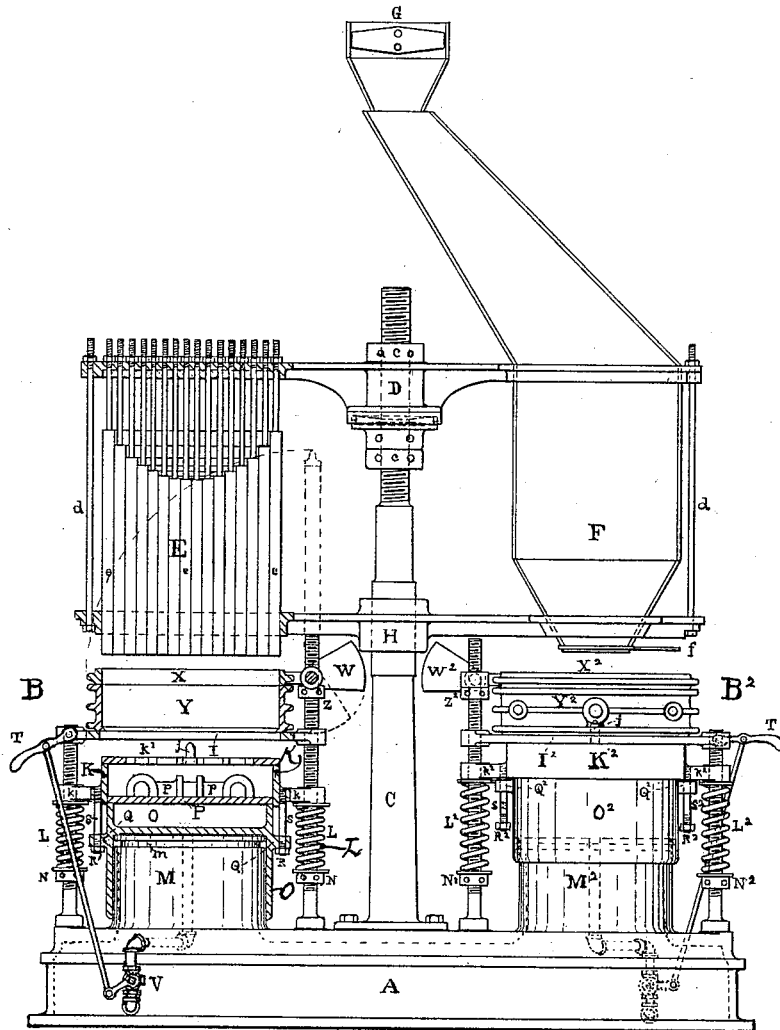


(No Model.)

M. R. MOORE.
SAND MOLDING MACHINE.

No. 346,382.

Patented July 27, 1886.



Witnesses.
Rollin Defries.
Thomas R. Hackley.

Matthew R. Moore
Inventor.

UNITED STATES PATENT OFFICE.

MATTHEW ROBERT MOORE, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO THE
PNEUMATIC COMPANY, OF SAME PLACE.

SAND-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 346,382, dated July 27, 1886.

Application filed May 11, 1886. Serial No. 201,889. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW ROBERT MOORE, of the city of Indianapolis, in the county of Marion and State of Indiana, have
5 invented a new and useful Improvement in Machinery for Making Sand Molds for Castings; and I do hereby declare that the following specification, with the accompanying drawing, which forms part thereof, is such a
10 full, clear, and exact description of my invention as will enable any person skilled in the art to which it pertains to understand, construct, and operate the same without further instruction.

15 My invention consists in an improved form of platen for compacting the sand in the molds, in a novel means for operating the same in relation to the flask, in the apparatus for supplying the sand, and in a new arrangement
20 of mechanism for operating the pattern-slides in pressing and withdrawing the patterns from the sand.

Within the last four years I have made many improvements in sand-molding machinery, and have taken out a number of patents, several of which relate to the construction of the
25 platen for ramming or compacting the sand. These inventions embody in different ways the principle of a presser capable of yielding in any part whenever opposed by a predetermined maximum resistance, the presser being
30 either formed of a flexible material or divided into independently-yielding sections producing the effect of flexibility in enabling the platen to accommodate itself to the irregularities of the pattern to be molded. This principle, which
35 I have the honor of originating, is a new one in the art of molding by machinery, and a very important one, since in the estimation of the competent judges, the practical success of the art depends wholly upon it. With a view of
40 securing to myself, as far as possible, the legitimate reward of the inventor of an improvement so valuable, I have devised various modes of carrying out the principle, and have
45 applied for and been granted Letters Patent covering the use of bags containing fluid, flexible diaphragms backed by fluid-pressure, and of movable sections in a platen backed by fluid-
50 pressure and by springs. The subject of the

present application for Letters Patent embraces a form of sectional yielding presser wherein the sections act in compressing the sand by means of their weight only.

In a former application for patent, now pending, I show the patterns, flask, &c., carried up and forced against the pressing-platen by means of fluid-pressure in a cylinder beneath; but there are separate means of raising the patterns into and withdrawing them from the flask.
60 I now show an arrangement whereby the whole operation of raising the patterns into the flask, forcing the flask up against the platen, lowering the flask, and withdrawing the patterns is performed by fluid-pressure in a cylinder controlled by a single valve. Thereby much complication is avoided and some time saved in operating.

In the former application, above referred to, I have shown an arrangement of sand-molding
70 machinery wherein two molding-benches with flasks, patterns, and means for operating them are connected together so as to revolve horizontally on a pivot, and be brought successively under a stationary sand-hopper for filling and a fixed platen for pressing the flasks.
75 I now show an arrangement wherein one, two, or more stationary molding-benches may be served by means of a sand-hopper and a platen so connected and revolving horizontally that
80 they may be brought over each of the molding-benches in succession.

Referring now to the drawing, which is a central vertical section with parts in elevation, I will more particularly describe the construction and operation of the machine.

A represents a foundation or bed-plate, which is made hollow, for a purpose hereinafter to be mentioned, and serves as a base for the molding-benches B and B², containing patterns and supporting flasks for the two parts of a mold, or for different molds, as may be desired. In the center of the bed-plate A is fixed a strong column, C, carrying at its top an anti-friction bearing, whereon revolves a
90 yoke, D, which supports on its left side, as shown in the figure, the platen E, and on its right side the sand-hopper F. The yoke D is adjustable vertically by means of the nuts
95 c c on the threaded portion of the column C, 100

to accommodate flasks of various heights. The end of the yoke D which carries the platen has the form of a flat plate of the shape and superficial dimensions of the flasks to be molded. It has a stiffening-flange surrounding its lower surface, and is pierced with holes to receive and support the rods or rammers of which the platen is composed. The other end has an open frame to surround and support the sand-hopper F, which is made in such shape that its upper end is directly over the column C, so that it can receive sand from a conveyor or an elevator, G, discharging there while the hopper revolves around the column. The outer ends of the yoke D have lugs, from which depend the long bolts *d d*, supporting the guide-frame H, which loosely surrounds the column C, and has openings, through which the lower ends of the sand-hopper and platen pass. The bottom of the hopper F has a gate, *f*, to control the discharge of sand into the flasks.

The platen E consists of an aggregation of rods or rammers, *e e*, of such length that they are capable by their weight alone of exerting sufficient pressure upon the sand in a flask to properly pack it against a pattern. I prefer to make them of iron, about one inch square, though they may be of any other suitable material, dimensions, or section. Their length will of course depend upon the material used and the pressure required, which latter will vary with the size of machine and character of the sand used. The number and arrangement of the rammers is such that they will loosely fill the top of the flasks to be molded. They are held in loose embrace by the guide-frame H, which allows them to slide freely up and down within it. Their upper ends are drawn down into round rods, which pass loosely through the holes in the yoke D. These ends are threaded and receive nuts, which rest upon the upper surface of D, and so support the rammers. Those rammers which come near the outside, or near bars in the flask, or in any other situation requiring, for any reason, greater pressure than the rest of the flask, have their thicker or square portion made longer than that portion of the others, which makes them heavier in proportion to the greater pressure required. It will readily be seen that if a flask of sand be pressed upward against the bottoms of these rammers, the sand will sink under the weight of each rammer until it acquires sufficient hardness to support the rammer, when no further packing will take place, but the rammer will be lifted and carried up by the sand. If the flask be pressed upward until all the rammers are lifted, and then lowered, it will be found that the sand has been packed to a uniform density proportional to the weight of the rammers, notwithstanding variations in the depth of the sand caused by the irregular thicknesses of the patterns.

The hopper and platen are brought over each of the molding-benches B B² in succes-

sion by revolving the yoke D upon the column C. Two benches are shown; but as they operate independently there might be one only, or any other number, as desired, and a description of one will apply to all. The top of the bench is a flat plate, I, having an opening through it a little larger than the inside, but not so large as the outside, of the flask to be used, so that a flask placed upon I, over the opening, will be supported. Plate I is supported by columns *i i*, projecting from the base-plate A. These columns serve also as guides for the silhouette-frame K, which has lugs *k k*, embracing and fitted to slide upon them. Surrounding the columns *i i*, beneath the lugs *k k*, are spiral springs L L, which rest upon nuts N N, upon a threaded portion of the columns. The lugs *k k*, resting upon these springs, support the silhouette-frame K. Upon the top of the frame is fastened the silhouette or "stripping" plate K², belonging to the pattern to be molded from. The springs L L should be so adjusted by means of the nuts N N, that the surface of the silhouette will be on a level with or a very little above the surface of the bench-top I, the silhouette and top of the frame K being of such size as to pass easily through the opening in I. The frame K has holes in its upper side, outside of the silhouette, into which the flask steady-pins *j j* are inserted. Directly beneath the molding-bench is a projection, M, of the base A, which is turned smooth and provided with a packing-ring, *m*, so that it forms a piston or plunger for the cylindrical cap O, which surmounts it. Suitable projections, *o o*, on the top of the cap O, form a support to which the pattern-plate P, bearing the patterns *p p*, is secured. Q Q are lugs on the sides of cap O, which embrace and slide upon studs S S, projecting downward from the lugs *k k* of the silhouette-frame, their motion being limitable by the nuts R R.

The hollow base A serves as a reservoir for fluid under pressure. A pipe (not shown,) conveys the fluid, which may be either aeriform or liquid, from the compressing-pump or generator to the reservoir. A three-way cock or valve, V, is so arranged as to admit the fluid-pressure through the top of the piston or plunger M, beneath the cap O, and to discharge the same outside or into a pipe (not shown,) which conveys it away. The valve is operated by means of the handle T. Two of the columns *i i* are extended above the bench-top I, and carry nuts *z*, which support the bearings of the sand-box X, the attachments being such as to permit the sand-box to be swung from the horizontal to a vertical position, as shown by the dotted lines. The nuts *z* support the sand-box at the height of the flask above the bench-top I, but do not prevent it being carried up higher when the flask rises with the sand-box resting upon it, as the bearings slide upon the columns *i i*. A counter-weight, W, is attached to the sand-box, which balances it in either position. The

sand-box holds the extra sand to be compressed into the flask.

The operation of the machine may be described as follows: Let the molding-bench B, with the parts I, K, M, O, and P be in the position shown on the left side of the drawing, but with the platen swung aside, the sand-box raised into the vertical position, and the flask removed. The operator, by means of the handle T, opens the valve V and allows the fluid-pressure to flow under and raise the cap O. The springs L L, being relieved of the weight of O and the patterns, expand and carry up the silhouette-frame K until the surface of the silhouette reaches the level of the bench-top I. The fluid continuing to flow, the cap O, bearing the pattern-plate P, slides upward on the studs S S until the patterns *pp* are projected through the silhouette *k*², and the plate P brings up against its under side. The valve is then closed, retaining the fluid admitted to O, so that the parts remain in the position reached. A flask, Y, is placed upon I, the steady-pins in the holes *jj* centering it properly. The sand-box is let down on the top of the flask, and the sand-hopper F swung round over it. The parts will then be in the position shown at B² on the right side of the figure. The gate *f* is then operated and the flask and sand-box filled with molding-sand. The hopper is swung by, and any hand-tucking, jaggering, &c., which may be necessary, is done. Then the platen E is brought over the sand-box, and the valve V is again opened to admit more fluid under O, which carries pattern, silhouette, flask, and sand all up against the rammers, which by their weight compress it, as before described. The valve V is then turned into such a position as to discharge a portion of the fluid. The flask sinks back onto the top of I. The sand-box is raised, superfluous sand struck off from the top of the flask, and the pouring-basin made about the gate-sticks which are attached to the pattern. Further discharge of fluid allows the cap O, with patterns *pp*, to sink down to the nuts R R, thus drawing the patterns from the sand which is supported by the silhouette. Upon striking the nuts R R the weight of O, P, and *pp* is thrown upon the springs L L, which compresses them, thus drawing down the silhouette and releasing the steady-pins, which leaves the flask resting upon I, ready to be carried away to the casting-floor. The machinery is now in the same position as at the beginning of the operation, which may be repeated as often as desired. One or more molding-benches may be in like manner operated independently in all respects, except as to the services of the sand-box and presser.

It is obvious that when but one molding-bench is used the platen E and hopper F need not make a complete revolution round the column C, but may be swung back and forth as wanted. Various changes may be made in the construction and arrangement of the parts of the machine without producing any essen-

tial change in its operation. I might vary the effect of the rammers by placing spiral springs around their upper ends above the yoke D, to sustain a part of their weight, and thus lighten their pressure, or put them below the yoke to increase the pressure. I might make the bodies of the rammers of one shape and their faces or lower ends of another; or I might provide each rammer with a shoe of rubber or other elastic substance, if found desirable. I may devise other means of support than that shown, so that the presser and hopper may be swung back and forth in a right line, instead of a circle. I may substitute for the plunger M one or more cylinders with pistons whose rods shall perform the office of the cap O in operating the patterns; or I may use equivalent mechanical means for producing the vertical reciprocating motion required to operate the patterns and perform the pressing. I may arrange the sand-boxes X X² to swing horizontally from the column C independently of the platen E and hopper F, either tangentially or radially.

I do not confine myself to the particular construction shown; but may make any variations which do not essentially change the operation of the machine.

Having now described my invention, I would base upon it the following claims:

1. In a machine for making sand molds for castings, a sectional platen, as E, composed of an aggregation of rammers, *ee*, &c., of different lengths, arranged to act independently of each other by means of their weight to compress the sand into the flask, in combination with means for presenting and removing a flask, substantially as shown and described.
2. In sand-molding machinery, a sectional platen composed of an aggregation of rammers, the bodies of the rammers having different lengths, substantially as shown and described, and for the purpose specified.
3. In sand-molding machinery, a platen arranged to swing horizontally, in combination with two or more molding benches or machines, so that it may be operated in connection with each, substantially as shown and described.
4. In sand-molding machinery, in combination with a molding bench and platen, an inclined chute and stationary central hopper and a sand-distributing hopper arranged to swing horizontally while receiving sand, substantially as shown and described.
5. In sand-molding machinery, a horizontally-movable platen and a horizontally-movable hopper, both carried on the same swinging frame, and the sand-hopper being at all times in connection with a source of sand, in combination with each other and with correspondingly-arranged molding benches or machines, with which they may be operated in succession, substantially as set forth.
6. In sand molding machinery, the combination and arrangement of parts E, I, K, L, O, P, Q, R, and S, or their equivalents, in connection with a flask-pattern, to perform, by

means of an intermittent vertical reciprocating motion imparted to O, the operations of raising the pattern with the flask, pressing the mold, and withdrawing the pattern, substantially as shown and described.

7. In sand-molding machinery, the combination of a cylinder, as O, a plunger or piston, as M, and a valve, as V, with parts E, I, K, L, P, Q, R, and S, in connection with flasks and sand to operate the patterns and ram the molds by means of fluid-pressure, substantially as shown and described.

8. In sand-molding machinery, the combination of a cylinder, as O, a platen, a flask

and support, a pattern or a pattern and silhouette-plate, a plunger or piston, as M, and a valve, as V, with a hollow base-plate, as A, serving as a reservoir for fluid under pressure, substantially as shown and described.

In testimony whereof I have hereunto set my hand, at Indianapolis, Indiana, this 5th day of May, 1886, in the presence of two subscribing witnesses.

MATTHEW ROBERT MOORE.

Witnesses:

ROLLIN DEFREES,
THOMAS R. KACKLEY.