which engages a bell-crank lever arm 39 upon the forward movement of the carriage 6. The arm 39 is pivoted in the bearing 40, and, when the frame 1 is inclined, its roller 41 will automatically follow along the cam 38 as the carriage 6 moves forward.

Attached to the arm 39 is an additional arm 42, the end of which engages a link 43. The sliding motion of the link 43 through the medium of bell-crank lever arms 44, pivoted in bearings 45, operates the swinging skids 37 to position them transversely of the frame 1 when the carriage 6 is in the position shown and longitudinally of the frame when the carriage moves towards the flasks 2. After the castings 3 are extracted from their respective flasks 2, and upon the return of the frame 1 to horizontal position, the castings are rolled off the swinging skids 37 onto stationary skids 46 from which they may be transported to other parts of the foundry.

The various controls for operating the different elements of the apparatus are preferably located centrally of the frame 1 so that one operator can perform all the steps necessary to free the castings 3 from the flasks 2. Beneath the apparatus and adjacent the flask end of the frame 1 there is shown a sand bin 47 for receiving the sand as the molds are disintegrated. It will be observed that the pipes 3 have been cast with a bell 48 on the one end and a bead 49 on the other end.

The flasks 2 are of a common construction used in foundries for making sand-spun pipe. They are perforated throughout their length with minute holes to allow the escape of gases evolved during the casting operation.

To thoroughly clear the flasks of sand, I have found that it is frequently desirable to supplement the apparatus described with a cutter of the type shown in Figs. VI, VII, and VIII, which I preferably attach to the bead end of the pipe casting 3 so that the cutter will progress through the sand lining 50 as the pipe casting is drawn from its flask 2. The supplementary cutting apparatus comprises a semi-cylindrical block 51 of slightly less diameter than the pipe casting 3 and adapted to fit within its end. Secured to the block 51 by means of a clamp bolt 52, a washer plate 53, and a spacer 54, is a U-shaped cutter 55. To retain the block 51 securely within the end of the pipe casting 3, an additional tap-bolt 56 is screwed into the boss 58 on the forward end of the block 51 with its head 57 accessible from the end of the flask 2 and projecting against the inner wall of the casting 3 so that it may be turned to frictional engagement therewith.

In Figs. IX and X, I have illustrated detailed views of the pipe chuck 12 showing its operating plunger 14 with a wedge-shaped end piece 59 engaging the movable jaw 13 which is expanded from the chuck 12 by the operation of the hydraulic cylinder 25 and returned to normal position by gravity. In addition to the movable jaw 13 there are shown two stationary jaws 60 secured to the chuck 12 by screws 61. The serrated faces of the jaws serve a two-fold purpose. They

are not only utilized to firmly grip the ends of the castings 3, to retain the castings against rotation, but may also be used to clean out the scruff or dross from the ends of the castings

3. This latter effect may be accomplished by controlling the pressure applied to the plunger 14 so as to permit frictional engagement of the jaws with the inside of the castings without overcoming the turning movement of the castings caused by the rotary chucks 11.

The operation of the apparatus is as follows: With the frame 1 in horizontal position, a pair of flasks 2 are rolled onto the frame and the tilting cylinder 7 utilized to tilt the frame 1 to the position shown in Fig. 1. As the frame 1 is inclined the flasks 2 are centered at one end by the centering plate 29, and at the other end by the steady rest 31, the lugs 33 of which strike the floor beam 34 to raise the rollers 32 and thus provide bearings for the flasks 2, at the same time aligning them with the rotary chucks 5. The flask chuck operating cylinders 10 are then operated to close the jaws 11 around the lower ends of the flasks 2. With the flasks 2 in position the carriage 6 is propelled along the tracks 16 by means of the carriage operating cylinder 22 until the pipe chucks 12 enter the ends of the pipe castings 3 within the flasks 2. As the carriage 6 progresses along the tracks 16 and at the point where the cam 38 passes beyond the roller 41 on the lever arm 39, the swinging skids 37 fall by gravity to permit the unobstructed passage of the carriage 6. The pipe chuck cylinder 25 is then operated to expand the jaws 13 so that they firmly grip the castings 3 and hold the same against rotation. The electric motors 9 are then set in motion to revolve the flasks 2, and the carriage 6 is propelled upward of the frame 1.

The resultant action is in effect to screw the castings from their molds which are disintegrated by the movement of the bead ends of the castings 3, or the cutters 55 when used, through the flasks 2, the sand falling from the lower ends of the flasks 2 into the bin 47. The turning motion of the flasks serves not only to disintegrate the molds, but also to substantially clear the vent holes or perforations in the flasks of loose sand, particularly when the supplementary sand cutting device 55 is used. As the carriage 6 moves away from the flasks 2, the cam 38 engages the roller 41 on the arm 39 and through the series of levers aforementioned, causes the swinging skids 37 to bridge the rails 16, thus providing a support for the pipe castings 3 as they are extracted from their molds. The pipe castings 3 having been extracted, the frame 1 is lowered to horizontal position and the castings are rolled off onto the discharge skids 46.

In operation, I have found that the rela-

tive rotative and longitudinal movement between the mold and casting gives a pronounced polishing effect to the surface of the casting by reason of the abrasive action of the sand, the mold having a tendency to adhere to the flask 2 rather than to the casting until the disintegration of the mold commences by the action of the bead or the mechanical cutters progressing through the flask. This polishing effect upon the exterior surface of the casting, as well as the interior cleaning action of the pipe chuck is most desirable and eliminates or reduces the labor in finishing the castings upon their extraction from the flasks.

In practice I have also found that an effective method of working a casting loose from its mold is to rotate the flask slowly in one direction and then by reversing the motor to rotate it in the opposite direction and to continue this process until the mold commences to disintegrate, whereupon the motor may be set to turn continuously while the casting is withdrawn. Accordingly, I desire it to be understood that the relative rotary movement between flask and casting referred to contemplates either a continuous turning in one direction or an intermittent or oscillatory movement effected by reversing the motor.

It will be apparent that the apparatus, as described, enables the quick removal of castings from flasks without damage to either, and that it reduces the handling labor very considerably by providing for the automatic dumping of the sand into a bin beneath, and, by the provision of devices for positioning and discharging the flasks and their castings, reduces the personnel required to work on the operation. While I have illustrated and described means for rotating a flask relative to its casting to free the latter from the former, the same effect can be produced by the rotation of a casting within a flask, and by an obvious modification the apparatus can be adapted to operate in that manner. Furthermore, the inclination of the flask, though it facilitates the removal of sand, is not essential for the extraction of the casting which can be readily removed by the principle of my invention with the flask in horizontal, inclined or vertical position.

Other changes may obviously be made in the form of the apparatus without departing from the spirit of my invention, which contemplates a variety of mechanisms for accomplishing the method or constituting the apparatus as claimed.

Having thus described my invention, I claim:

1. An apparatus for freeing a casting from a mold consisting of a sand lined flask comprising means for tilting the flask, and means for applying relative rotative and longitudinal movement between the flask and

casting, whereby the sand lining is disintegrated and falls from the flask.

2. An apparatus for extracting a pipe casting, having a bell at one end and a bead at the other end, from a cylindrical mold consisting of a sand lined flask, comprising means for rotating the one element, while holding the other element against rotation, and means for drawing the pipe from the bell end out of the flask.

3. An apparatus for extracting a casting from a sand-lined flask, comprising means for rotating the one element relative to the other, and means for drawing the casting from the flask.

4. An apparatus for freeing a casting from a mold consisting of a sand lined flask, comprising means for rotating the flask, means for holding the casting against rotation, and means for progressing the casting through the flask.

5. An apparatus for extracting a hollow casting from a cylindrical mold consisting of a sand lined flask, comprising means for rotating the flask, a chuck interiorly of the casting for holding the same against rotation, and means for drawing the casting from the flask.

6. An apparatus for extracting a pipe casting from a cylindrical mold consisting of a closed sand lined flask, comprising a rotary jaw for rotating the flask, means for holding the pipe against rotation, and means for drawing the pipe from the flask.

7. An apparatus for extracting a pipe casting from a cylindrical mold consisting of a closed sand lined flask, comprising a rotary jaw for gripping the flask, means for rotating said jaw, a chuck interiorly of the pipe for holding the same against rotation, and mechanism co-operating with said chuck to draw the pipe from the flask.

8. An apparatus for freeing a pipe casting from a cylindrical mold consisting of a closed sand lined flask, comprising means for rotating the flask, means for holding the casting against rotation, and means for tilting the flask, whereby the sand lining is disintegrated and falls by gravity from the flask.

9. An apparatus for freeing a pipe casting from a cylindrical mold consisting of a closed sand lined flask, comprising means for rotating the flask, means for holding the casting against rotation, hydraulic mechanism for tilting the flask to inclined position, and mechanism for drawing the casting from the flask, while the same is inclined.

10. In an apparatus for freeing a casting from a mold consisting of a sand lined flask, including means for rotating the one element relative to the other and means for drawing the casting from the flask, supporting skids for said casting, and means for automatically positioning said skids beneath the casting as it is drawn from the flask to facilitate the discharge of the casting from the apparatus.

11. In an apparatus for freeing a pipe casting from a cylindrical mold consisting of a closed sand lined flask, including a rotary jaw for gripping the flask, means for rotating said jaw, a chuck interiorly of the pipe for holding the same against rotation, and mechanism co-operating with said chuck to draw the pipe from the flask, said mechanism carrying a cam, supporting means for said pipe casting, and additional mechanism engaging said cam whereby the supporting means are positioned beneath the pipe casting to facilitate its removal.

12. An apparatus for freeing a casting from a mold consisting of a sand lined flask, comprising a tiltable frame carrying said flask and means for tilting said frame, a rotary chuck for gripping said flask and means for rotating said chuck, a cylindrical chuck for gripping said casting and holding the same against rotation, and means for automatically centering said flask with respect to said rotary chuck as the frame is tilted to inclined position.

13. An apparatus for simultaneously freeing and extracting a number of hollow castings from a similar number of sand-lined flasks comprising means for tilting the flasks together, means for rotating the flasks, and means for simultaneously drawing each casting from its flask.

14. In an apparatus for extracting a casting from a sand-lined flask including means for mechanically drawing the casting through the flask, a cutting tool adapted to be attached to one end of the casting and to progress with the casting through the flask.

15. In an apparatus for freeing a casting from a sand-lined flask, including means to rotate the one element relative to the other, and means to progress the casting through the flask, a cutting device adapted to be attached to one end of the casting and to progress through the flask with the casting to disintegrate the sand.

16. In an apparatus for freeing and extracting a casting from a mold consisting of a sand-lined flask, including means for rotating the flask relative to the casting, and means for drawing the casting from the flask, a cutting device adapted to be attached to one end of the casting to disintegrate the sand lining, and means for tilting the flask whereby the disintegrated sand may fall from the flask.

In testimony whereof, I have hereunto signed my name at Florence, New Jersey, this 31st day of May, 1928.

LOUIS A. CAMEROTA.