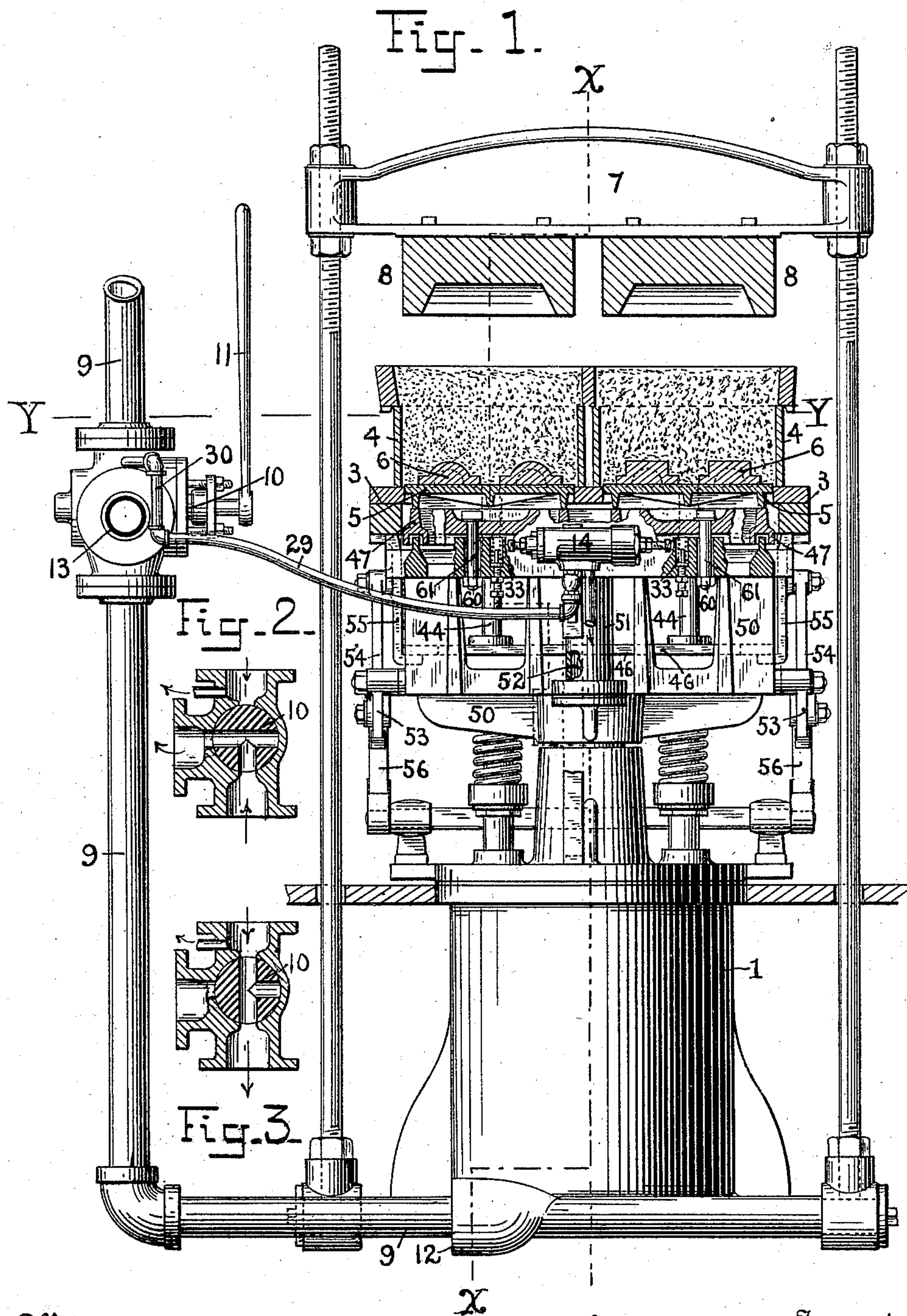


3 Sheets—Sheet 1.

No. 533,401.

Patented Jan. 29, 1895.



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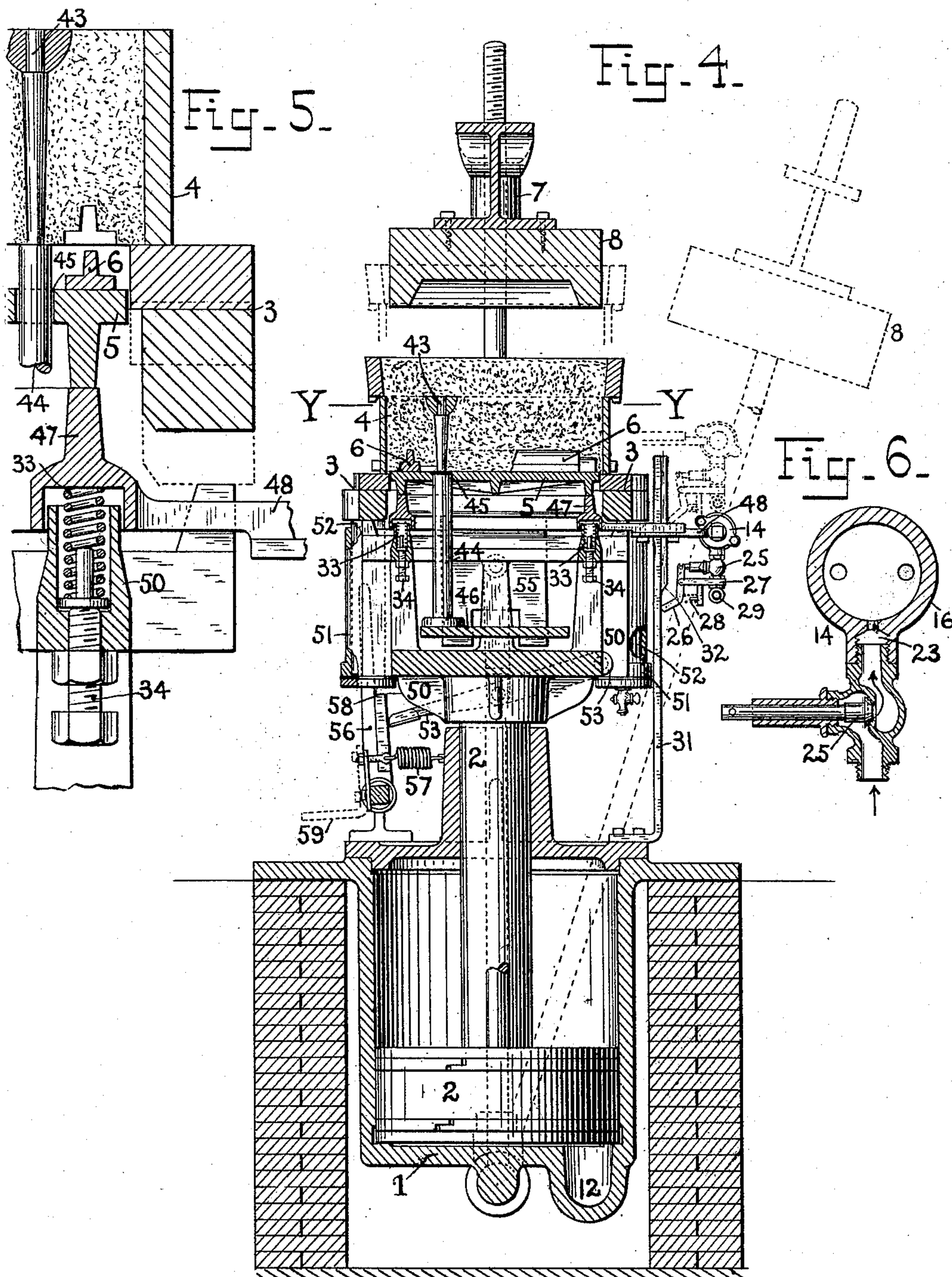
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3 Sheets—Sheet 2.

H. TABOR.
MOLDING APPARATUS.

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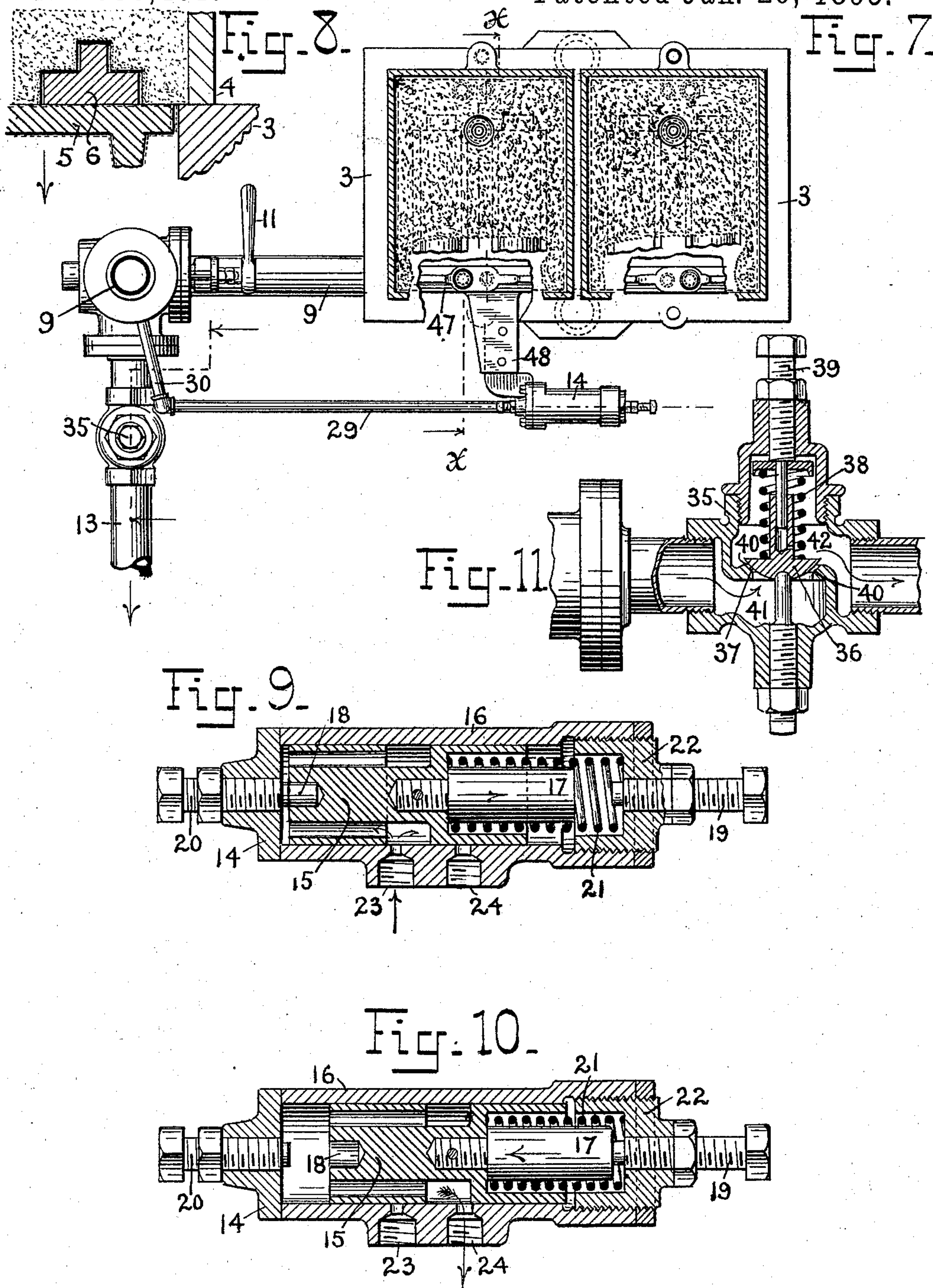
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MOLDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 533,401, dated January 29, 1895.

Application filed April 14, 1894. Serial No. 507,508. (No model.)

To all whom it may concern:

Be it known that I, HARRIS TABOR, a citizen of the United States, residing in Elizabeth, Union county, State of New Jersey, have invented certain new and useful Improvements in Molding Apparatus, of which the following is a specification.

This invention relates to improvements in apparatus for producing molds in which metal castings are to be made, and said improvements consist in providing the apparatus with means for slightly agitating the patterns with relation to the sand in the flasks, in order to free the patterns from any clinging particles of sand, when the patterns are to be withdrawn from the molds, thereby doing away with the necessity of a "stripping-plate;" in mounting the pattern-plate upon a yielding support, in order that such agitation may be the more effective, and the molds be left in better condition when the patterns are withdrawn; in supporting the sprue-plug in the sand so that the molds cannot be damaged by any downward movement of said plug when it is seized to be removed; and in certain other features of construction and arrangement, all as hereinafter described and claimed.

In order to illustrate my improvements and their application, I have selected a power molding-machine, the general construction and operation of which is similar to that shown and described in Letters Patent of the United States granted to me March 17, 1891, and numbered 448,596, though said improvements may be applied to machines differently constructed.

In the accompanying three sheets of drawings, Figure 1 represents a front view of a power molding-machine to which the improvements are shown as applied, with the blocks on the ramming-head, the filled flasks, the patterns, and portions of the parts in vertical section. Figs. 2 and 3 show vertical sections in two positions, of the three-way valve that may be employed in the power-inlet pipe. Fig. 4 represents a vertical section of the machine, on line X X of Figs. 1 and 7. Fig. 5 shows, on a larger scale, a vertical section of a portion of the flask, its supporting-frame, and parts adjacent, illustrating the mounting of the pattern-plate on yielding supports, and

means for retaining the sprue-plug in position when the patterns are withdrawn. Fig. 6 represents, on an enlarged scale, a vertical section of the cylinder or case in which the power rapper, or agitator, is mounted to reciprocate, and shows the valve-box governing the inlet of the medium for operating said rapper. Fig. 7 represents a horizontal section, on line Y Y of Figs. 1 and 4, through the flask and power-inlet pipe, and a top view of the automatic rapper and its connections with the machine and with such pipe. Fig. 8 shows, on a larger scale, a vertical section of a portion of the flask, pattern-supporting plate, and pattern, illustrating the effect (greatly exaggerated) on the molded sand, of the operation of the rapper. Figs. 9 and 10 represent, on an enlarged scale, vertical, longitudinal sections of the rapping-device with the reciprocating hammer in two positions. Fig. 11 shows, on an enlarged scale, in vertical section a check-valve which may be employed in the exhaust-pipe that connects with the main cylinder of the machine, to govern the descent of the piston when near the end of its downward movement.

The specific construction of all the parts of the power molding-machine shown in the drawings needs no description, as it forms, in general, no part of the present invention. The machine, however, consists chiefly of a cylinder, 1, in which a piston, 2, is mounted to be reciprocated vertically, the said piston carrying upon its upper end a head or frame, 50, upon which normally rests a frame, 3, that supports the flask or flasks, 4, and a pattern-holding plate or plates, 5, upon which the patterns, 6, are secured. The pattern-plate is independent of the flask-supporting frame, and is vertically movable with relation thereto, in order that the patterns may be withdrawn from the sand after the molding operation has been completed. The machine is furnished with a ramming-head, 7, to which are secured one or more blocks, 8, according to the number of flasks to be rammed, and these blocks are adapted to enter between the walls of the respective sand-boxes on the flasks in order to pack the sand firmly upon and around the patterns. The piston, carrying the patterns and flasks, is moved upwardly, to bring the

sand in the flasks into engagement with the blocks, 8, by any suitable power, as steam, water, or air, which is introduced into the cylinder, 1, through the pipe, 9, Fig. 1. This pipe is shown as being provided with a three-way valve, 10, Figs. 2 and 3, which is operated by a lever, 11. When the valve is in the position shown in Fig. 3, the steam (which is preferably used) passes through the valve and enters the cylinder, at 12, Figs. 1 and 4, and forces the piston to its highest point, thereby securing a proper ramming of the sand in the flask. The lever, 11, is then operated to turn the valve, 10, into the position shown in Fig. 2, thereby shutting off the entrance of steam, and opening the pipe, 9, into the exhaust-pipe 13. The piston now descends by gravity, the patterns being withdrawn from the sand by such descent. The head, 7, with its blocks, 8, is swung to one side, as shown by dotted lines in Fig. 4, to enable the flasks to be conveniently reached, and the flasks are removed.

The arrangement of the parts by which the withdrawal of the patterns from the sand is effected, is as follows: The rigidly-attached head or frame, 50, on the upper end of the piston, carries cylinders or socket-pieces, 51, that are occupied by guide-rods, 52, Figs. 1 and 4, depending from the flask-supporting frame, 3, so that the piston may move vertically independently of the frame, 3. On each side of the machine, bars, 53, are pivoted at one end to the head, 50, and are connected intermediate of their length to the flask-supporting frame, by links, 54, which are pivoted at their lower ends to said bars, and at their upper ends to hanger-arms, 55, depending from and attached to the flask-supporting frame, 3. Arms, 56, are pivoted at their lower ends upon the cylinder-head, and springs, 57, tend to swing them toward the central, vertical line of the machine. When the piston is about to move upwardly, that the ramming-operation may be performed, the parts are in the position shown in Fig. 4. As the piston ascends, the free end of each bar, 53, moves up its adjacent arm, 56, until it passes above the shoulder, 58, on the arm, when the arms are swung inward by the springs, against the ends of the bars. When the piston begins to descend, the bars, 53, are carried downward with it until their free ends rest upon said shoulders, which now form fulcrums for the bars, and the descent of the flask-supporting frame is thereby retarded, but not stopped. The pattern-plate continues to descend with the piston, and as its rate of speed is greater than that of the frame, 3, or differential with relation thereto, the patterns are gradually withdrawn from the molded sand. After the flasks have been removed, the workman's foot is applied to a toe-piece, 59, on the arm, 56, when the bars, 53, are released from the shoulders, 58, and the frame, 3, and bars, 53, fall by gravity to the positions shown in Fig. 4.

In a machine organized as above described,

it has been found necessary to employ a "stripping-plate," fitting closely around the patterns, in order that the sand at the lower edges of the molds shall not break away or crumble off, when the patterns are withdrawn; and the warming of the patterns has also been resorted to for this purpose. The construction of such stripping-plates, and such warming, form a material expense in the molding operation, and the stripping-plates can be conveniently applied only to the exterior outline of the patterns. One object of my invention is to do away with such plates, and the warming of the patterns. This object I accomplish by employing a rapping-device, which, by its operation, very slightly agitates the patterns laterally with relation to the sand, and frees them from any clinging particles of sand, so that the molds made by the patterns will be left clean, and sharp at all the edges, when the patterns are withdrawn, thereby securing a mold which is superior to one where a stripping-plate has been used, which plate can only protect the edges of the mold that are in contact therewith.

The agitator or rapping-device, 14, shown in the drawings, consists of a movable block, or hammer, 15, which is mounted to be reciprocated by suitable means, in a barrel or case, 16, Figs. 9 and 10. To secure the greatest durability, this hammer is preferably provided at one end with a hardened steel plug, 17, and at the other end with a similar plug, 18, which plugs receive the impact of the hammer against the two screws, 19, 20, threaded into the respective ends of the case, 16. These screws are, also, preferably hardened on their inner ends, and are made adjustable, so as properly to control the amount of movement of the hammer under all, or varying circumstances. A spring, 21, whose office is to return the hammer to its normal position, shown in Fig. 9, bears at one end upon the hammer, and at the other upon a screw-plug, 22, which plug enables the spring to be conveniently inserted, and furnishes a means by which the same can be variably compressed. The case, 16, is provided within two openings or ports, 23, 24, the former to admit the steam, or power to drive the hammer toward the right hand, and into the position shown in Fig. 10, and the latter to allow said steam to exhaust, as shown by the arrow in said figure, when the hammer has been desirably moved in such direction.

To govern the inlet of steam, the device is furnished with a suitable valve, 25, Figs. 4 and 6, which is shown as adapted to be opened by a bent lever, 26, connected to the outer end of the valve-stem and pivoted upon an arm, 27, projecting from the valve-body. The valve is held closed, by a spring, 28, operating upon the lever, or by any other suitable means. A flexible tube, 29, Figs. 1 and 7, is shown as connecting the device with a pipe, 30, which enters the steam-supply pipe above its valve, 10.

The agitating-device may be applied to the machine so as to operate upon the flask, or upon its supporting-frame, as will be readily understood, but I prefer to have it operate upon the pattern-holding plate, or an attachment thereto. For convenience, the pattern-plate is secured to a frame, 47, Figs. 1, 4 and 5, which frame virtually forms a part of the plate, and from this frame an arm, 48, is shown as projecting laterally, Figs. 4, 5 and 7, to which the rapping-device is secured, so that the movements of the hammer will impart a slightly tremulous motion, or agitation to the pattern-plate, and thereby free the patterns from sand and loosen them in the molds, as shown in Fig. 8, where the clearance between the pattern and mold is greatly exaggerated in order that the effect may be understood. As a matter of fact, although this agitation secures the result desired, it does not perceptibly or measurably enlarge the molds.

The rapping-device may be brought into operation when the ramming has been completed, but I prefer to cause the device to act before such completion, in order that it may perform the further office of causing the sand to settle into more intimate contact with the patterns.

Various means may be employed for bringing the device into action, but the means shown consist of a vertical bar, 31, Fig. 4, projecting upwardly from the head of the cylinder 1, and having an inclined portion, 32, which opens the valve, 25, when the lever, 26, comes in contact therewith during the rising of the piston, 2, and the parts which it supports. The length of time that the device continues in action will depend upon the edge-contour of the bar, 31, which is shown as straight, above the incline, 32, so that the rapping operation continues while the ramming of the sand is being effected and until the patterns have been partially withdrawn.

In order that the rapping may be the more effective for the purpose described, I prefer to mount the pattern-plate upon a yielding support. Such a support is shown in Figs. 1, 4 and 5, to consist of springs, 33, which are placed in sockets in the head, 50, the springs bearing on their upper ends upon the frame, 47, to which the pattern-plate is secured, as hereinbefore described. This yielding support for the pattern-plate performs a further useful office, which will now be explained.

In order to save time, it is desirable that the piston shall descend as speedily as properly possible after the ramming has been effected; but, as a sudden downward movement of the pattern-plate would be likely to disturb the molds made by the patterns, the springs, 33, serve to hold the patterns in contact with the molds during the initial portion of such downward movement of the piston, and until the springs have fully expanded, when the pattern-plate will move with, and at the same speed as the piston until the patterns have passed out of the sand, into the po-

sition indicated in Fig. 5, without in any way adding to the time of the piston's descent. After the springs, 33, have expanded, the pattern-plate is caused to move downwardly with the piston by the engagement of the head, 50, with nuts or stops, 60, located on the lower ends of guide-pins, 61, which pins depend from the plate, 47, and pass through holes in the head, 50, as shown in Fig. 1. Preferably the springs, 33, are seated on adjusting screws, 34, Fig. 5, by which the force of the springs can be desirably regulated.

As hereinbefore explained, the piston, 2, descends by gravity, when the steam has been shut off and the exhaust-pipe opened; but as such descent, unless checked at the latter end, would produce an undesirable jar, I prefer to employ a valve, in the exhaust-pipe, which shall prevent such a result. Such a valve, 35, is shown in Fig. 11, and its application to the exhaust-pipe is indicated in Fig. 7. When the exhaust-pipe is opened, the pressure of the steam in the cylinder, 1, will raise the valve-spindle, 36, from its seat, 37, against the pressure of the spring, 38 (which spring-pressure can be regulated by the adjusting-screw, 39, according to the weight of the piston and the time desired for its descent) and the steam will quickly pass out of the cylinder until the pressure therein is reduced below that of the spring, 38, when said spring will close the valve, and the remaining steam will be forced slowly to escape through a leak-slot or slots, 40, in the valve-seat, or other small leak-opening from the chamber, 41, into the chamber, 42, thereby cushioning the piston, and bringing it to rest without jar.

It is desirable that the sprue-plug, 43, Figs. 4 and 5, shall be removed before the flask is taken from the machine, and as there is danger that said plug, if unsupported at the bottom, may be forced downward, somewhat, into the molded sand when the plug is grasped to be withdrawn, and the molds be thereby affected, I have provided means for supporting such plug at the time it is applied and when the flask has fully descended. These means are shown to consist of a post, 44, which is located in axial, vertical alignment with the plug, passes loosely through a hole, 45, in the pattern-plate, and rests upon a plate, 46, which is shown as supported upon the hanger-arms, 55, that depend from the flask-frame, 3, Fig. 1. On the plate, 46, the posts, 44, can be mounted so as to support the sprue-plugs wherever they may be located in the sand.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a molding-apparatus, the combination of a flask-supporting frame; a pattern-holding plate independent thereof and movable laterally in a horizontal plane with relation thereto; and a power device for agitating the plate and frame relatively to each other, substantially as and for the purposes specified.

2. In a molding-apparatus, the combination of a flask-supporting frame; a pattern-hold-

ing plate independent thereof; and a laterally yielding support for said plate, substantially as set forth.

3. In a molding-apparatus, the combination
5 of a flask-supporting frame; a pattern-holding plate independent thereof; a yielding support for said plate; and a device for agitating the plate and frame relatively to each other, substantially as and for the purposes specified.

10 4. In a molding-apparatus, the combination of a flask-supporting frame; a pattern-receiving plate independent thereof, movable laterally in a horizontal plane with relation thereto and provided with a projecting arm; and a
15 device mounted on said arm, for agitating the plate, substantially as and for the purposes specified.

5. In a molding-apparatus, the combination
20 of a ramming-head; a flask-supporting frame; a pattern-receiving plate independent of said frame, said frame and plate being movable to and from the head; means for moving the frame and plate toward the head; a device for agitating the plate and frame relatively
25 to each other; and means for automatically bringing said device into action during such movement of said plate, substantially as set forth.

6. In a molding-apparatus, the combination
30 of a flask-supporting frame; a pattern-receiving plate; and a support for the sprue-plug,

which is independent of said plate, substantially as set forth.

7. In a molding-apparatus, the combination
35 of a piston; a flask-supporting frame, and a pattern-receiving plate mounted on said piston and movable with relation to each other; springs upon which said pattern-plate is supported by the piston; and guides and stops for defining the movement of said plate relatively to the piston, substantially as set forth. 40

8. In a power-molding apparatus, the combination of a cylinder; a piston mounted therein; a flask-supporting frame and a pattern-receiving plate mounted on said piston
45 independent of each other; a yielding support for said plate; and means for securing a differential, downward movement of said frame and plate, substantially as set forth.

9. In a fluid-power molding-apparatus comprising a cylinder, a piston mounted therein,
50 a flask-supporting frame and a pattern-receiving plate mounted on said piston, a valve located in the exhaust-passage from said cylinder, having an adjustable spring for seating the valve, and a leak-orifice, whereby the
55 piston is cushioned in its descent, substantially as set forth.

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