No. 627,538. Patented June 27, 1899.

N. SHAW.

MOLDING APPARATUS.

(Application filed Sept. 24, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

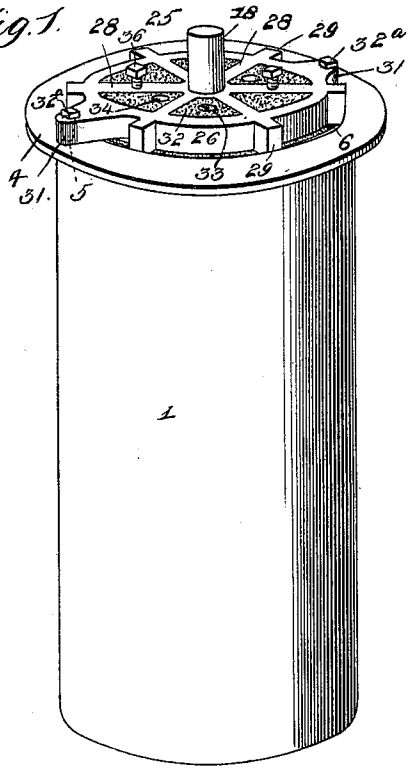


Fig. 2.

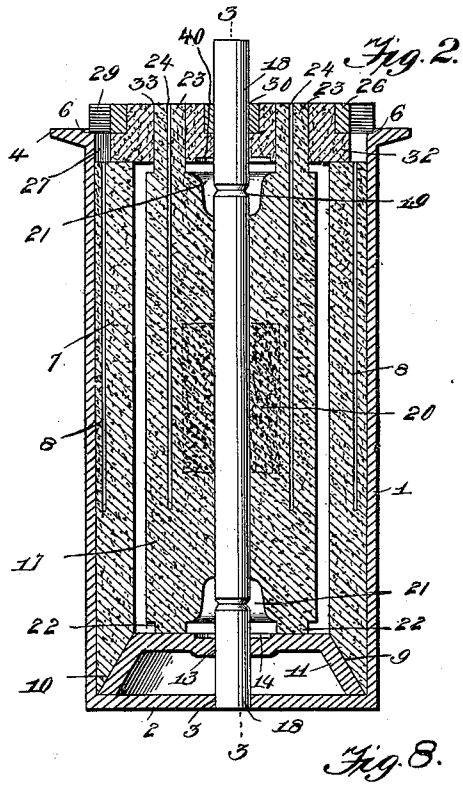


Fig. 8.

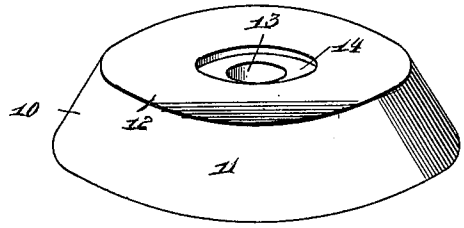


Fig. 4.

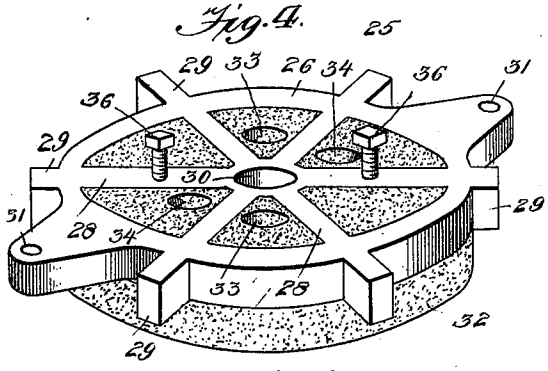


Fig. 9.

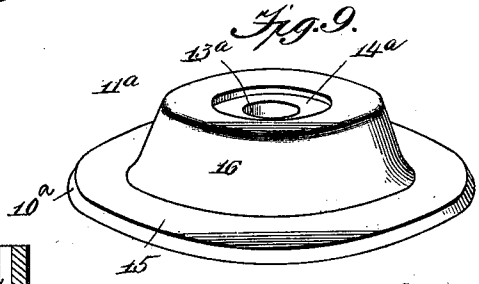
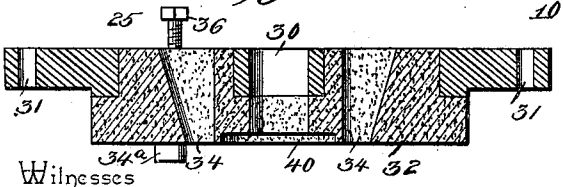


Fig. 5.



Witnesses

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No. 627,538. Patented June 27, 1899.

N. SHAW.

MOLDING APPARATUS.

(Application filed Sept. 24, 1895.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

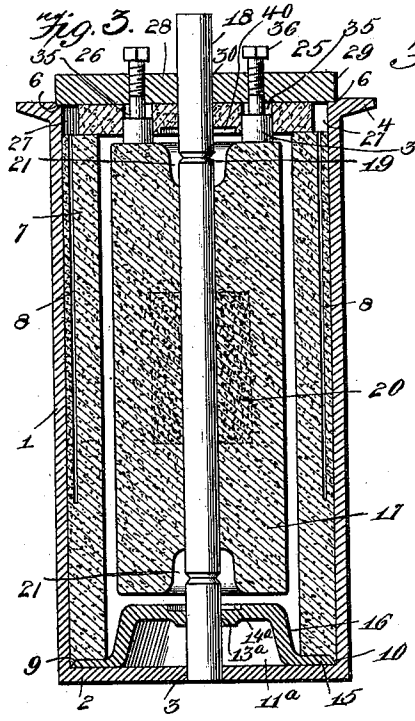


Fig. 6.

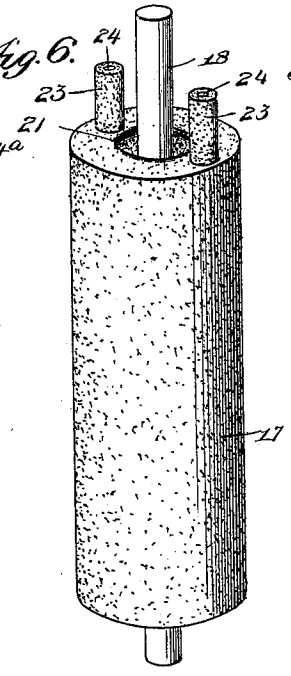


Fig. 7.

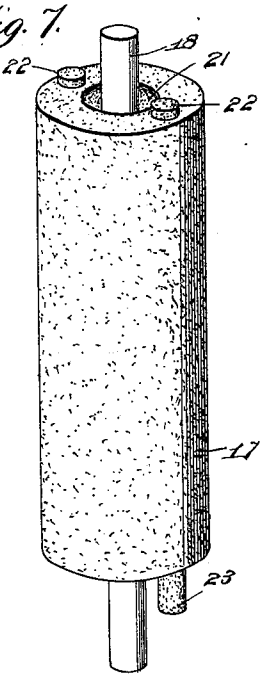


Fig. 10.

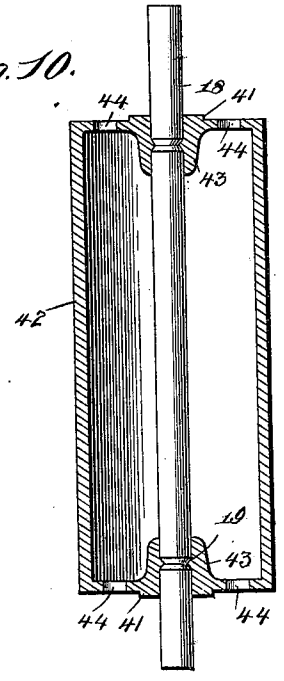
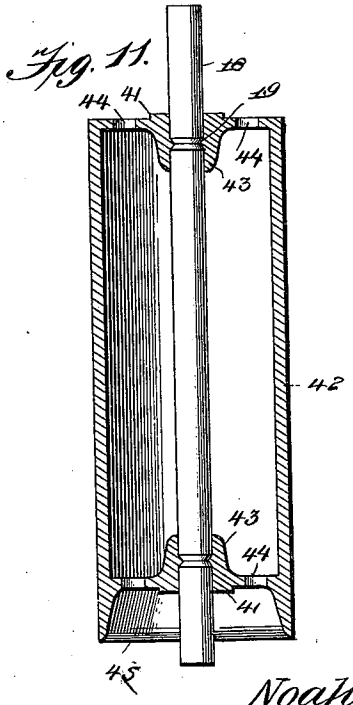


Fig. 11.



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UNITED STATES PATENT OFFICE.

NOAH SHAW, OF EAU CLAIRE, WISCONSIN.

MOLDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 627,538, dated June 27, 1899.

Application filed September 24, 1895. Serial No. 563,550. (No model.)

To all whom it may concern:

Be it known that I, NOAH SHAW, a citizen of the United States, residing at Eau Claire, in the county of Eau Claire and State of Wisconsin, have invented a new and useful Molding Apparatus, of which the following is a specification.

This invention relates to molding apparatus for molding cast-iron rolls; and it has for its object to provide a new and useful apparatus of this character which insures the casting of iron rolls that are perfectly true and in balance and which require no finishing after leaving the foundry.

To this end the invention also contemplates means for insuring the firm fastening of the roll on its shaft, obviating bending or buckling of the shaft between the ends of the roll, and at the same time permits of the complete finishing of the shaft with keyways and the like before it is cast in the roll.

With these and many other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a perspective view of a complete molding apparatus constructed in accordance with this invention. Fig. 2 is a central vertical sectional view thereof. Fig. 3 is a similar view on the line 3 3 of Fig. 2, showing the bottom mold-head employed for forming a roll with a recessed end. Fig. 4 is a detail in perspective of the mold-cover. Fig. 5 is a detail sectional view of said mold-cover on a line of section intermediate of the lines of section of Figs. 2 and 3. Fig. 6 is a detail in perspective of the mold-core removed from the mold. Fig. 7 is a similar view of the core, showing the reverse end from that shown in Fig. 6. Fig. 8 is a detail in perspective of the bottom mold-head employed for forming rolls with unrecessed ends. Fig. 9 is a similar view of the bottom mold-head for forming a roll with a recessed end. Fig. 10 is a longitudinal sectional view of a hollow metal roll formed by the molding apparatus. Fig. 11 is a similar view of the metal roll formed with a recessed end.

Referring to the accompanying drawings, the numeral 1 designates an upright cylindrical iron flask open at its upper end and provided with a flat bottom 2, which forms a base or support for the flask to hold the same in an upright position. The upright cylindrical flask 1 is provided in the bottom thereof with a central shaft-opening 3 and at its upper end with an offstanding annular flange 4, provided therein at diametrically opposite points with the bolt-openings 5. The said upright flask 1 is of a uniform diameter throughout its entire length and is further provided at its extreme upper inner edge with an annular shoulder 6, the purpose of which will be hereinafter more particularly referred to. The upright cylindrical flask 1 is designed to accommodate therein a cylindrical mold body or filling 7, which may be made of green sand. The cylindrical mold body or filling 7 forms the outer wall of the mold proper and is made within the flask 1 by packing the sand in the latter around a cylindrical pattern supported centrally in an upright position and of a shape and size conforming exactly to the interior of the mold body or filling 7, as will be readily understood by those skilled in the art. The mold body or filling 7, which is packed within the upright flask 1, is provided in the walls thereof with a circular series of vent-openings 8, which extend downward from the top edge of the body or filling 1 a sufficient distance to provide means for allowing the gas to escape from the mold when the molten metal is introduced therein. The said mold body or filling 7 is provided at its inner lower edge with an annular bevel 9, which registers with the beveled outer edge 10 of a bottom mold-head 11, which removably fits within the bottom of the flask 1 and forms the lower head of the mold, while at the same time acting in the capacity of a chill to shape the lower end of the metal roll that is cast in the mold. The bottom mold-head 11, which registers with the lower end of the mold body or filling 7, is made of iron in a substantially inverted-cup shape, and the form of bottom mold-head illustrated in Fig. 8 of the drawings is provided with a plain flat top portion 12, having the central shaft-opening 13, which is surrounded by an annular recess 14, which will be more particularly referred to; but the form of bottom mold-head illustrated in Fig.

9 of the drawings and designated by the numeral 11^a is of a slightly-different shape from the head just described. The bottom mold-head 11^a is adapted to occupy the same position within the bottom of the flask 1 as the head 11; but the beveled outer edge 10^a of the head 11^a is formed at the outer edge of a flat base-flange 15, which rests flat on the bottom of the flask 1 and from which flange rises a rounded core portion 16, having in the top thereof a central shaft-opening 13^a, surrounded by an annular recess 14^a. In this construction of mold-head it will be noted that the essential difference between the same and the mold-head 11 is that the beveled outer edge 10 of the head 11 registers completely within the beveled lower end of the body or filling 7, so that the metal when introduced into the mold simply runs over the flat top portion 12 of the head 11 to form the lower unrecessed end of the roll illustrated in Fig. 10, while, on the other hand, the narrow beveled outer edge 10^a of the head 11^a only partly fits in the lower end of the body or filling 7, and thereby leaves the entire rounded core portion 16 projected upwardly within the bottom of the flask, so that the same will be entirely surrounded by the molten metal to form the recess in one end of the roll illustrated in Fig. 11 of the drawings.

The cylindrical mold body or filling 7 is adapted to receive therein the smaller cylindrical sand core 17. The cylindrical sand core is shaped and dried on the roll-shaft 18, on which is cast the roll. Previous to shaping and drying the cylindrical core 17 on the shaft 18, which practically forms a part of the core, the said shaft is completely finished to the proper size with the necessary keyways and the like and is preferably provided near its opposite ends with the metal notches or cuts 19, which fill with the molten metal forming the roll, and thereby serve to tighten the shaft within the roll as the metal shrinks in cooling. The cylindrical sand core 17 is solid and is partially formed by a filling of cinders or broken coke 20, which during the formation of the core are packed around the central portion of the shaft 18, so as to protect such portion of the shaft from the effect of the heat and prevent the same from buckling or bending between its ends, as is quite common in the ordinary processes, in which the metal rolls are cast in a horizontal instead of an upright position. The said solid cylindrical sand core 17 is provided centrally in each end and directly surrounding the shaft 18 with the inwardly-extending conically-shaped recesses 21, which receive the molten metal as the same is poured into the mold, and at its lower end the core 17 is provided at diametrically opposite sides of the shaft 18 with the short spacing-studs 22, which rest directly on top of the mold-head in the bottom of the flask and serve to space the lower end of the core from the bottom mold-head to leave a space which forms one of the heads or ends of the hollow metal roll, and the said studs at the same time provide means for forming openings in one end of the hollow metal roll, through which the sand forming the core is removed after the roll is cast, as will be readily understood by those skilled in the art. The solid sand core 17 is provided at its upper end, at diametrically opposite sides of the shaft 18, with the elongated cylindrical pipe projections 23, in which pipe projections are formed the vent-openings 24, which extend a sufficient distance into the body of the core to provide for the escape of gases when the molten metal is poured into the mold. When the core is positioned within the mold in an upright position, the pipe projections and the shaft extremity at the upper end of the core project above the plane of the top of the flask, and the lower shaft extremity at the lower end of the core projects through the shaft-opening in the bottom mold-head and in the bottom of the flask to provide for properly holding the lower end of the core in position within the mold, while the upper end of the core is properly steadied in position by means of the removable mold-cover 25. The removable mold-cover 25 essentially consists of a circular skeleton frame 26, of a smaller diameter than the inner diameter of the flask 1, thereby leaving a gas-escape space 27 between the mold-cover, when in position, and the inner sides of the flask, with which gas-escape space the vent-openings 8 communicate, so that the gas which escapes out of said openings 8 can freely pass into the outer air. The said circular skeleton frame 26 is provided with a series of radially-extending arms 28, the outer extremities of which are projected beyond the rim of the frame and form projections 29, which rest in the annular shoulder 6 at the upper inner edge of the flask 1 and serve to firmly steady the mold-cover in position. The said skeleton frame 26 of the mold-cover is further provided with a central shaft-opening 30, which receives the upper extremity of the shaft 18, and thereby holds the core properly in position within the mold, and at diametrically opposite sides the frame 26 is also provided with the offstanding perforated bolt-lugs 31, which receive the bolts 32^a, fitted in the bolt-openings 5 of the flange 4, to provide means for detachably fastening the mold-cover in position at the top of the flask.

The circular skeleton frame 26 forms a support for the cover-body 32. The cover-body 32 is of a substantially circular shape, so as to fit within the upper part of the flask on top of the mold body or filling 7, inside of the line of openings 8, and is made of sand, which is shaped and dried on the circular skeleton frame 26, which is made of metal and can be used continuously in connection with a new sand cover-body 32. The circular sand cover-body 32 is packed into the spaces between the spaced radial arms 28 of the frame 26, so that when the sand forming the body 32 is dried

the said body and the frame 26 form a cover for the top of the mold.

The removable sand body 32 is provided in the body thereof, at diametrically opposite points, with the pipe-openings 33, through which project the pipe projections 23 of the core 17, so that the gases which escape out of the core 17 can freely pass into the outer air. At points alternating with the openings 33 the body of the mold-cover 25 is provided with the diametrically-opposite-tapered pouring-openings 34, through which the molten metal is poured into the mold on top of the core therein. In order to properly hold the core down within the mold, the mold-cover is provided on its under side with a pair of diametrically opposite chapelets 34^a. The chapelets 34^a are fitted in the openings 35, formed in the mold-cover, and are adjusted so as to project the proper distance below the bottom of the mold-cover by means of the set-screws 36, mounted in the frame 26 and working into the openings 35, within which the chapelets are fitted. When the mold-cover has been fastened in position on top of the flask, as just described, the chapelets are adjusted downward against the top of the core and serve to hold the same in place, while at the same time providing an intermediate space between the bottom of the mold-cover and the top of the core, so as to form one of the heads or ends of the hollow metal roll. At the same time the said chapelets form openings in one head of the hollow metal roll, through which the sand forming the core is removed after the roll is cast.

With the several parts of the molding apparatus assembled together as described the molten metal is poured through the pouring-openings 34 and necessarily completely fills the space between the core and the inside of the mold body or filling 7, and also the spaces between the bottom of the core and the bottom mold-head and the top of the core and the bottom of the mold-cover. By the arrangement of the molten-metal spaces and the disposition of the shaft the expansion is necessarily equal, so that the shaft is not bent out of line, as is quite common in connection with molding apparatus in which the roll is cast on its side or in a horizontal position. It is also to be noted at this point that the shaft, by being protected at its central part by the solid core, and especially by the filling of cinders or coke 20, is not subjected to the extreme heat except at each end, where the molten metal comes in contact therewith. Therefore the shaft will not shrink as much as the shell of the hollow roll, and the natural result is that the shaft is firmly keyed in the hollow roll by the shrinkage of the body of the roll drawing the heads toward the center, as will be readily understood.

At the lower end of the shaft-opening 30 the mold-cover 25 is provided with an annular recess 40, corresponding to the recess 14 of the bottom mold-head 11. These annular recesses 40 and 14 produce a thickened collar 41 directly around the shaft on the outside of each head of the hollow metal roll 42, which is formed by the method of molding herein described, and on the inside of each head of the hollow roll 42 are formed conically-shaped bosses 43, which are formed by the conically-shaped recesses 21 in the ends of the core 17. The heads of the hollow metal roll 42 are provided with the sand-escape openings 44, which are formed by the spacing-studs 22 of the core and the chapelets 34^a of the mold-cover, as hereinbefore referred to. When the bottom mold-head 11 is used, a metal roll with unrecessed ends is formed; but when the mold-head 11^a is employed the core portion 16 of said mold-head forms a recess 45 in one end of the hollow roll, which necessarily produces a roll of greater length, and it will therefore be seen that by interchanging the bottom mold-heads 11 and 11^a hollow metal rolls of different lengths may be cast in the same mold.

The many advantages of the herein-described molding apparatus other than those stated will be readily apparent to those skilled in the art, and I will have it understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. A molding apparatus for casting hollow iron rolls on their shafts in an upright position, comprising an upright cylindrical metal flask having a closed flat bottom provided therein with a central shaft-centering opening, a metal mold-head removably fitted in the bottom portion of the flask and provided with a central opening alining with that of the flask-bottom, a cylindrical sand mold-body packed within the upright metal flask on top of the bottom mold-head, a detachable mold-cover provided with a central shaft-centering opening, and a solid cylindrical sand core carrying a vertical shaft registering at its ends in the alined shaft-centering openings, said core being supported so as to leave a space between its ends and the mold-cover and removable metal head, substantially as set forth.

2. In a molding apparatus, an upright cylindrical flask, a metal mold-head removably fitted in the bottom of the flask, a cylindrical sand mold body or filling packed within the flask on top of said mold-head, a solid cylindrical sand core carrying a vertical shaft and supported inside of the mold body or filling with a space between its lower end and said mold-head, and a mold-cover detachably fastened at the top of the flask and spaced from the top of the core, substantially as set forth.

3. In a molding apparatus, an upright cylindrical iron flask, a metal mold-head remov-

ably resting on the bottom of the flask and provided with a beveled outer edge, a cylindrical sand mold body or filling packed within the flask and provided at its inner lower edge with an annular bevel registering with the beveled outer edge of the bottom mold-head, a mold-cover arranged on top of the flask, and a solid cylindrical sand core carrying a vertical shaft and supported within the mold body or filling so as to leave a space between the ends thereof and the mold-head and mold-cover, substantially as set forth.

4. In a molding apparatus, an upright cylindrical iron flask, a metal mold-head removably resting on the bottom of the flask and provided with a beveled outer edge and in the top portion thereof with a shaft-opening and an annular recess surrounding said opening, a cylindrical sand mold body or filling packed within the flask and provided at its inner lower edge with an annular bevel registering with the beveled outer edge of the mold-head, a mold-cover arranged on top of the flask and provided with a central shaft-opening and an annular recess at the lower end of said shaft-opening, and a solid cylindrical sand core carrying a vertical shaft fitting in said shaft-openings, said core being supported within the mold body or filling so as to leave a space between the ends thereof and the mold-head and mold-cover, substantially as set forth.

5. In a molding apparatus, an upright cylindrical flask, a bottom metal mold-head resting on the bottom of the flask and provided with a flat base-flange having a beveled outer edge and a rounded core portion rising from said base-flange and having in the top thereof a central shaft-opening and an annular recess surrounding said central shaft-opening, a mold-cover arranged on top of the flask and provided with a central shaft-opening and an annular recess at the lower end of said shaft-opening, a cylindrical sand mold body or filling packed within the flask and provided at its inner lower edge with an annular bevel registering with the beveled outer edge of the bottom mold-head, and a solid cylindrical sand core carrying a vertical shaft fitting in said shaft-opening, said core being supported within the mold body or filling so as to leave a space between the ends thereof and the mold-head and mold-cover, substantially as set forth.

6. In a molding apparatus, an upright cylindrical flask, a mold-head resting on the bottom of the flask and provided in the top portion thereof with a shaft-opening and an annular recess surrounding said opening, a cylindrical sand mold body or filling packed within the flask on top of the mold-head, a mold-cover arranged on top of the flask and provided with a central shaft-opening and an annular recess at the lower end of said shaft-opening, and a solid cylindrical sand core carrying a vertical shaft fitting in said shaft-opening and provided centrally in each end directly surrounding the vertical shaft with inwardly-extending conically-shaped metal recesses, said shaft being supported so as to leave a space between the ends of the core and the mold-head and mold-cover, substantially as set forth.

7. In a molding apparatus, the upright cylindrical flask, a bottom mold-head fitted within the bottom of the flask, a cylindrical sand mold body or filling packed within the flask on top of the mold-head, a solid cylindrical sand core carrying a vertical shaft and provided at its lower end with short spacing-studs which rest directly on top of the mold-head, and a mold-cover removably fastened on top of the flask and provided on its under side with a pair of downwardly-projecting chapelets which bear on top of the core, substantially as set forth.

8. In a molding apparatus, the upright cylindrical flask, a cylindrical sand mold body or filling packed within the flask and provided in its walls with a circular series of vent-openings which extend downward from the top edge of the body or filling, a smaller solid cylindrical sand core arranged within the mold body or filling, and a circular mold-cover fastened on top of the flask, said circular mold-cover being of a smaller diameter than the inner diameter of the flask so as to lie inside of the line of the vent-openings in the mold body or filling to provide a gas-escape space between the mold-cover and the inner sides of the flask, substantially as set forth.

9. In a molding apparatus, the upright cylindrical flask, a bottom mold-head fitted in the bottom of the flask, a cylindrical sand mold body or filling packed within the flask on top of the mold-head, a solid cylindrical sand core carrying a vertical shaft and provided at its lower end with short spacing-studs resting on top of the mold-head, a mold-cover removably fastened on top of the flask and provided on its under side with downwardly-projecting chapelets movably fitting in openings in the mold-cover, and set-screws mounted within the top of the mold-cover and working into the openings within which the chapelets are fitted to provide for adjusting the latter, said chapelets being adapted to bear on top of the core, substantially as set forth.

10. In a molding apparatus, an upright metal flask truly cylindrical throughout its length and having a closed flat bottom, a cylindrical sand mold-body packed within the flask and provided with a series of vent-openings extended downward from the top edge of the body in its walls, a solid cylindrical sand core carrying a vertical shaft and provided at its upper end with integral cylindrical pipe projections having therein vent-openings extending downward into the solid body of the core, and a circular mold-cover fastened on top of the flask and of a smaller diameter than the inner diameter of the flask so as to lie inside of the line of the vent-openings in the sand mold-body, said cover hav-

ing a sand body provided with pipe-openings receiving the pipe projections of the core, substantially as set forth.

11. In a molding apparatus, an upright cylindrical metal flask provided at its upper inner edge with an annular shoulder, a cylindrical sand mold body or filling packed within the flask and provided with vent-openings formed vertically in its walls, a solid cylindrical sand core carrying a vertical shaft and arranged within the mold-body, and a mold-cover arranged on top of the flask and comprising a solid circular sand body and a circular skeleton metal frame supporting said body and of a less diameter than the interior diameter of the flask, said skeleton frame being provided with a central shaft-centering opening and a series of radially-extending arms, the outer extremities of which arms project beyond the rim of the frame and register in the annular shoulder at the upper edge of the flask, substantially as set forth.

12. A core for upright molds consisting of an upright shaft and a solid sand body formed directly on the shaft and surrounding intermediate of its ends a separate interior filling of cinders or broken coke, which entirely surrounds the central portion of the shaft and is in direct contact therewith for the purpose of protecting the central portion of the shaft from undue heating, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

NOAH SHAW.

Witnesses:
A. C. PUTNAM,
C. G. STEARNS.