

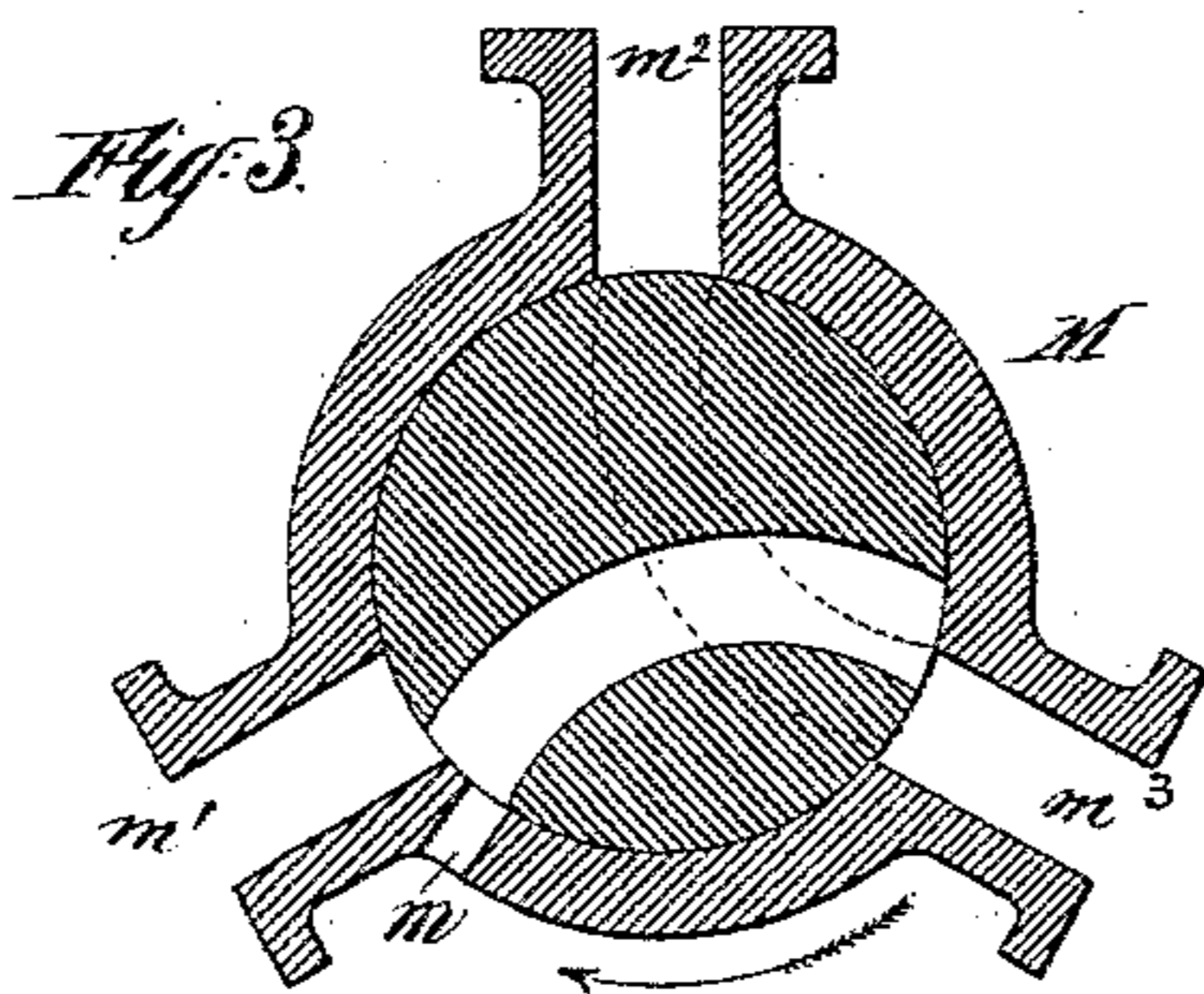
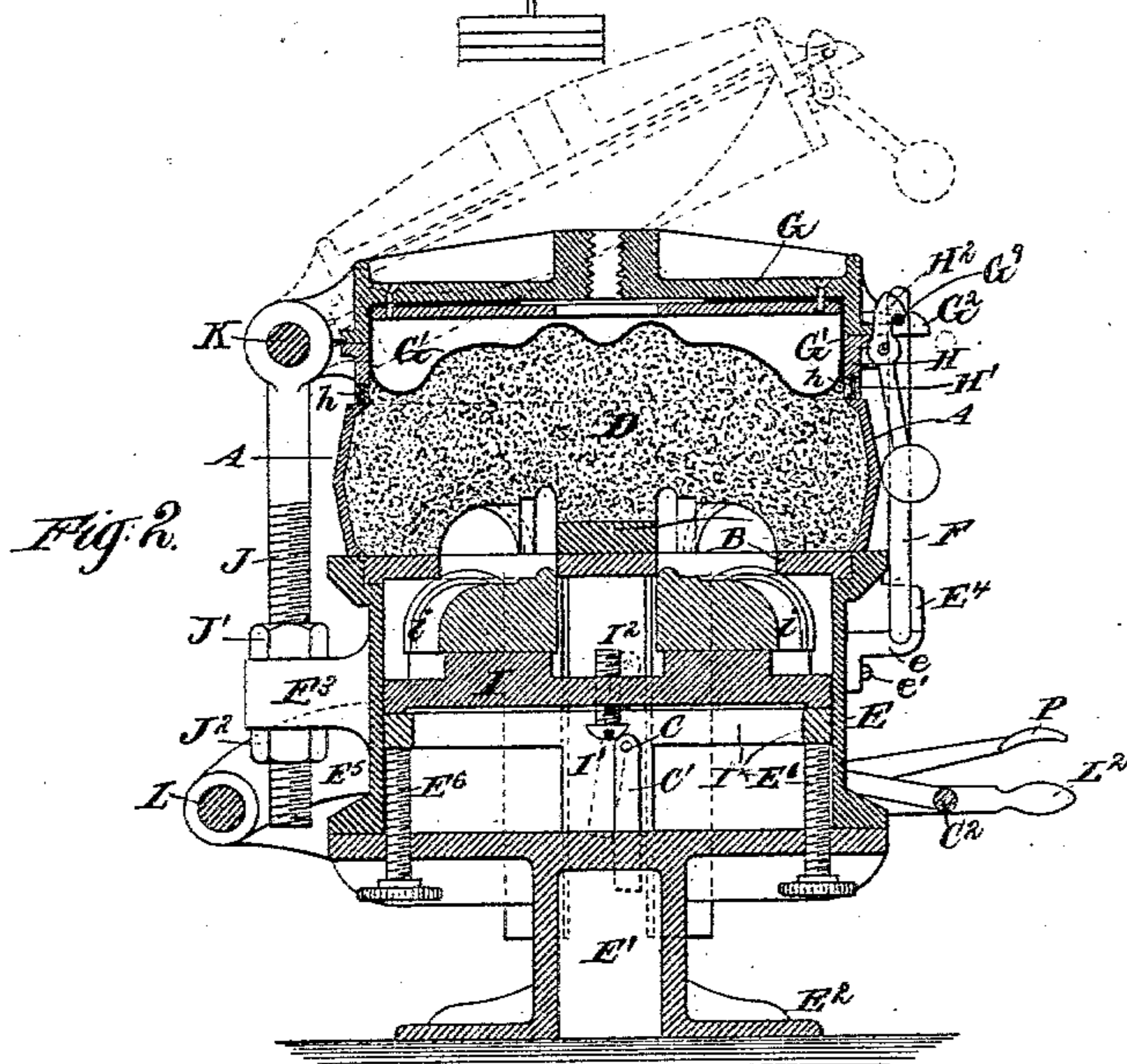
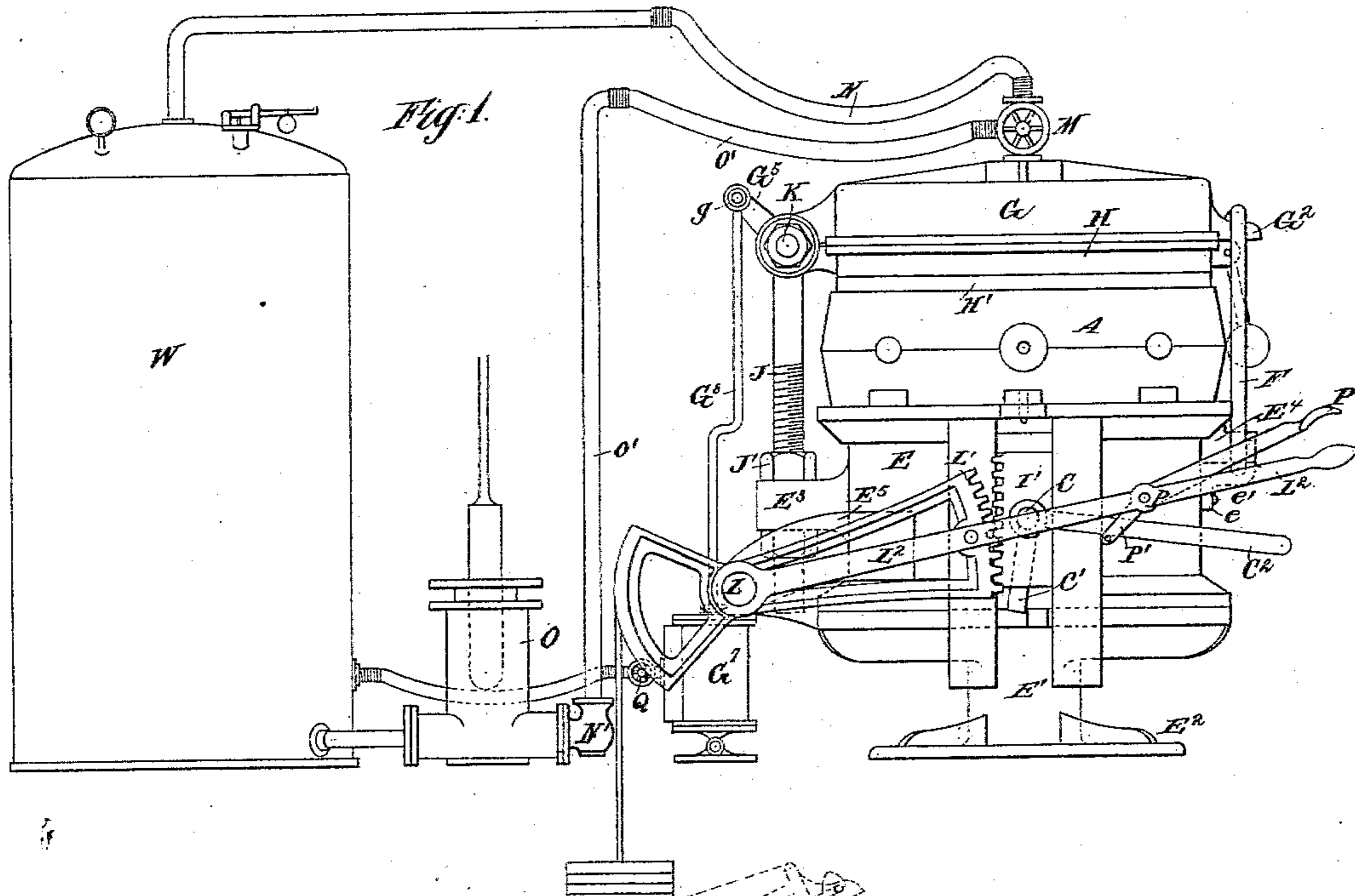
(No Model.)

M. R. MOORE.

MACHINE FOR MAKING MOLDS FOR CASTINGS.

No. 318,784.

Patented May 26, 1885.



Witnesses:  
Charles R. Charles  
M. H. Boyle

Inventor:  
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by his attorney  
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# UNITED STATES PATENT OFFICE.

MATTHEW R. MOORE, OF INDIANAPOLIS, INDIANA.

## MACHINE FOR MAKING MOLDS FOR CASTINGS.

SPECIFICATION forming part of Letters Patent No. 318,784, dated May 26, 1885.

Application filed January 20, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, MATTHEW R. MOORE, of Indianapolis, Marion county, in the State of Indiana, have invented certain new and useful Improvements in Machines for Making  
5 Molds for Castings, of which the following is a specification.

Letters Patent to me dated July 22, 1884, No. 302,349, set forth means for rapidly and  
10 uniformly compressing the dampened "sand" in a flask. I have since devised further improvements.

A stout platen equipped with a diaphragm and connections for introducing compressed  
15 air or other fluid to depress the diaphragm upon the sand is hinged by hinge-posts to the body, so that it may be easily brought into position for use and removed to allow the exchange of the flask. I combine with such  
20 mechanism for operating the pattern through a close-fitting hole in the stripping-plate, which latter I term a "silhouette" or a "silhouette-plate," and provide strong dogs with convenient operating means for supporting the pattern-plate against the great strain to which it  
25 is subjected. I make the hinge conveniently adjustable up and down, to accommodate different heights of flasks and appurtenances. I provide a top box turning on the same hinge.  
30 I provide for conveniently increasing the depth of the top box, to vary the quantity of sand thus stored. I provide an automatic catch for allowing the top box and platen to be worked together for certain movements and  
35 separately for other movements.

The improved machine is compact and conveniently operated. My experiments indicate that it can be worked with great rapidity, the  
40 molds therefrom producing castings of more than usual reliability and perfection.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention as applied to the casting of elbows for  
45 steam or gas pipes, casting four at once. Figure 1 is a general side elevation of the entire apparatus. Fig. 2 is a vertical section through the flask and the immediately adjacent parts. Fig. 3 is a vertical section showing a portion  
50 on a larger scale.

Similar letters of reference indicate corre-

sponding parts in all the figures where they occur.

E is a stout body of cast-iron or other suitable material, certain portions of which will  
55 be designated by additional marks, as E' E<sup>2</sup>.

E' is a post or standard under the center, and E<sup>2</sup> a foot sufficiently extended to afford a stable support.

E<sup>3</sup> E<sup>3</sup> are stout lugs at the back, which receive screw-threaded hinge-posts J, stiffly  
60 held by nuts J' J<sup>2</sup>. Eyes in the tops of these posts J receive a transverse bolt, K, which forms an axis or hinge on which turns a stout platen, G, of cast-iron or other suitable material, carrying on its under face a flexible diaphragm, G', adapted to be depressed to variable  
65 extents by air, water, or other fluid under pressure, introduced through an orifice in the top by means of a flexible hose, N, or other suitable connection. 70

E<sup>4</sup> E<sup>4</sup> are short arms or lugs, which, in conjunction with detachable pieces e, held by the screws e', form stout connections for links  
75 F, adapted to engage over stout projections G<sup>2</sup> on the front of the platen G. The hinge-posts J and links F serve as strong ties to hold the platen to the body E.

In the use of the machine the flasks A are introduced in succession one after another in  
80 the space left between the platen and the body, and the sand D, introduced in liberal quantities, is compressed around the patterns by the depression of the diaphragm. The platen, with the diaphragm, is raised by the disengagement of the links F and the turning of  
85 the platen and its attachments on the hinge K. This allows the flask to be removed and a new one substituted.

I operate by protruding the patterns upward through close-fitting holes in a silhouette-plate below, and depressing them through  
90 such holes to effect the "drawing" of the patterns after the sand has been compacted around them by my machine. This mode of operation has been before proposed, but as heretofore attempted there have been serious practical difficulties in the working. 95

My system of compressing the sand by a yielding force applied on all parts of the upper  
100 surface of the sand, in combination with such mode of working the patterns, is a great ad-

vance in the arts. I have devised means of rendering the action very perfect.

I is the pattern-plate, and *i i* are the patterns. The pattern-plate rests on a skeleton frame, I\*, to which it is secured by screws or other suitable fastenings. (Not shown.) This frame I\* is provided with two wings, I', which traverse in vertical slots in the sides of the body E. Rack-teeth on the back face of each wing I' are engaged by corresponding toothed segments, L', fixed on a rocking shaft, L, supported in arms E<sup>5</sup>, extending rearward from the body E. Levers L<sup>2</sup>, bolted to the segments L', extend forward and allow the attendant to conveniently apply his strength to raise and lower the pattern-plate by operating on the wings I'. The lowering of the pattern-plate I and patterns *i* draws the patterns from the sand. Screws E<sup>6</sup> serve as adjustable stops to determine the extent to which the pattern-plate I and its attachments may be lowered.

B is what is sometimes known as the "stripping-plate." I prefer to term it "silhouette." Its lower surface may have any form to give it proper strength, but for ordinary castings its upper surface should be plane. Holes are cut or otherwise produced in the silhouette accurately corresponding to the patterns.

G<sup>7</sup> is an oscillating cylinder containing a piston, the piston-rod G<sup>8</sup> of which is connected to a pin, *g*, on an arm, G<sup>5</sup>.

A cock, Q, controlled by the attendant, lets on at will the compressed air from the reservoir W, which, pressing on the upper surface of the piston, pulls downward on the pin *g* and raises the platen G. Turning the cock Q in a different position allows the air to escape and the platen G to sink again. The pressure in W is maintained by a pump, O, operated constantly by a steam-engine or other suitable power. (Not shown.) The pump O receives its air from the atmosphere by drawing it in through an automatic valve, N'.

The hinge-posts J are screw-threaded for a long distance. By adjusting the nuts J' J<sup>2</sup> up and down thereon the effective height of the posts may be varied, and consequently the hinge-axis may be raised and lowered.

When the platen is raised by the action of compressed air in the cylinder G<sup>7</sup>, care should be taken to correspondingly lengthen and shorten the link G<sup>8</sup> when the hinge K is raised or lowered. The links F at the front may be correspondingly lengthened and shortened. I prefer, however, in most cases to exchange links. This is effected by having a number at hand of different lengths, and on slackening the screws *e'* and lowering the clamps *e* the exchange may be readily effected and the parts restored to their position again. These changes of length of the hinge-posts J and links F allow the machine to receive flasks A of greatly-varying depth. For small or flat castings shallow flasks may be used. For deeper objects deeper flasks are required.

In preparing to operate, the pattern-plate is raised by the strength of the attendant ap-

plied to the levers L<sup>2</sup> until the patterns are thrust to the proper extent up through their respective apertures in the plate B. It is important to hold them there with unusual firmness, because the force applied by strong pressure over the whole upper surface of the sand in the flask is felt by the pattern-plate in proportion to the area of pattern presented. This downward strain on the pattern-plate is liable in some forms of patterns to be very great. It is in my apparatus received on two dogs, C', standing one on each side and attached to a transverse rocking shaft, C, carried in bearings in the wings I' and controlled by levers C<sup>2</sup>, one on each side, which are connected across the front by a cross-bar, preferably formed in one piece with the levers C<sup>2</sup>, as shown. When the pattern-plate and its connections have been raised to the proper position for use, the gravity of the levers, aided or not by the attendant, deflects the bottom of each dog C' out of the vertical and engages them with a firm support afforded in the body E. They support the pattern-plate and the patterns reliably against all the downward strain that can be applied. When the molding is completed and the pressure is removed and it is desired to depress the patterns, the attendant simply lifts the levers C<sup>2</sup>, thus bringing the dogs C' into the perpendicular position. Then the gravity of the parts, aided, if necessary, by the force of the attendant applied to one or both the levers L<sup>2</sup>, lowers the pattern-plate until its supporting-frame I\* rests on the screws E<sup>6</sup> again.

The flask A may be of any ordinary or suitable construction. I have shown a form which will be made the subject of a separate application for patent, and need not be further described here.

H is what I term the "top piece." It is an open frame or bottomless box of a size and form corresponding to the flask A. It is provided with eyes, by which it is connected to the bolt K, so that it turns on the same axis as the platen G. Its use is to lie on the top of the flask when the sand is applied thereto, and to contain an excess of sand sufficient to more than compensate for the sinking which will be induced by the pressure applied on the upper surface. H<sup>2</sup> is a catch pivoted to the front of the frame and weighted, as shown. It engages with a staple, G<sup>9</sup>, in the front of the platen G.

H' is a removable piece secured by screws *h* on the under face of the top piece, H. When shallow flasks are used, and only a little depth of sand is presented at any point, the sinking of the surface of the sand under the strong pressure of the diaphragm is less than when a deep flask is used. For shallow flasks there need not be so much depth of the top piece. I apply or remove the pieces H' as required to vary the depth of the top piece.

When the platen is lifted, the top piece, H, rises with it, leaving a surplus of sand above the top of the flask which has just been filled,

The excess of sand is removed by striking off with any suitable straight-edged implement. The flask, with its contents, is removed and a similar empty flask introduced.

5 M is a cock having several connections and functions. A passage, *m*, opens into the external atmosphere. Another passage, *m'*, connects to the pipe O', which is provided with the valve N', opening inward, and leads to the suction side of the pump O. Another pas-  
10 sage, *m*<sup>2</sup>, connects to the hose N, which leads to the reservoir W, and another, *m*<sup>3</sup>, leads to the spaces between the diaphragm G' and the rigid platen G.

15 The first step toward the production of the new mold is to disengage the catch H<sup>2</sup> and lower the top piece, H, into its proper horizontal position, resting on the flask A. Then, the sand being introduced to loosely fill both  
20 the flask and the top piece, the platen G is drawn down into the horizontal position, the links F brought up and engaged on the strong projections G<sup>2</sup>, and the cock M is turned to let the compressed air in the hose N into the  
25 space between the platen G and the diaphragm G'. The air flows rapidly and fills the space with a pressure of some forty pounds per square inch. The air under this tension, acting over the whole upper surface of the sand, finds  
30 a firm abutment in the strong and rigid platen G, held down by the hinge-posts J on one side and the links F on the other, and presses downward with an equable force over the whole area of the sand. The depth of sand which  
35 lies over the highest parts of the pattern will be compressed to a certain extent. The greater depths of sand which lie between the patterns will be compressed to the same relative extent, and by reason of the greater depth of  
40 the sand to thus be compressed the upper surface of the sand will sink lower at these points than over the patterns. The result will be a uniform compression of all the sand in the mold, and the diaphragm will lie compressed  
45 firmly and equably against the top of the sand, which latter, with the diaphragm, will lie in the form of hills and valleys. Now, the cock M is turned slowly by the attendant in the direction indicated by the arrow in Fig. 3, and  
50 the surplus pressure is discharged through the aperture *m* into the atmosphere. On turning the cock a little farther connection is made with the induction or suction side of the pump O. The continued working of the pump by  
55 exhausting the air from the diaphragm G' makes a partial vacuum therein. The vacuum will be but slight before the check-valve N' will be lifted and the pump will commence to receive its air in the ordinary way from the  
60 external atmosphere through this valve, but before the check-valve lifts a slight vacuum will be produced, and this will be sufficient to draw up the diaphragm into close contact with the platen. Now, the attendant elevates  
65 the levers C<sup>2</sup> either by taking hold directly of the cross-bar or by acting on the lever P, which is pivoted on the lever L<sup>2</sup> at the point

*p*, and acts on the lever C<sup>2</sup> through a pin carried on the arm P'. This movement brings the dogs C into the vertical position, where  
70 they are ready to descend through the aperture provided in the bottom of the body, and the pattern-plate I and its attachments descend by gravity, aided or restrained, if necessary,  
75 by the strength of the attendant applied through the levers L<sup>2</sup>. The patterns *i* are by this movement drawn downward, leaving their impressions in the compacted sand, which latter is held up by the silhouette-plate. Next,  
80 the attendant disengages the links F, and, either by hand or by the mechanism described, lifts both the platen G and top piece, H, into the position shown in dotted lines in Fig. 2, and  
85 proceeds as before to strike off the surplus sand and remove the flask and supply a new one.

I<sup>2</sup> is a screw tapped through the pattern-plate I, and adjusted to support the central portion of the silhouette-plate B when the pressure of the diaphragm G' is transmitted  
90 downward through the sand received thereon. The edges of the silhouette rest on strong internal shoulders in the body E.

The check-valve N' should be only sufficiently heavy to generate a gentle vacuum in  
95 the space between the platen G and diaphragm G' when the cock M is in the right position. The orifice *m* lets out the excess of pressure when the cock M is turned one way before the vacuum commences to be made, and lets in  
100 air to relieve the vacuum when the same cock is turned the other way before the strong pressure from the reservoir W is let on.

Modifications may be made in the forms and proportions within wide limits. 105

Parts of the invention may be used without the whole.

I can operate successfully by the attendant taking hold directly on the cross-bar, and raising the levers C<sup>2</sup> to liberate the dogs C'. 110

For large machines I can apply power to work the pattern-plate and its attachments up and down, and even to turn the cock M.

I can dispense with the addition H' to the top box, H, or even with the top box itself,  
115 taking care to secure a good surface for the top face of the mold by other means.

For small machines I can dispense with the cylinder G<sup>7</sup> and piston G<sup>8</sup>, to operate the platen and top piece, and can work both by  
120 the force of the hands directly applied. In such case I can partially balance the platen by a weight attached by a cord or chain to one arm or quadrant, as will be obvious.

I claim as my invention— 125

1. In a machine for making molds for castings, the rigid platen G and diaphragm or yielding presser G', connected with the body E by a hinge-joint on one side and detachable links on the other, arranged to operate as  
130 herein specified.

2. In a machine for making molds for castings, the diaphragm G' and means for forcing it with a yielding pressure against the sand

in the flask, in combination with the pattern-plate I, carrying its patterns *i*, and suitable means for operating the latter, combined and arranged to serve as herein specified.

5 3. In a machine for making molds for castings, the hinge-posts J and adjusting means J' J<sup>2</sup>, in combination with the hinged platen G, holding means F, and flexible presser G', arranged to serve relatively to each other and  
10 to a flask and contents substantially as herein specified.

4. In a machine for making molds for castings, the platen G, diaphragm G', and provisions for depressing the latter to force down  
15 the sand, in combination with the top box, H, turning on the same hinge or axis, K, and adapted to contain surplus sand, as herein specified.

5. In a machine for making molds for castings, the addition pieces H', and means for securing them to the top box, H, in combination with the latter and with the platen G and diaphragm G', to allow the depth of the  
20 top box to be varied, as herein specified.

25 6. In a machine for making molds for castings, the catch H<sup>2</sup>, in combination with the top piece, H, platen G, and diaphragm G', arranged to serve as herein specified.

7. In a machine for making molds for cast-

ings, the pump O, hose N, air-reservoir W, and check-valve N', in combination with each  
30 other and with the hinged platen G, diaphragm or presser G', and means for presenting a flask and patterns thereto, all arranged for joint operation, substantially as herein  
35 specified.

8. In a machine for making molds for castings, the reservoir, pump, and pipes N and O', in combination with the cock M, provided with three-way connections, and vent *m*, adapted to allow a pressure upon the diaphragm,  
40 to relieve such pressure, and to induce a partial vacuum at will, as set forth.

9. In a machine for making molds for castings, the air-pressure device G<sup>7</sup>, connection G<sup>8</sup>, rigid platen G, flexible presser G', and the  
45 valves M and Q, controlling connections from the said parts to the compressed-air reservoir W, combined and arranged for joint operation substantially as herein specified.  
50

In testimony whereof I have hereunto set my hand, at New York city, New York, this 10th day of January, 1885, in the presence of two subscribing witnesses.

MATTHEW R. MOORE.

Witnesses:

W. C. DEY,

CHARLES R. SEARLE.