No. 606,779.

Patented July 5, 1898.

G. FLICKINGER.

MOLDING MACHINE.

(Application filed July 6, 1896.)

(No Model.)

3 Sheets—Sheet 1.

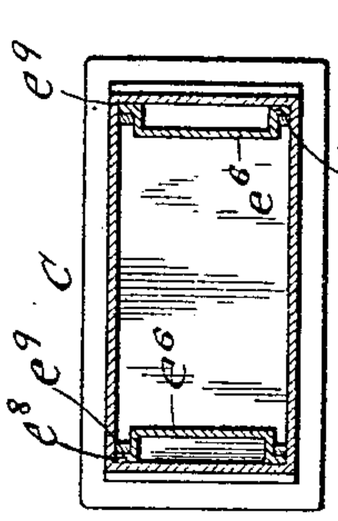

Fig. 12.

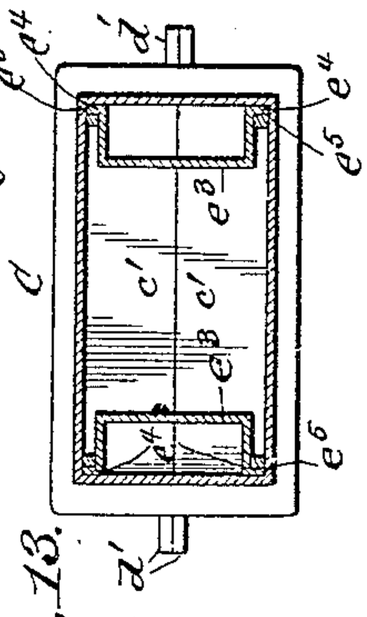

Fig. 13.

Fig. 1.

Fig. 11.

WITNESSES:

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Fig. 3.

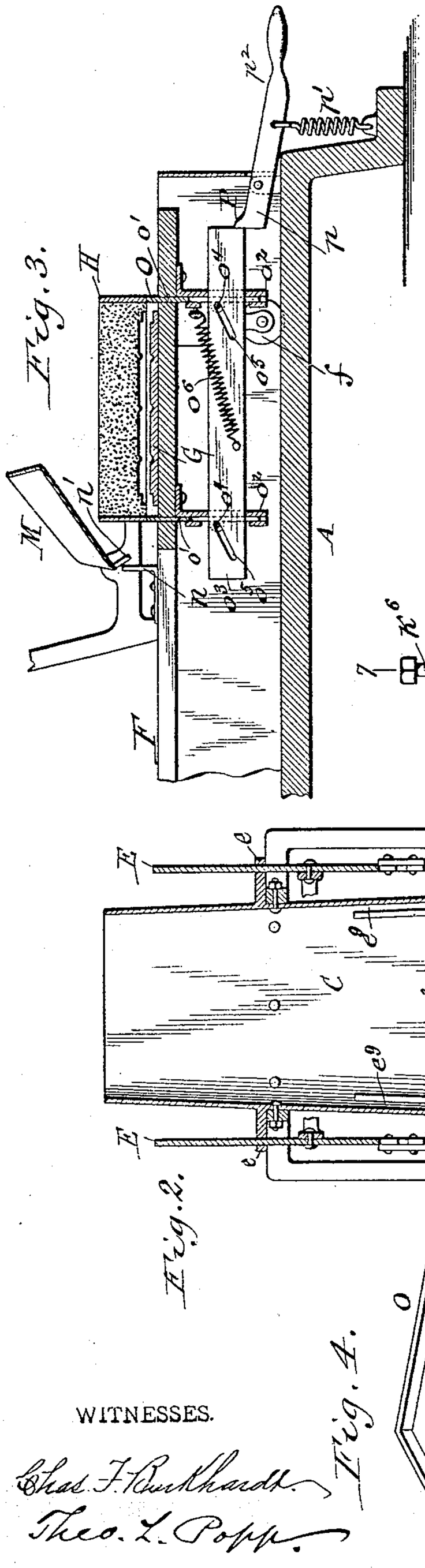

Fig. 5.

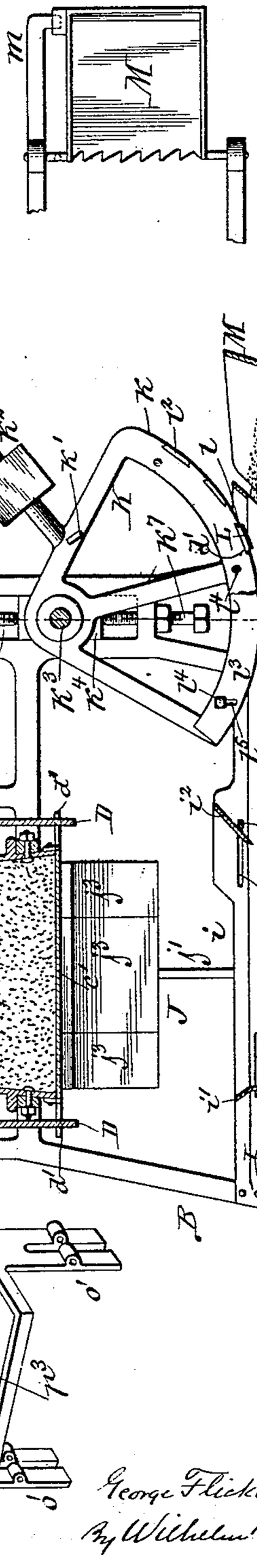

Fig. 2.

Fig. 4.

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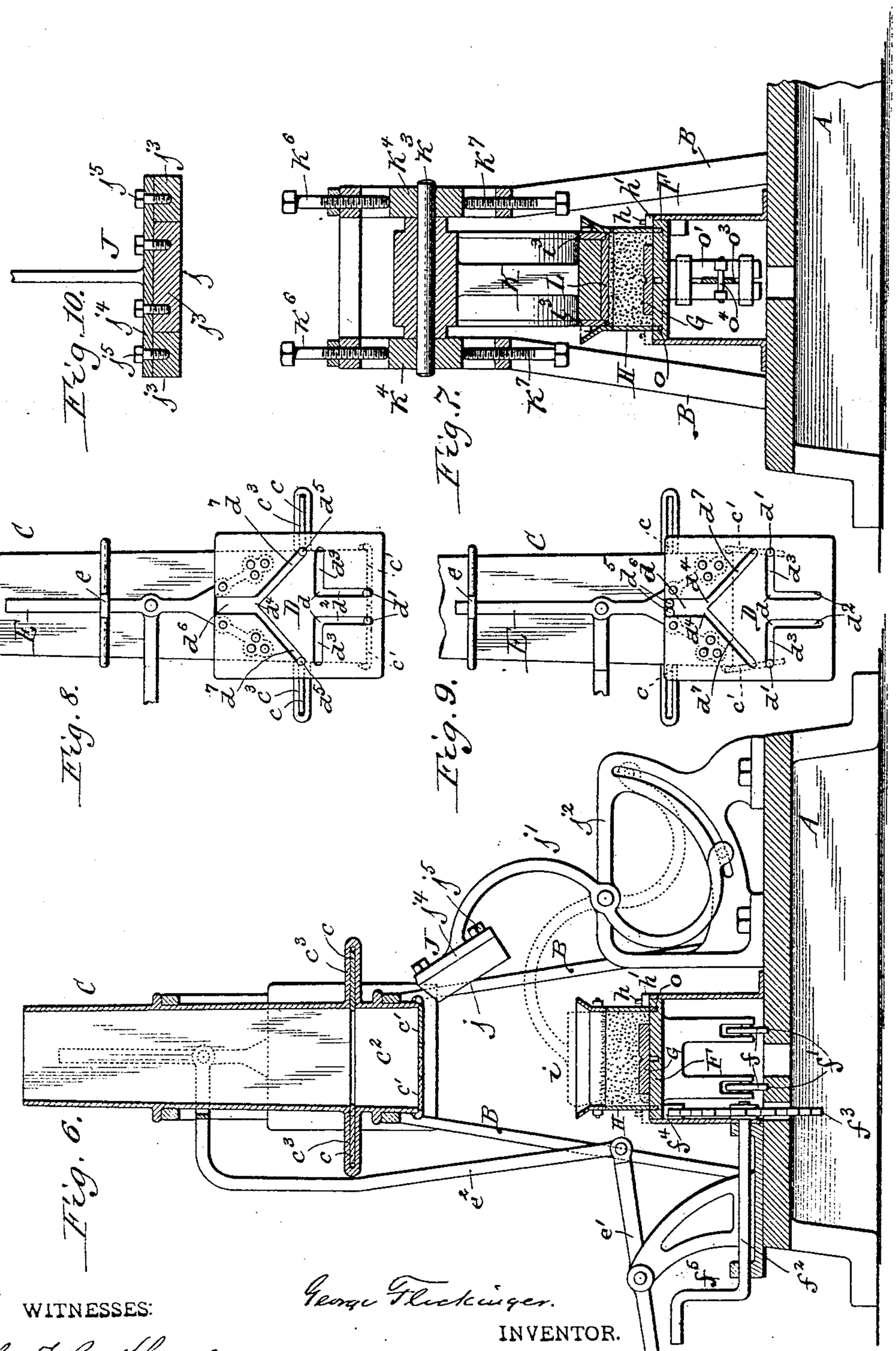

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UNITED STATES PATENT OFFICE.

GEORGE FLICKINGER, OF BUFFALO, NEW YORK, ASSIGNOR OF THIRTY-THREE FIFTIETHS TO CHARLES A. HAGER AND GUSTAVUS STEINWACHS, OF SAME PLACE.

MOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 606,779, dated July 5, 1898.

Application filed July 6, 1896. Serial No. 598,198. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FLICKINGER, a citizen of the United States, residing at Buffalo, in the county of Erie, in the State of New York, have invented a new and useful Improvement in Molding-Machines, of which the following is a specification.

This invention relates to a machine for making molds for castings, and has for its object to produce a machine for this purpose whereby perfect molds can be economically and expeditiously made.

In the accompanying drawings, consisting of three sheets, Figure 1 is a side elevation of my improved molding-machine, showing the molding-flask underneath the sand-hopper. Fig. 2 is a longitudinal sectional elevation of the same on an enlarged scale, showing the molding-flask underneath the compressor. Fig. 3 is a fragmentary sectional elevation similar to Fig. 2, showing the mold in its outermost position on the bed. Fig. 4 is a perspective view of the flask-elevating frame. Fig. 5 is a top plan view of the striker which removes the surplus sand from the flask. Fig. 6 is a vertical cross-section, on an enlarged scale, on line 6 6, Fig. 1. Fig. 7 is a vertical cross-section on line 7 7, Fig. 2. Figs. 8 and 9 are fragmentary side elevations of the sand-hopper and the valve-operating mechanism, showing the latter in different positions. Fig. 10 is a fragmentary longitudinal section of the packer. Fig. 11 is a sectional elevation of the sand-hopper provided with filling-pieces for reducing the discharge of sand. Figs. 12 and 13 are horizontal sections on lines 12 12 and 13 13, Fig. 11, respectively.

Like letters of reference refer to like parts in the several figures.

The main frame of the machine consists of a base or bed A and two standards B B, arranged on the front and rear sides of the bed.

C represents a feed-hopper, from which a measured quantity of molding-sand is delivered into each molding-flask. This hopper is supported on the standards above the bed and is flared or gradually enlarged from its upper receiving end toward its lower or delivery end, so that the sand will not become clogged in the hopper, but will always tend to clear itself and flow freely downward through the hopper.

c c represent two upper cut-off valves, and *c' c'* two lower cut-off valves, whereby the discharge of sand from the hopper is controlled. The lower valves are pivoted to the front and rear sides of the hopper at the lower end thereof and are adapted to swing inwardly and upwardly into a horizontal position, so that the free ends of both valves meet and close the hopper, as shown in full lines, Fig. 6, or downwardly and outwardly into a substantially vertical position, as shown by dotted lines in Fig. 9, so as to open the lower end of the hopper and permit the sand to escape. The upper cut-off valves are arranged in the hopper above the lower cut-off valves a sufficient distance to form a measuring space or chamber c^2 between the upper and lower valves, the capacity of this chamber being sufficient to supply the necessary sand for making one mold. The upper valves are guided in horizontal ways c^3, formed in the sides of the hopper, and are capable of moving inwardly toward each other until their inner ends meet and cut off the passage of the sand at this part of the hopper or outwardly until their inner ends are flush with the sides of the hopper and permit the passage of the sand. Upon closing the lower valves and opening the upper valves the sand moves downwardly in the hopper by gravity and fills the measuring-space between the upper and lower valves, and upon subsequently closing the upper valves and opening the lower valves the measured quantity of sand drops from the measuring-space into the flask, which latter is underneath the outlet of the hopper when its lower valves are opened.

D D represent two vertically-movable actuating or shifting plates which are arranged on opposite sides of the hopper and whereby the upper and lower valves are opened and closed alternately. Each of these plates is provided in its lower portion with two slots *d d*, which receive laterally-projecting pins *d' d'* on the adjacent ends of the lower valves. Each of these lower slots consists of an inner vertical portion d^2 and an upper horizontal portion d^3, extending outwardly from the up-

per end of the vertical portion, as shown in Figs. 8 and 9. When the shifting plates are depressed into their lowermost position, the pins of the lower valves are arranged in the outer ends of the horizontal portions of the lower slots, as shown in Fig. 9, in which position of the parts the lower valves are opened fully. Upon raising the shifting plates the horizontal slots move the pins of the lower valves inwardly, thereby raising the free ends of these valves, and when these pins reach the inner ends of the horizontal slots the lower valves are closed. During the continued upward movement of the shifting plates the pins of the lower valves move through the vertical portions of the lower slots, and the valves are not affected by this portion of the movement of the shifting plates. During the first portion of the subsequent downward movement of the shifting plates the lower valves are not affected until the pins of the valves clear the vertical portions of the lower slots, after which these pins enter the horizontal portions and the lower valves are opened by the latter portion of the downward movement of the shifting plates. Each of the shifting plates is provided in its upper portion with two slots d^4 d^4, which receive laterally-projecting pins d^5 on the adjacent ends of the upper cut-off valves. Each of these upper slots consists of an inner vertical portion d^6 and an outer oblique portion d^7, which extends outwardly and downwardly from the lower end of the vertical portion, as shown in Figs. 8 and 9. The vertical portions of the upper slots in each plate are preferably united into one slot equal to the width of both slots, as shown in Fig. 8. When the shifting plates are depressed into their lowermost position, the pins of the upper valves are arranged in the upper ends of the vertical portions of the upper slots, as shown in Fig. 9, in which position of the parts the upper valves are fully closed. Upon raising the shifting plates the pins of the upper valves during the first portion of this movement move downwardly in the vertical portion of the upper slots to the lower ends thereof without shifting the upper valves, after which the pins enter the oblique portions of these slots and the upper valves are opened by the last portion of the upward movement of the shifting plates, during which time their pins move from the inner to the outer ends of the oblique slots. The relative arrangement of the upper and lower slots in the shifting plates is such that the upper valves do not begin to open until the lower valves have been fully closed during the upward movement of the shifting plates, and the lower valves do not open until the upper valves have been fully closed during the downward movement of the shifting plates, thereby effectually preventing any sand from escaping from the hopper without being measured.

The shifting plates are guided in their vertical movements by means of guide-bars E, extending upwardly from the plates and guided in lugs e on the sides of the hopper, and the plates may be raised and lowered in any suitable manner—for instance, by a hand-lever e', pivoted on the front portion of the bed, and a connecting-rod e^2, pivoted with its upper bifurcated portion to the guide-bars of the shifting plates and with its lower end to the hand-lever. In order to permit of reducing the capacity of the measuring-chamber when smaller flasks are used to make smaller molds, filling-pieces e^3 are provided, which are detachably secured to the inner side of the hopper by means of vertical flanges e^4, formed on the ends of the filling-pieces and engaging with vertical grooves e^5, formed on the inner side of the hopper. A number of such filling-pieces of different sizes are provided to enable the capacity of the measuring-chamber to be varied according to the size of the flask, these filling-pieces being readily interchanged by sliding them into or out of the grooves in the hopper. When the filling-pieces are used, the sand is prevented from lodging on the upper ends of the same by means of deflecting-pieces e^6, which are provided with inclined sides e^7 for deflecting the sand between the filling-pieces and which are detachably secured to the hopper by means of vertical flanges e^8, formed on the deflecting-pieces and engaging with grooves e^9 in the hopper in the same manner in which the filling-pieces are secured to the hopper.

F represents a longitudinally-movable carriage which supports the pattern and flask and carries the same toward and from the molding mechanism. This carriage is provided on its underside with supporting-wheels f, which run in guideways or grooves f', arranged on the top of the base, and is moved forward and backward by any suitable mechanism. As shown in the drawings, the carriage is reciprocated by means of a crank-shaft f^2, journaled transversely in bearings on the front side of the base and provided on its inner end with a gear-wheel f^3, which meshes with a gear-rack f^4 on the under side of the carriage, and at its outer end with a crank f^5 for operating the shaft.

G represents the pattern, which is fastened upon the upper side of the front end of the carriage, and H is the flask, which is detachably secured to the carriage around the pattern by means of vertical pins h, secured to the carriage and entering perforated ears h' on the flask.

I I represent two longitudinal retaining rails or bars which bear upon the upper ends of the side walls of the flask as it is carried past the molding mechanism and whereby the flask is held against displacement and the sand is confined on the flask during the molding operation. These bars may be supported in any suitable way—for instance, by securing them to the standards B.

i is a funnel which is mounted on the inner portion of the retaining-bars and which serves

to direct the molding-sand into the flank as it drops from the sand-hopper. The inner and outer transverse ends i' i^2 of the funnel are capable of adjustment toward and from each other on the longitudinal sides of the funnel to permit of adjusting the size of the funnel to the length of the flask which is used for molding. A simple means for effecting this adjustment consists of clamping-bolts i^3, secured to the transverse ends of the funnel and engaging with horizontal slots i^4, formed in the longitudinal sides of the funnel.

J represents a preliminary packer which is adapted to condense or cake and flatten the sand in the upper portion of the mold preparatory to effecting the final and complete packing and condensing of the sand around the pattern. This packer has the form of a rectangular block of nearly the same size as the flask and is provided with a flat face j, which is adapted to press down upon the sand in the flask. This packer may be moved toward and from the flask by means of a rock-lever j', which is pivoted to a bracket j^2 on the rear portion of the base and which carries the packer on its upper arm, while its lower arm is provided with a handle for operating the lever. In order to permit of adjusting the packer to different sizes of flasks, the packer is built up of a number of sections j^3, which are fastened to a supporting-head j^4 on the upper arm of the packer-lever by bolts j^5. By shifting these sections on the packer-head the desired packing-surface can be readily obtained. After the sand has been caked and flattened on the top of the flask the latter is carried outwardly by the carriage and past the mechanism which finishes the compressing and molding of the sand in the flask. During the initial portion of the outward movement of the flask a portion of the surplus sand on the flask is removed by the inclined front side of the funnel, which serves as a scraper.

K represents a rotary compressor whereby the entire body of sand is compacted into the flask and firmly pressed around the pattern. This compressor preferably has the form of a segment, which is pivoted at its upper end to the standards and hangs with its face k in the path of the upwardly-projecting sand in the flask.

The inward movement of the compressor is limited by a stop k', arranged on one side thereof and engaging against one of the standards. When the compressor is in its innermost position, the outer end of its face is arranged in the path of the projecting sand in the flask, and the compressor is normally held in this position by a weight k^2, which is mounted on the compressor in front of its pivot. As the flask is moved outwardly the sand which projects above the top of the flask engages with the face of the compressor, whereby the latter is turned, and the sand is at the same time compressed. The face of the compressor is of such width and length that all of the sand is thoroughly packed in the flask. After the latter in its outward movement becomes disengaged from the compressor the latter is immediately restored to its normal position by gravity. The required pressure of the packer upon the sand is only so much as is necessary to flatten out the top of the pile of sand which is dumped into the flask and to form a flat compact crust on the sand. This crust forms a base on which the rolling compressor operates and which enables the compressor to obtain a firm grip on the sand for forcing the same downwardly into the flask. It has been found in practice that when the surface of the sand has not been previously flattened and slightly packed the sand is pushed forwardly off from the flask by the rolling compressor instead of being compacted downwardly into the flask, thereby producing loose and imperfect molds. In order to enable the pressure upon the sand to be regulated, the pivot k^3 of the compressor is journaled with its ends in bearings k^4, each of which is capable of being adjusted vertically in a guideway k^5 in one of the standards by means of adjusting-screws k^6 k^7, arranged in screw-threaded openings in the standard and engaging, respectively, against the top and bottom of the bearing. Upon loosening the upper screws and tightening the lower screws of both bearings the compressor is elevated and the pressure on the sand in the flask is decreased, while upon reversing the action of the screws the compressor is lowered and the sand is packed more firmly in the flask. In some kinds of molding it is necessary to compact the said more densely in certain portions of the flask. This is accomplished by providing the face of the compressor with supplemental pressure-blocks L, which project outwardly beyond the face of the compressor and are so arranged that they bear upon those portions of the sand in the flask which require additional pressure. These supplemental pressure-blocks are preferably detachably connected with the compressor by means of dovetail tenons l, formed on the blocks and engaging with correspondingly-shaped mortises l' in the face of the compressor. When the pressure-blocks are not used, the mortises are filled, so as to be flush with the face of the compressor, by means of dovetail filling-pieces l^2, fitted into the mortises. The pressure-blocks are held against lateral displacement on the compressor by means of retaining-plates l^3, bearing against the ends of the blocks and movably secured to the sides of the compressor by means of bolts l^4, passing through slots l^5 in the retaining-plates.

M represents a striker or scraper whereby the surplus sand is scraped off flush with the upper side of the flask after the latter has passed the compressor. This striker has the form of a flat-bottom scoop, the front edge of which is toothed or serrated, so as to form a cutter. The striker is pivoted near its front or cutting edge to the standards, and its

downward movement is limited by a stop m on one of the standards, against which it is normally held by a spring m'. When the striker rests on the stop m, its bottom is arranged in its operative position and horizontally in line with the top of the flask, so that the striker will cut or scrape off the sand which projects above the top of the flask as the latter passes outwardly underneath the striker. After the flask has passed the striker the latter is turned on its pivot, so as to dump the sand which it cuts off, by means of a tappet or lug n, arranged on the carriage and adapted to engage with a depending arm n' on the striker for tipping the latter after the flask has passed, as shown in Fig. 3. After the flask has passed the striker the flask containing the finished mold is lifted from the pattern during the remaining portion of its outward movement by an elevating mechanism which is constructed as follows:

O represents a vertically-movable lifting-frame which engages with the lower edge of the flask and which is fitted into grooves formed in the top of the carriage, so as to be flush therewith. This frame is provided with depending bifurcated stems o' on its front and rear cross-bars, which are guided in ways formed in hangers o^2, depending from the under side of the carriage.

o^3 is a longitudinally-movable shifting bar whereby the lifting-frame is raised and lowered. This bar is guided in openings formed in the hangers and passes through the bifurcated stems of the lifting-frame. The latter are provided with transverse pins o^4, which engage with inclined slots o^5, formed in the shifting bar. The slots are so arranged that upon moving the shifting bar inwardly with reference to the carriage the lifting-frame, together with the flask, is raised, while upon moving this bar outwardly the lifting-frame is lowered and the flask is permitted to rest on the carriage.

The shifting bar is normally held in its outer position for lowering the lifting-frame by means of a spring o^6, secured with its ends to said bar and one of the hangers.

P is a stop which is arranged on the front end of the bed and which is adapted to engage with the shifting bar for raising the lifting-frame. During the last portion of the outward movement of the carriage the outer end of the shifting bar engages with the stop P, whereby the further outward movement of the bar is arrested, while the carriage continues to move outwardly a short distance independent of the bar, which causes the lifting-frame and flask to be lifted. The stop P consists, preferably, of a lever which is pivoted on the bed and which has its inner or stop arm p normally held in an elevated position in the path of the shifting bar by a spring p', connected with its ends to the bed and the rear arm or handle p^2 of the lever. After the mold has been lifted from the pattern the same is removed by the operator and the handle of the stop-lever is raised, thereby depressing the stop-arm and permitting the spring to pull the shifting bar outward for lowering the lifting-frame. An empty flask is now placed around the pattern, with its ears in engagement with the guide-pins of the carriage, and the latter is then moved inwardly until the flask stands underneath the sand-hopper. During the first portion of the inward movement of the carriage its tappet clears the arm of the striker and permits the latter to resume its normal position with its flat bottom arranged in line with the top of the flask. The carriage and the bed are provided with longitudinal openings which permit the surplus sand which is removed from the flask to drop below the machine.

If it is desired to produce molds in smaller flasks, additional cross-bars may be placed in the lifting-frame to properly support the flasks, as shown by dotted lines p^3, Fig. 4.

Although I have shown the several movable parts of my improved molding-machine arranged to be operated by hand, it is obvious that all of these parts can be operated by suitably-timed gearing which is driven by power. If desired, a compressor may be arranged on each side of the sand-hopper, and a flask-lifting contrivance may be arranged at each end of the carriage, in which case the capacity of the machine would be doubled without an extra expenditure of time, because one flask would be filling while the other is being replaced.

I claim as my invention—

1. In a molding-machine, the combination with the flask-carrier, of a sand-hopper arranged above the carrier and provided with a measuring-chamber, a lower valve pivoted to the hopper at the lower end of the measuring-chamber and provided with a pin, an upper valve sliding transversely in the hopper at the upper end of the measuring-chamber and provided with a pin, and a vertically-movable shifting plate provided with upper and lower slots which receive the pins of the upper and lower valves, respectively, the lower slot consisting of a vertical portion and a horizontal portion extending outwardly from the upper end of the vertical portion, and the upper slot consisting of a vertical portion and an oblique portion extending downwardly and outwardly from the lower end of the vertical portion, substantially as set forth.

2. In a molding-machine, the combination with the flask-carrier, of a sand-hopper arranged above the flask-carrier, and provided with a measuring-chamber, valves arranged at the upper and lower ends of the measuring-chamber, a filling-piece detachably fitted into the measuring-chamber and a deflector detachably secured to the inner side of the hopper above the filling-piece and provided

with an inclined side which deflects the sand beyond the upper end of the filling-piece, substantially as set forth.

3. The combination with the sand-hopper and the flask-carrier, of stationary retaining-bars arranged lengthwise over the sides of the flask whereby the latter is held in place on the carrier during its longitudinal movement, substantially as set forth.

4. The combination with the sand-hopper and the flask-carrier, of stationary longitudinal retaining-bars arranged lengthwise over the flask and adapted to hold the flask on the carrier during its longitudinal movement and two transverse bars secured adjustably at their ends to the longitudinal bars under the hopper, substantially as set forth.

5. The combination with the flask-carrier and the mechanism whereby the same is moved back and forth, of an oscillating compressor having a segmental presser-face and pivotally supported above the path of the flask so as to swing forward when engaged by the flask during the forward movement of the latter with the flask-carrier, and means for moving the compressor backward to its normal position after the flask during its forward movement has cleared the compressor and before the flask-carrier begins its subsequent backward movement, substantially as set forth.

6. In a molding-machine, the combination with the flask-carrier, of an oscillating compressor having a segmental presser-face and pivotally supported above the path of the flask so as to swing forward when engaged by the flask, a weight mounted on said compressor and adapted to move the same backwardly and a stop which arrests the backward movement of the compressor when the front end of its face stands in the path of the sand on the mold, substantially as set forth.

7. In a molding-machine, the combination with the flask-carrier and the sand-compressing device, of a striker or scraper pivoted above the path of the flask and a tappet arranged on the carrier and adapted to turn said striker, substantially as set forth.

8. In a molding-machine, the combination with the flask-carrier and the sand-compressing device, of a scoop-shaped striker or scraper pivoted above the path of the flask and adapted normally to stand with its bottom in line with the top of the flask, a spring whereby the striker or scraper is yieldingly held in its normal position, and a tappet arranged on the carrier and adapted to turn the striker or scraper into an elevated position, substantially as set forth.

9. In a molding-machine, the combination with the flask-carrier, and the vertically-movable lifting-frame adapted to engage with the flask and provided with depending stems, a shifting bar capable of longitudinal movement on said carrier and provided with inclines engaging with said stems, a spring whereby said bar is shifted for lowering the lifting-frame, a stop-lever having a stop-arm and a spring whereby the stop-lever is normally held with its stop-arm in the path of the shifting bar, substantially as set forth.

Witness my hand this 26th day of June, 1896.

GEORGE FLICKINGER.

Witnesses:
THEO. L. POPP,
KATHRYN ELMORE.