No. 753,951. PATENTED MAR. 8, 1904.

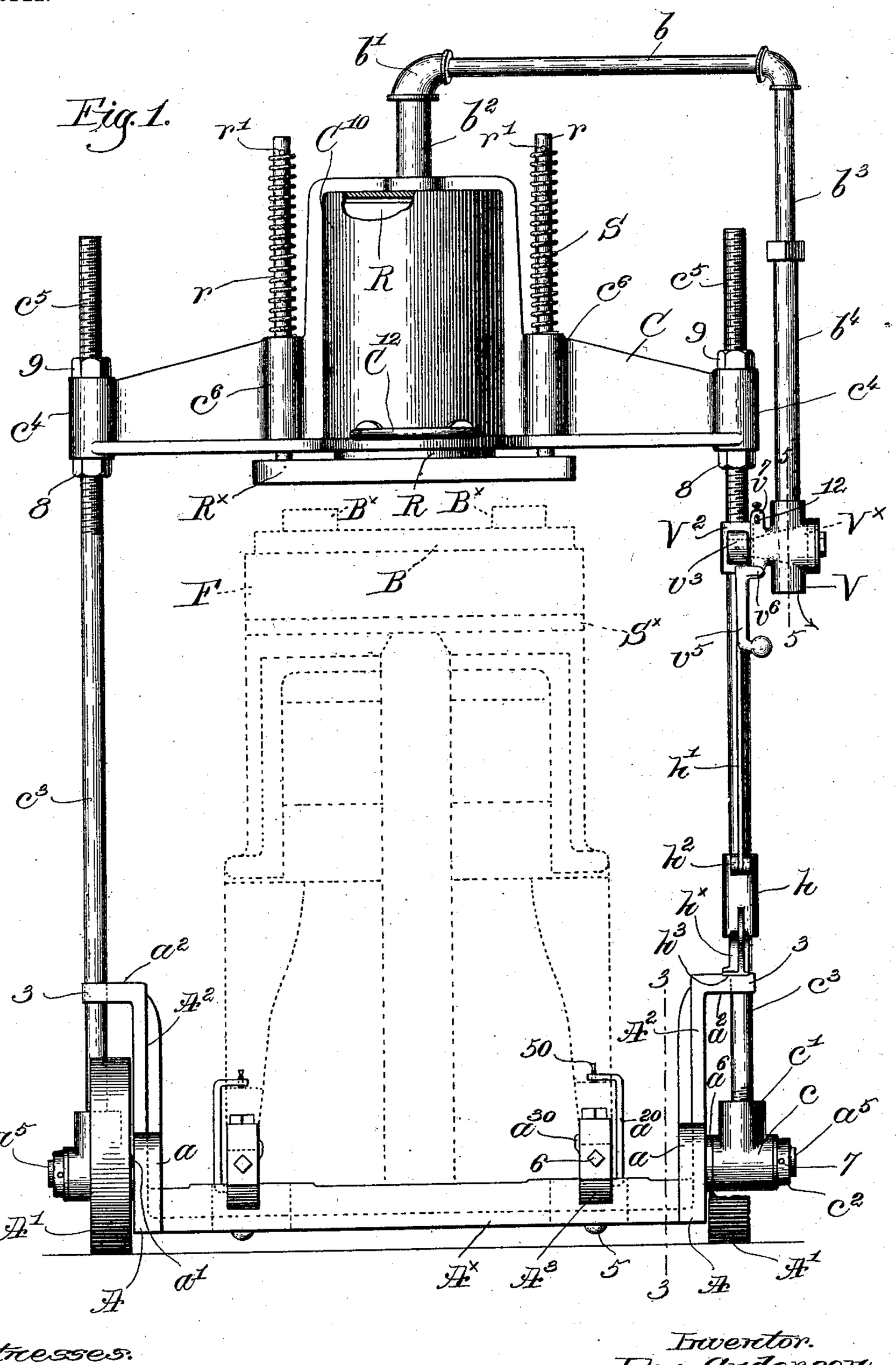
J. ANDERSON.

MOLDING APPARATUS.

APPLICATION FILED DEC. 5, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

Fig. 5.

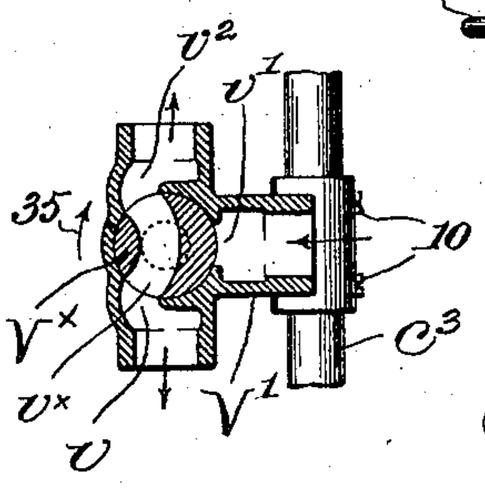


Fig. 4.

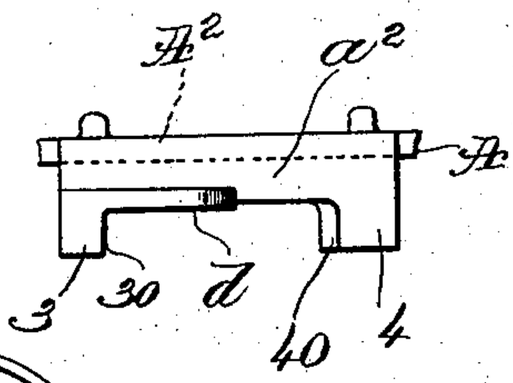
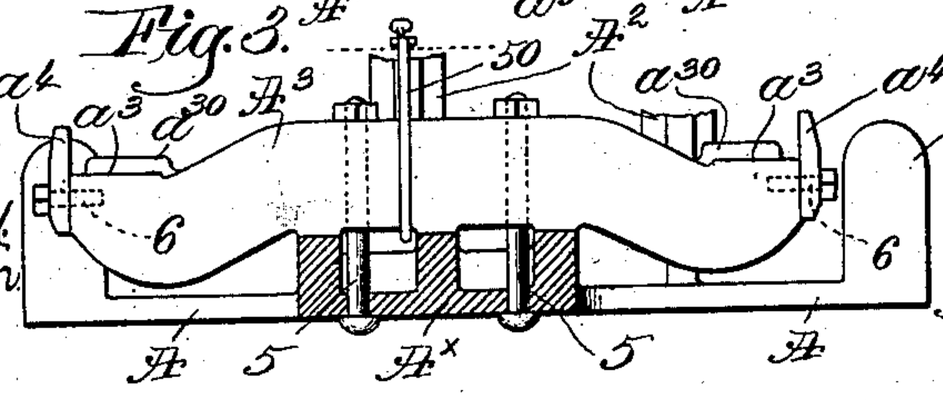


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN ANDERSON, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

MOLDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 753,951, dated March 8, 1904.

Application filed December 5, 1903. Serial No. 183,870. (No model.)

To all whom it may concern:

Be it known that I, JOHN ANDERSON, a citizen of the United States, and a resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Molding-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to apparatus for facilitating the making of molds for use in metal founding, and more especially to apparatus for dispensing altogether or to a large extent with the laborious and time-consuming operation of hand-ramming.

In "machine-molding," as it is technically termed, the two parts of the mold are formed rapidly and accurately on machines of the stripper-plate type when the parts of the pattern are deep, the stripper-plate being cut out to accurately conform to the contour of the pattern, which is fixed on a carrier adapted to be moved away from the stripper-plate in an exact path when it is desired to draw the pattern from the mold. When the portion of the pattern from which one part of the mold is made is shallow and can be readily drawn by hand, a "flat back" is frequently used—*i. e.*, a flat plate having the pattern rigidly secured thereto, the plate forming the parting face for that part of the mold as does the stripper-plate for a mold formed on a molding-machine.

Formerly the molder shoveled the sand into the flask and rammed it by hand, whether using a molding-machine or a flat back, and this ramming consumed the greater part of the time required to complete a mold. Power or machine ramming apparatus have recently come into use, wherein means are provided to compress or squeeze the sand into the flask and around the pattern by means of an opposed rammer and supporting-table, one of which is moved toward and from the other by the medium of steam, compressed air, or other motive fluid. My present invention belongs to this general type of apparatus, but involves various novel features of construction and arrangement whereby the operation is facilitated, the scope of the apparatus very materially enlarged, and its accuracy and general effectiveness increased.

By means of the apparatus to be hereinafter described, in which my invention is embodied, molding-machines can be used in conjunction therewith with great convenience and effect, so that the valuable features of the molding-machine and the power-ramming apparatus are combined and utilized.

The various novel features of my invention will be fully described in the subjoined specification, and particularly pointed out in the following claims.

Figure 1 is a front elevation of a molding apparatus embodying one form of my invention in readiness to operate, and a molding machine and flask are shown in dotted lines to illustrate the mode of operation of my present invention. Fig. 2 is a right-hand side elevation of the apparatus shown in Fig. 1, the dotted-line position of some of the parts illustrating the ease with which the flask can be applied to or removed from position for ramming. Fig. 3 is a partial section of the base of the apparatus on the line 3 3, Fig. 1, looking toward the left. Fig. 4 is a top or plan view detail of a portion of the locking means to be described; and Fig. 5 is a sectional detail of the controlling-valve which governs the admission and exhaust of the motive fluid, taken on the line 5 5, Fig. 1.

The apparatus in which my invention is at present embodied comprises, essentially, a supporting-base and an upturned carrier mounted to swing on the base, a rammer to ram the sand in a properly-supported flask, and means to actuate the rammer, means being provided to permit the ramming operation only when the carrier is in its operative position, and I have also provided means whereby when the rammer is operated the carrier will be instantaneously and automatically locked in its operative position. The base is shown in Figs. 1, 2, and 3 as comprising elongated side members A, rigidly connected by a cross-girth $A^{\times}$, which preferably is an integral part of the sides and conveniently formed therein as a single casting. The ends of the side portions A are enlarged and upturned at *a* to support out-

wardly and laterally extended studs a', on which suitable truck-wheels A′ are rotatably mounted, whereby the apparatus can be readily moved from place to place in a foundry or molding-shed, as the work may demand. The sides of the base are shaped to form upturned and substantially rectangular enlargements A^2, the tops of the parts A^2 being laterally widened, as at a^2, (best shown in Fig, 4,) and recessed to present stops 3 and 4, the acting face 30 of the stop 3 being vertical, while the acting face 40 of the stop 4 is inclined, as clearly shown in Figs. 2 and 4. Supports A^3 are seated on the cross-girth $A^\times$ and extend fore and aft of the base in parallelism with each other and with the sides A thereof, said supports being made as heavy castings and rigidly secured to the cross-girth by bolts 5. (Best shown in Fig. 3.) At the top of each support at or near its ends flat seats a^3 are formed for a purpose to be described, and upturned clamps a^4 are detachably secured to the ends of the supports by suitable bolts 6. I have provided each side member of the base at about its center with a horizontal outwardly-extended stud a^5, which studs constitute fulcra for the upturned carrier to be described, the fulcrum-studs being located in alinement with each other. Heavy hubs c, having upturned hollow bosses c', are mounted on the studs and retained in place thereon by collars c^2, pinned to the studs at 7, (see Fig. 1,) the inner end of the hub resting against an enlargement a^6 of the base. The bosses are preferably threaded internally to have screwed into them the lower threaded ends of side bars c^3, which extend upward for a considerable height above the base sufficient in the present embodiment of my invention to admit a molding-machine between the base and the rammer, as will be described. The side bars pass upward between the two pairs of stops 3 and 4, and by reference to Fig. 2 it will be seen that when the side bars are in upright or vertical position they bear against the vertical edges 30 of the stops 3. When the side bars are swung back into dotted-line position, Fig. 2, they rest against the inclined faces 40 of the other stops, 4. The side bars and the parts carried thereby thus have a limited swinging movement upon and relatively to the base. A strong and rigid cross-head C has at its ends hollow bosses c^4 to loosely receive the upper ends of the side bars, which are screw-threaded, as at c^5, and check-nuts 8 and 9 below and above the bosses c^4 and screwed onto the side bars firmly retain the cross-head in the desired vertical position and at the same time rigidly connect the upper ends of the side bars. A cylinder C^{10} is vertically mounted upon the cross-head at its center, the open end of the cylinder being downturned and receiving a plunger-like piston R of the rammer $R^\times$, the rammer being made as a substantially rectangular metal plate, and it may conveniently be fast with the plunger-piston R. Rods r, rigidly secured to the rammer near its ends, are upturned and slide through tubular guides c^6, forming a part of the cross-head, and lifting-springs S are interposed between the upper ends of the tubular guides and suitable holding devices, as pins r', extended through the upper ends of the rods r. These springs act to elevate the rammer when the motive fluid is exhausted from the cylinder. The upper end of the cylinder C^{10} communicates with an inlet-pipe b by means of a fitting b' and short pipe b^2, so that the pipe b is fixedly supported. The said pipe b is coupled with a depending portion b^3, which is fitted to telescope into a larger pipe b^4, the lower end of which is rigidly secured fluid-tight to the upper end of a valve-case V. This valve-case, as shown in Fig. 5, has an outlet-port v, an inlet or admission port v', and a third port v^2, which communicates with the lower end of the pipe b^4. The admission-port v' is formed in a hollow boss V′ of the casing, having a sleeve V^2 integral therewith and adapted to receive one of the side bars c^3 of the carrier, said screws 10 rigidly holding the sleeve in place on the side bar.

An inlet or admission pipe I, communicating with any suitable source of motive power, whether the same be steam, compressed air, or water, is secured to the port V′ of the valve-case and communicating with the admission or inlet port v' thereof. A plug-valve $V^\times$ is rotatably mounted in the case V transversely thereto and provided with a passage $v^\times$, the valve and its case constituting a three-way valve. When the valve $V^\times$ is in the position shown in Fig. 5, communication is established between the upper end of the cylinder C^{10} and the exhaust or outlet port v to thereby exhaust or discharge the cylinder of its fluid contents. If now the valve be turned in the direction of the arrow 35, Fig. 5, to bring the passage $v^\times$ into communication with the ports v' and v^2, the motive fluid will be admitted to the cylinder behind the piston R to depress the rammer. The ramming must be effected only when the carrier is in absolute operative position in order that the ramming action upon the sand in the flask shall be uniform and even, and it is also of great importance that during the ramming the carrier shall be locked from movement. It is also important to prevent actuation of the controlling-valve when the carrier is swung back into its inoperative position. (Shown in dotted lines, Fig. 2.) The plug-valve is extended through the inner end of the case V and has rigidly secured thereto a hub v^3, (see Fig. 1,) provided with a short rocker-arm v^4 (see dotted lines, Fig. 2) and an actuating-handle v^5. The handle is provided with a lateral enlargement or lug v^6, Fig. 1, to engage a stop-screw 12, mounted in an ear v^7 on the valve-case, when the handle v^5 has been swung upward to fully open the valve and admit the motive fluid to the cylinder.

A sleeve h is slidably mounted on the side bar c^3 of the carrier, which supports the valve-case, said sleeve having a downturned latch $h^\times$, (clearly shown in Fig. 2,) offset from the sleeve far enough to coöperate with the outer upright edge of the stop 3 when the sleeve h is depressed. A link h' is pivotally connected at its opposite ends to the rocker-arm v^4 and an ear h^2 on the upper end of the sleeve h.

When the parts are in the position shown in Fig. 2, the rammer is properly positioned to operate, and when the operator swings the handle v^5 upward to open the valve the rocker-arm v^4 is depressed and the link h' is moved longitudinally to depress the sleeve h. This downward movement of the sleeve causes the upright flat face of the latch $h^\times$ to descend and engage the outer upright face of the shoulder 3 and positively lock the carrier and parts supported thereby from any movement relatively to the base of the apparatus. When the handle v^5 is moved back into the position shown in Fig. 2 to shut off the motive fluid and to permit the cylinder to exhaust, the sleeve h is elevated and the latch $h^\times$ withdrawn from engagement with the stop 3. This stop thus also forms a keeper for the latch. When the latch has been thus withdrawn to inoperative position, the carrier can be swung backward into dotted-line position to permit the removal of the flask and the insertion of a new one. When the carrier is in its inoperative position, the controlling-valve should not be operated, accidentally or otherwise, and to prevent such operation I have formed on the overhanging part a^2 of one of the sides of the frame a cam surface or detent d, over which the slightly-beveled lower end h^3 of the latch rides when the carrier is swung back, the upper face of the detent being an arc struck from the center of the adjacent stud a^5. Manifestly no movement of the controlling-valve can take place while the end of the latch is in engagement with the detent. It follows, consequently, that the latch can be actuated only when the carrier is in operative position. (Shown in full lines, Fig. 2.)

I have particularly designed this present apparatus for use in connection with a molding-machine of the stripper-plate type, a convenient form of which is shown in United States Patent No. 744,152, granted to me the 17th day of November, A. D. 1903, and in Fig. 1 I have shown in dotted lines such a molding-machine in place on the base of the molding apparatus forming the subject-matter of this application. The seats a^3 sustain the flattened portions 14, formed on the lower ends of the legs of the molding-machine, and the clamps a^4 are then screwed up tightly against the outer edges of the legs, as shown in Fig. 2. This brings the stripper-plate $S^\times$ of the molding-machine in proper position for ramming when the flask F, Fig. 1, has been placed upon the said stripper-plate. To prevent any lifting of the molding-machine from the base, clamp-hooks a^{20} are employed, said clamp-hooks fitting over the lower portions of the frame of the molding-machine and underneath the lower edges of the supports A^3. Suitable thumb-screws 50 tighten the clamps in place. When the flask has been placed on the molding-machine and the pattern-carrier raised to bring the pattern into operative position, the molder shovels sand into the flask and levels it off. A bottom board B (see dotted lines, Fig 1) is then placed on the top of the same, the board having cross cleats or bars $B^\times$ secured to its upper face. The molder then grasps a handle c^{12} on the front of the carrier and swings the carrier forward from dotted to full line position, Fig. 2, and while holding the carrier forward turns the handle v^5 to open the valve, and thereupon the rammer is depressed and forces the board B down into the sand in the flask with the desired pressure. The sand is thus quickly, uniformly, and evenly rammed or squeezed into the flask around the pattern and with great rapidity. As soon as the flask is rammed the operator returns the valve to normal position, thereby permitting the motive fluid to exhaust from the cylinder and the springs S lift the rammer. At the same time the carrier is unlocked, as has been described, and the operator pushes back the carrier to inoperative position. The space is then clear for him to lower the pattern-carrier and draw the pattern, remove the completed flask, and place in position on the stripper-plate an empty flask, and the operation is continued, as before described.

It will be manifest that instead of using a molding-machine of the specific character referred to in my patent any other molding-machine may be used, or the flask may be supported on a stand or table erected on the base. I prefer, however, to use a molding-machine in connection with the apparatus herein described, as I am thus enabled to utilize the various advantages of a molding-machine with the novel features in the apparatus herein described.

To counterbalance in a measure the weight of the cylinder and parts mounted on the upper portion of the carrier, the hubs c are provided with rigid rearwardly-extended arms c^{15}, to which one end of stout springs S^2 are secured, the other ends of the springs being fixed to the overhanging tops a^2 of the side portions A^2 of the base, one of the springs and rocker-arms c^{15} being clearly shown in Fig. 2. To prevent the movement of the molding-machine toward the sides of the base, short upturned flanges a^{30} are formed on the supports A^3 at the inner sides of the seats A^3.

The cross-head C is vertically adjusted by means of the check-nuts 8 9, coöperating with

the bosses c^4, and the telescopic connection between the pipes b^3 and b^4 permits such vertical adjustment.

Manifestly a flexible connecting-pipe could be used instead between the valve-case V and the top of the cylinder C^{10}.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified and rearranged in various particulars by those skilled in the art without departing from the spirit of my invention as expressed in the appended claims.

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

1. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a power-actuated rammer on one of said members and a flask-support on the other, a controlling-valve to govern the operation of the rammer, and means to positively lock the carrier in operative position by or through actuation of the controlling-valve.

2. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a power-actuated rammer on one of said members and a flask-support on the other, a controlling-valve to govern the operation of the rammer, means to positively lock the carrier in operative position by or through actuation of the controlling-valve, and separate means to prevent actuation of said valve when the carrier is in inoperative position.

3. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a power-actuated rammer on one of said members and a flask-support on the other, a controlling-valve to govern the operation of the rammer, a keeper on the base, a coöperating locking-latch mounted on the carrier, and a connection between said latch and the valve, whereby actuation of the latter causes operative engagement of the latch and keeper to retain the carrier in operative position.

4. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a power-actuated rammer on one of said members and a flask-support on the other, a controlling-valve to govern the operation of the rammer, a keeper on the base, an adjacent detent, a latch movable with and also relatively to the carrier, to coöperate with the keeper or the detent, and connections between the valve and the latch, whereby actuation of the valve is prevented unless the carrier is in operative position, actuation of the valve at such time causing the latch to positively engage the keeper and lock the carrier in position.

5. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a depending rammer on the carrier, means, including a cylinder and a fluid-pressure-controlling valve, to actuate the rammer and move it toward a flask supported on the base, positively-acting locking means to retain the carrier in operative position, and connections between said means and the valve, opening of the latter locking the carrier and shutting of said valve rendering the locking means inoperative.

6. In a molding apparatus, a base, an overhead swinging carrier mounted thereon, a reciprocating rammer depending from the top of the carrier, fluid-pressure-actuating means for the rammer, including a manually-operated controlling-valve, a latch slidable on the carrier and operatively connected with the valve, a keeper on the base, and an adjacent, elongated detent, opening of the valve being permitted only when the latch is beyond the detent and the carrier in operative position, operation of the valve to cause movement of the rammer effecting positive locking engagement of the latch and keeper.

7. In a molding apparatus, a portable base adapted to support a flask for ramming, an overhead carrier mounted to swing on the base, a rammer depending therefrom, springs to lift it, fluid-pressure means, including a cylinder and controlling-valve, to depress the rammer, and means operated by actuation of said valve when the carrier is in operative position to positively lock the carrier in such position.

8. In a molding apparatus, a base, seats thereon to support the feet of a molding-machine, means to clamp the molding-machine rigidly on the base, an overhead swinging carrier fulcrumed on the sides of the base, a depending rammer, fluid-pressure-operating means therefor, and a controlling-valve, all mounted on the carrier, and means operated by actuation of the valve to lock the carrier in operative position.

9. In a molding apparatus, a base, seats thereon to support the feet of a molding-machine, means to clamp the molding-machine rigidly on the base, an overhead swinging carrier fulcrumed on the sides of the base, a depending rammer, fluid-pressure-operating means therefor, and a controlling-valve, all mounted on the carrier, a latch operatively connected with the valve, a keeper, and an adjacent detent, both mounted on the base, the detent acting through the latch to prevent actuation of the valve when the carrier is in inoperative position and actuation of the valve causing positive coöperation of the latch and the keeper.

10. In a molding apparatus, a base adapted to support a flask, an overhead rammer and its operating-cylinder, a manually-actuated controlling-valve for the cylinder, a carrier for the latter mounted to swing on the base into and out of operative position, means to prevent the actuation of the valve when the carrier is in inoperative position, and means

to positively and automatically lock the carrier in operative position by actuation of the valve.

11. In a molding apparatus, a base adapted to support a flask, a rammer, an attached piston and its cylinder for operating it, a swinging carrier for the cylinder mounted on the base, a valve to govern the admission of motive fluid to the cylinder, means to lock the swinging support in operative position, and controlling connections between the valve and the locking means to positively lock the swinging support by or through opening of the valve and to permit actuation of the valve only when the carrier is in operative position.

12. In a molding apparatus, a base having upturned sides and lateral studs, side rods fulcrumed on the studs, a cross-head connecting the rods above the base, a rammer, and actuating means therefor mounted on the cross-head, a manually-actuated controlling-valve for said means, fixed stops on the upturned sides of the base to limit the swinging movement of the side rods, a sliding latch on one of said rods, a keeper therefor on the base, and a connection between the latch and controlling-valve, whereby actuation of the latter slides the latch into engagement with the keeper and positively locks the cross-head in operative, ramming position.

13. In a molding apparatus, a base adapted to support a flask, a carrier mounted thereon and comprising side rods fulcrumed on the base and an attached cross-head, an upright cylinder on the cross-head, a plunger-piston therein having a rammer on its lower end, upright guide-rods fast on the rammer and slidable in the cross-head, lifting-springs surrounding said rods between their upper ends and the top of the cross-head, and a manually-actuated valve to control the entrance of motive fluid to the cylinder above the piston, to depress the rammer.

14. In a molding apparatus, a rectangular base having upturned sides, truck-wheels at the corners of the base, horizontal seats on the base to support the feet of a molding-machine, means to clamp the same on the seats, a swinging carrier mounted on the base, an overhead rammer and actuating means therefor sustained on the carrier, a manually-actuated controlling-valve for said means, a keeper and an elongated detent on one of the upturned sides of the base, a latch movable with and relatively to the carrier, and a connection between the latch and valve, the latch engaging the detent and preventing actuation of the valve unless the carrier is in upright, operative position, actuation of the valve at such time moving the latch into engagement with the keeper and positively locking the carrier in operative position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN ANDERSON.

Witnesses:
GEORGE OTIS DRAPER,
ERNEST W. WOOD.