

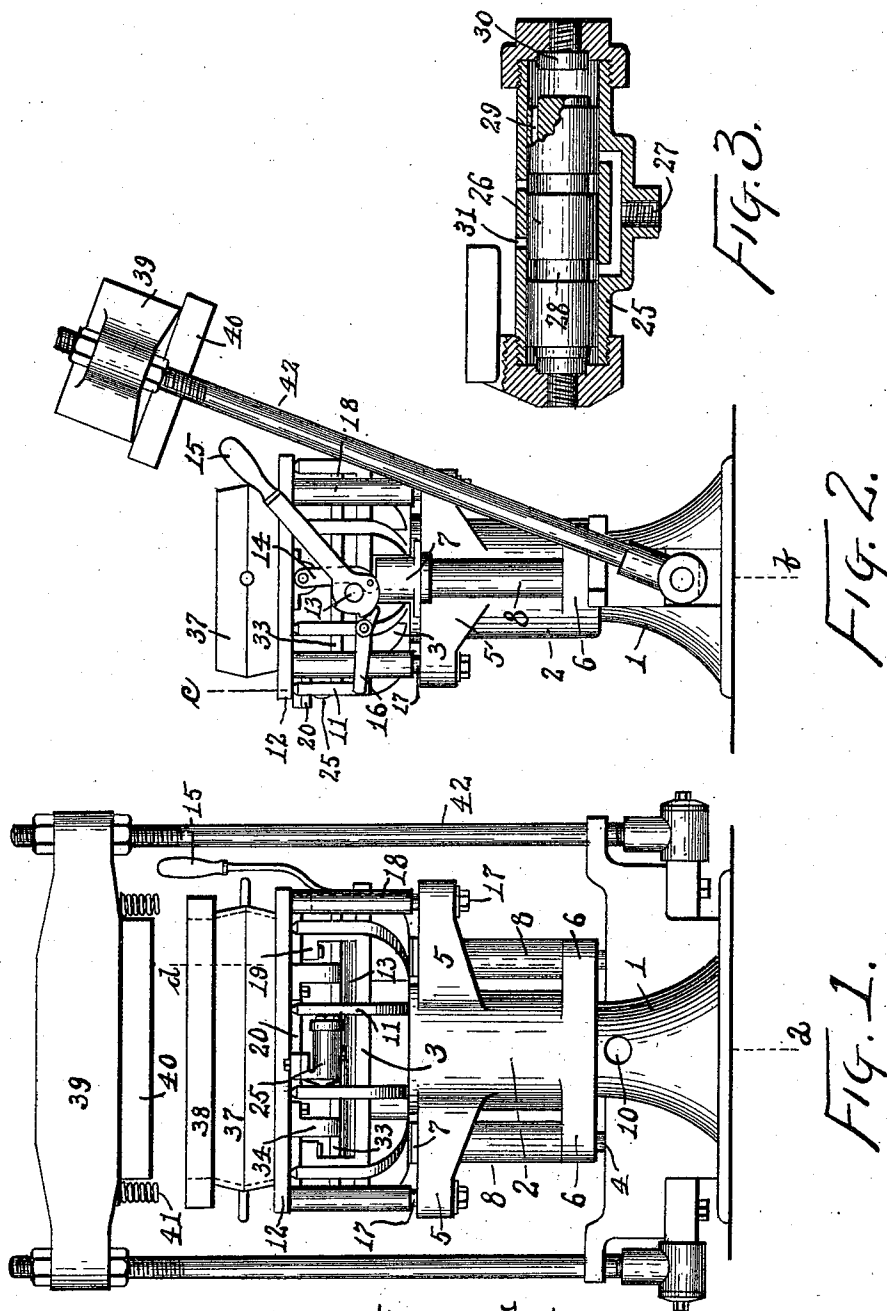
(No Model.)

3 Sheets—Sheet 1.

H. TABOR & E. H. MUMFORD.
METAL FOUNDING MACHINE.

No. 582,325.

Patented May 11, 1897.



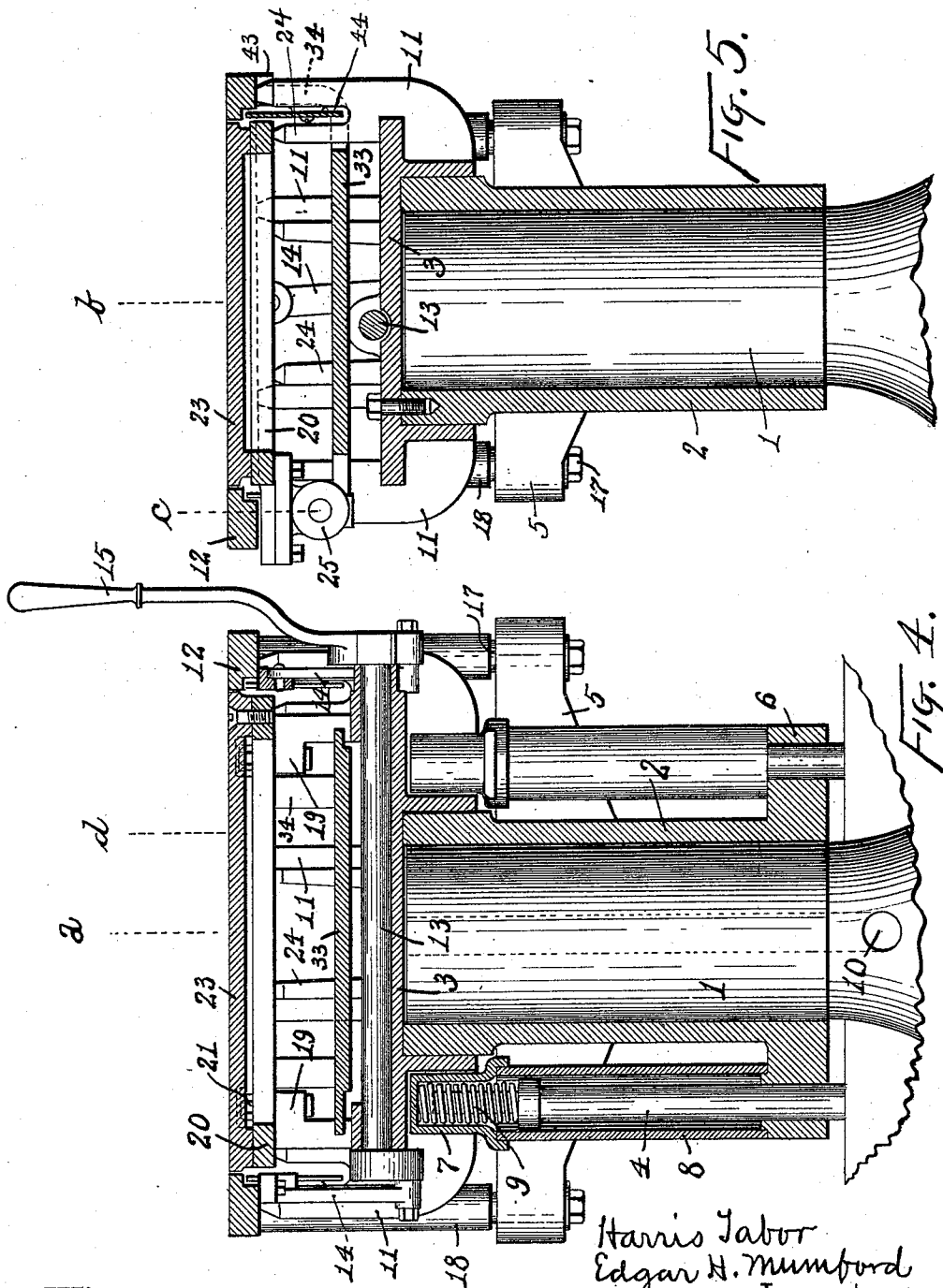
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3 Sheets—Sheet 3.

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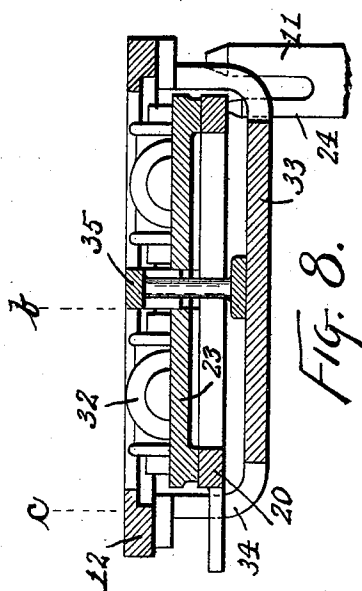


FIG. 8.

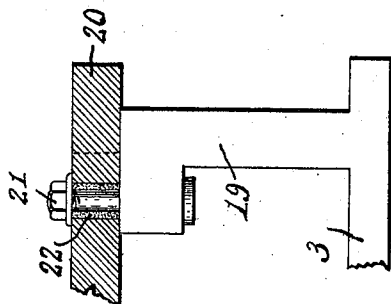


FIG. 9.

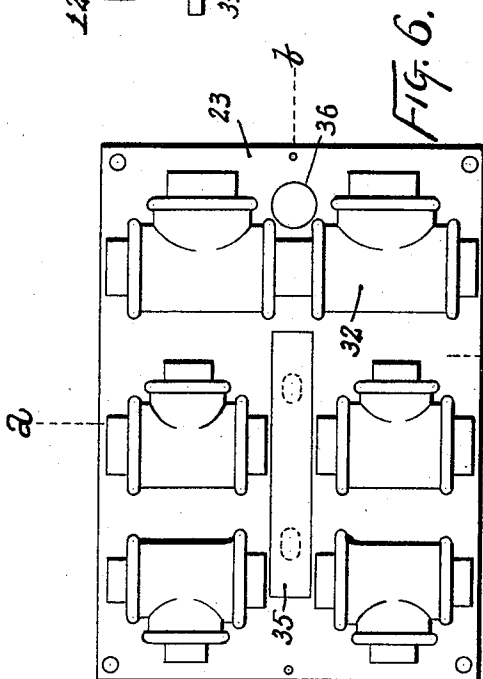


FIG. 6.

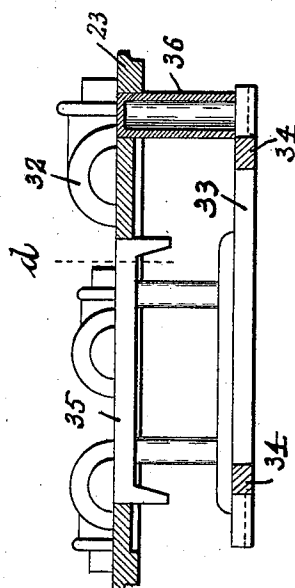


FIG. 7.

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UNITED STATES PATENT OFFICE.

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NEW JERSEY, ASSIGNORS TO THE TABOR MANUFACTURING COMPANY,
OF ELIZABETH, NEW JERSEY.

METAL-FOUNDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 582,325, dated May 11, 1897.

Application filed November 14, 1896. Serial No. 612,162. (No model.)

To all whom it may concern:

Be it known that we, HARRIS TABOR, of Elizabeth, and EDGAR H. MUMFORD, of Plainfield, Union county, New Jersey, have invented certain new and useful Improvements in Metal-Founding Machines, of which the following is a specification.

Our invention relating to improvements in metal-founding machines will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a metal-founding machine embodying our improvements; Fig. 2, a side elevation of the same; Fig. 3, a vertical longitudinal section of the rapping-engine in the plane of line *c* of Fig. 5; Fig. 4, a vertical longitudinal section of main portions of the machine in the plane of line *b* of Figs. 2, 5, 6, and 8; Fig. 5, a vertical transverse section of the same in the plane of line *a* of Figs. 1, 4, and 6; Fig. 6, a plan of the pattern-plate provided with patterns; Fig. 7, a vertical longitudinal section of the same in the plane of line *b* of Fig. 6 and 8; Fig. 8, a vertical transverse section of the same in the plane of line *d* of Figs. 6 and 7; and Fig. 9, a front elevation of one of the supports for the rapping-frame, the rapping-frame appearing in vertical longitudinal section. The patterns and stools are shown only in Figs. 6, 7, and 8.

In the drawings, 1 indicates a vertical piston having a base by means of which it may be supported upon the floor or upon suitable trucks; 2, a cylinder inverted over this piston and adapted for vertical motion thereon when steam or compressed air is admitted to the cylinder over the piston; 3, (best seen in Figs. 4 and 5,) the cylinder-head, having the form of a large rectangular plate having a hub capping over the upper end of the cylinder and rigidly secured thereto, as by screws; 4, studs projecting rigidly up from the base of piston 1; 5, stiff arms projecting out diagonally from the cylinder near its upper end; 6, arms projecting out from the lower end of the cylinder and having eyes engaging studs 4, which therefore act as guide-studs for the

cylinder and prevent its turning upon the piston, studs 4 projecting upwardly between the pairs of arms 5; 7, caps over the upper ends of studs 4 and having flanges secured to the arms 5 of the cylinder; 8, tubes surrounding studs 4 and extending from caps 7 down to arms 6, so as to form a complete inclosure for the upper portion of studs 4; 9, springs upon the upper ends of studs 4 and engaging between the roofs of caps 7 and shoulders on studs 4, these springs serving as elastic abutments as the cylinder descends on the piston, the descent being limited by cylinder-head 3 engaging the top of the piston; 10, conduit to admit steam or compressed air to the cylinder over the piston, this conduit extending up through the piston and being adapted to be piped from any suitable source of supply of steam or compressed air, such piping to be provided with suitable valves for controlling the inflow and outflow of the pressure medium, as is usual in metal-founding machines; 11, fingers projecting rigidly upward from the rectangular margin of cylinder-head 3; 12, a rectangular frame resting upon the upper ends of fingers 11, this frame being the flask-supporting frame; 13, a crank-shaft journaled across over cylinder-head 3 and having a crank-arm at each end; 14, links connecting such crank-arms with flask-supporting frame 12; 15, a hand-lever on the crank-shaft, its hub being provided with a couple of detent-teeth; 16, a pawl-lever adapted to engage the detent-teeth of lever 15, the arrangement being obviously such that while flask-supporting frame 12 is resting on fingers 11 if the crank-shaft be turned the frame 12 will be raised and maintained in raised position by pawl 16, the release of the pawl permitting the flask-supporting frame 12 to again go down upon the fingers; 17, studs projecting upwardly from arms 5 of the cylinder toward flask-supporting frame 12; 18, downwardly open sockets secured to the under surface of flask-supporting frame 12 and engaging over guide-studs 17, these sockets and studs therefore forming vertical guides for flask-supporting frame 12 as it rises from and returns to the fingers; 19, brackets projecting

up from rectangular cylinder-head 3 and extending inwardly beyond flask-supporting frame 12; 20, a rectangular frame called the "rapper-frame," secured to brackets 19 and having its upper surface somewhat below the upper surface of flask-supporting frame 12 when the latter frame is down on fingers 11, rapper-frame 20 coming within the area margined by frame 12; 21, vertical bolts securing rapper-frame 20 to brackets 19; 22, Fig. 9, elastic bushings, as a rubber, around bolts 21 where they pass through rapper-plate 20, whereby the rapper-plate while held to a normal relationship of brackets 19 is capable of slight horizontal motion with reference to the brackets; 23, the pattern-plate, being a flat plate separably but rigidly secured to the top of rapper-frame 20, the edges of this pattern-plate fitting within flask-supporting frame 12 with some freedom and the upper surface of the pattern-plate coming flush with the upper surface of flask-supporting frame 12 when the latter is down on fingers 11; 24, fingers alongside fingers 11, but farther inward and with their upper ends on a somewhat lower plane, so as to engage under and give vertical support to rapper-frame 20 and pattern-plate 23, such support being additional and intermediate to that furnished by brackets 19; 25, Fig. 3, the cylinder of the rapping-engine, rigidly secured to rapper-frame 20; 26, a piston free to play endwise within this cylinder; 27, inlet for steam or compressed air to the cylinder, the entry to the cylinder being by a pair of ports straddling the mid-length of the cylinder; 28, a pair of circumferential grooves in piston 26, dividing that piston into a central and two end portions, the central portion having such length as to always be straddled by the ports from inlet 27 and the grooves having such width and disposition that when the piston is at one extremity of its stroke the piston member at the opposite end of the piston will cover its inlet-port and have some lap; 29, a passage extending through each end member of the piston and placing each end of the cylinder in communication with one of the grooves in the piston; 30, anvils secured to the inner surface of each cylinder-head, the cylinder-heads being screwed onto the cylinder and the anvils being formed preferably of hardened steel, as is also the piston; 31, exhaust-ports communicating alternately with the grooves in the piston and covered alternately by the central member of the piston with some lap, the construction being obviously such that with the parts in the position shown in Fig. 3 the pressure medium acts on the left-hand end of the piston, throwing the piston to the right against the right-hand anvil, the motion of the piston soon cutting off the left-hand supply-port and opening the left-hand exhaust-port and opening the right-hand supply-port, whereupon the piston becomes thrown against the left-hand

anvil, the piston thus rapidly reciprocating; 32, Figs. 6, 7, and 8, the half-patterns secured to the upper face of pattern-plate 23, thus forming a match plate; 33, a stool-plate disposed below rapper-plate 20; 34, arms extending from this stool-plate upwardly into rigid attachment with flask-supporting frame 12, stool-plate 33 thus presenting the aspect of a greatly-depressed central portion of the flask-supporting frame 12; 35, a patch disposed in a mortise in pattern-plate 23 and having its upper surface against the sand-surface, this patch having its base resting on stool-plate 33, the patch being shown as in position to come between pattern elements, but free of contact with them, patch-plate 35 appearing in the drawings as a longitudinal piece occupying a position between four pattern elements where sand may need support as the patterns are separated from the sand; 36, a second patch-plate, like the one previously referred to except that it is small and cylindrical, occupying a position with reference to pattern elements where the circular form is suitable; 37, the half-flask resting upon flask-supporting frame 12 around the joint formed between frame 12 and pattern-plate 23; 38, the usual sand-box set over the half-flask to hold sand to allow for compression; 39, top bridge-tree of the machine, disposed across over the flask, &c.; 40, the rammer, being a plate secured to the bridge-tree and adapted to compress the sand down into the half-flask and out of sand-box 38; 41, springs supported under the bridge-tree and adapted to engage over sand-box 38, and the usual radius-bars pivoted at the base of the machine and supporting the top bridge-tree and permitting the bridge-tree and its connected parts to be swung back as usual in machines of this class.

Normally cylinder-head 3 is down against the upper end of its piston, and pattern-plate 23 is flush with flask-supporting frame 12. The half-flask is to be set upon the flask-supporting frame 12, sand-box 38 set upon the half-flask, and the half-flask and sand-box properly filled with sand. The bridge-tree is then brought forward so that rammer 40 will come to working position over the sand-box. Steam or air is now admitted to the cylinder, causing everything carried by the cylinder to rise suddenly. The rising action causes rammer 40 to press the sand out of the sand-box and compactly into the half-flask over the patterns and pattern-plate. The action is that of a sudden blow, and in some kinds of work a second ramming is found desirable. As the sand becomes pressed out of the sand-box into the half-flask there is little resistance to the continued upward motion of the sand-box by momentum after the other parts have completed their upstroke. It is the office of springs 41 to check the momentum of the sand-box.

The ramming having been completed and

the parts being again down in normal position, hand-lever 15 is now to be actuated, the result being that the half-flask is elevated away from the pattern-plate and pattern, 5 which remain down in normal position. This causes the drawing of the patterns from the sand and leaves the flask supported in its elevated position by the action of pawl-lever 16 engaging one of the teeth on the hub 10 of lever 15, one of the teeth pertaining to patterns calling for a shallow draw and the other tooth pertaining to patterns calling for a deeper draw. The half-flask may now be removed from the machine. Pawl-lever 16 15 being released permits the flask-supporting frame to descend again to its fingers and the machine is then ready to receive another half-flask.

While the patterns are being drawn, the 20 rapping-engine is to be in action, the hammering of its piston upon the anvils giving to the rapper-plate and patterns a jar or shiver represented by several thousand strokes a minute on the part of the rapping-engine. 25 This rapping action frees the patterns and permits of their clean sharp withdrawal from the sand.

By inspecting Fig. 6 it will be observed that there are locations, represented by the patches 30 35 and 36, where unsupported sand might tend to fall. This is prevented by the patches 35 and 36, which go up with the sand as the mold moves up from the patterns and pattern-plate. Should stripping-plates be employed 35 in the usual manner, there could of course be no fall of sand, but stripping-plates and corresponding patterns are very expensive affairs. In our improved system we use no stripping-plates and no special patterns, the 40 pattern-plate and its attached patterns costing no more than an ordinary match plate. Where sand requires extra support between the patterns, we mortise the pattern-plate, giving the mortise a shape suited to the conditions and keeping the margins of the mortises away from the patterns. These mortises are then filled by correspondingly-shaped patches resting on the stool-plate and free 45 for movement through the mortises. The form and disposition of the patches will of course vary with the form of the patterns. In many cases the mortises may be merely properly-disposed round holes through the pattern-plate and patched by simple round 50 plugs resting their lower ends upon the stool-plate.

The upper ends or surfaces of these patches are to reach to the sand surface of the face of the mold, which surface may be at the surface of the pattern-plate between patterns or 60 it may be on the pattern itself if the form of the pattern is such that sand needs special support above the pattern. In the latter case the patches will go also through some portion 65 of the pattern. The general idea is, after finding points over any portion of the pat-

tern-plate which require extra support for the sand, to put a hole or mortise through the pattern-plate at that point and provide a patch in such hole or mortise with its upper surface in position to support the sand at 70 such point when the pattern separates from the sand.

In practice it is found that this simple and cheap expedient, adding but a trifle to the 75 cost of a match plate, gives results as satisfactory as elaborately-fitted stripping-plates. In practice cases have arisen where to embody the stripping-plate system would cost thousands of dollars for a given set of pat- 80 terns and require weeks of time in their preparation, while with the system now under consideration the ordinary wooden patterns could be employed and could be mounted on their pattern-plates and properly provided 85 with patches in a few hours' time and at trifling expense.

It is to be observed that in the construction of our machine there are few places to catch sand where it can do harm. The upper 90 ends of the fingers are beveled, so as to readily shed sand. The cylinder 2 is inverted over an upstanding piston, so as to present no opening upwardly, and the various guide-sockets are inverted over upstanding guide- 95 studs.

The supporting-fingers 11 have their upper ends beveled, so as to readily shed sand which might work between them and the flask-supporting frame. Ordinarily little or no trouble 100 will arise from sand accumulating at these points; but in special cases we guard against any trouble in this respect by means of guards inside and outside the fingers, as illustrated in Fig. 5. From the outer edge of the flask- 105 supporting frame depends a curtain 43, which may be of leather, such curtain being continuous around the machine or in sections of sufficient extent to properly guard the fingers from the approach of sand inwardly. Some 110 sand may work down between the pattern-plate and the flask-supporting frame, and the entry of such sand over the fingers may be prevented by the guard-strip 44, which may be of thin metal, this strip extending around 115 so as to guard all of the fingers or each finger having its individual guard-strip of suitable width.

In the drawings and general description consideration has been given to fully-equipped 120 molding-machines—that is to say, the ramming is done by power; but it will be obvious that the ramming-head and the ramming-piston may be dispensed with and the machine employed as a hand-machine. Thus 125 in Fig. 1 after the sand has been shoveled in the ramming is done by power. Assume that the ramming is done with the usual hand-rammer. In such case handle 15 may be employed in elevating the flask to effect the 130 withdrawal of the pattern. The benefits of the rapper-engine and of the supporting-patches

may be obtained regardless of whether the ramming be done by hand or power.

We claim as our invention—

1. In a metal-founding machine, the combination, substantially as set forth, of a downwardly-presenting ramming-head, an upstanding piston supported on a base centrally below said ramming-head, a sliding cylinder disposed on said piston and open at its upper end and having a cylindrical exterior surface at its upper end, a plate disposed over the upper end of said cylinder and secured thereto and projecting outwardly from said cylinder at all sides to form a table substantially corresponding in size with said ramming-head, a hub integrally formed with said plate and projecting downwardly therefrom and closely fitting the cylindrical exterior of the upper end of the cylinder, and fingers or braces integrally formed with said hub and plate and engaging the exterior of the hub and reaching outwardly under said plate.

2. In a metal-founding machine, the combination, substantially as set forth, of an upstanding piston, a cylinder upon the piston and adapted for vertical movement thereon and carrying guide-eyes, guide-studs projecting upwardly from the piston-base and engaging said guide-eyes and caps carried by said cylinder and covering the upper ends of said guide-studs.

3. In a metal-founding machine, the combination, substantially as set forth, of an upstanding piston, a cylinder upon the piston and adapted for vertical movement thereon, stationary guide-studs projecting upwardly rigidly from the piston-base, guide-eyes carried by the base of the cylinder and engaging said guide-studs, caps carried rigidly by the upper portion of the cylinder and disposed over the upper ends of said guide-studs, and springs disposed upon the guide-studs within said caps and engaging the roofs of the caps.

4. In a metal-founding machine, the combination, substantially as set forth, of an upstanding piston, a cylinder upon the piston and adapted for vertical motion thereon, guide-studs projecting upwardly from the piston-base, guide-eyes carried by the base of the cylinder and engaging the guide-studs, caps carried by the upper portion of the cylinder and disposed over the upper ends of the guide-studs, and tubes engaging said guide-eyes and caps and surrounding the intermediate portions of the guide-studs.

5. In a metal-founding machine, the combination, substantially as set forth, of a downwardly-presenting ramming-head, an opposing press member arranged for vertical motion and adapted to support a flask and superposed sand-box, and springs carried by said ramming-head and adapted to engage over said sand-box.

6. In a metal-founding machine, the com-

bination, substantially as set forth, of a flask-supporting frame, a pattern-plate disposed within said flask-supporting frame and supported flush therewith, bolts serving in uniting said pattern-plate to its support, and elastic bushings surrounding said bolts.

7. In a metal-founding machine, the combination, substantially as set forth, of a rapping-engine comprising a cylinder having a pair of inlet-ports and having a pair of exhaust-ports disposed between the inlet-ports, a middle piston member adapted to alternately uncover said exhaust-ports, end piston members rigidly connected with the middle piston member and adapted to alternately uncover said inlet-ports and having passages through them to and from their respective ends of said cylinder, and anvils at the ends of the cylinder to arrest the motion of the piston.

8. In a metal-founding machine, the combination, substantially as set forth, of a pattern-plate having patterns secured thereto and having mortises or apertures through it between the patterns and away from the margins of the patterns, patches fitting said mortises or apertures and adapted for movement upwardly from the face of the pattern-plate, and supports for said patches below said pattern-plate.

9. In a metal-founding machine, the combination, substantially as set forth, of a pattern-plate having mortises or apertures between the patterns and away from the margins of the patterns, a flask-supporting frame surrounding said pattern-plate and normally supported flush therewith, patches fitting said mortises or apertures in the pattern-plate and connected rigidly with said flask-supporting frame, and mechanism adapted to move said flask-supporting frame and said patches vertically with reference to said pattern-plate.

10. In a metal-founding machine, the combination, substantially as set forth, of a pattern-plate provided with mortises or apertures between the patterns and away from the margins of the patterns, a flask-supporting frame surrounding said pattern-plate, patches fitting said mortises or apertures and supported below said pattern-plate, mechanism for moving said flask-supporting frame and said patches vertically with relation to said pattern-plate, and a rapping-engine adapted to agitate said pattern-plate.

11. In a metal-founding machine, the combination, substantially as set forth, of a pattern-plate provided with mortises or apertures between the patterns and away from the margins of the patterns, a flask-supporting frame surrounding said pattern-plate and supported normally flush therewith, and patches connected below said pattern-plate with said flask-supporting frame and having their upper surfaces in position to engage the mold-sand over the points of location of said mortises or apertures.

12. In a metal-founding machine, the combination, substantially as set forth, of a pattern-plate, a flask-supporting frame surrounding said plate, fingers disposed below said
5 flask-supporting frame and adapted to support said frame normally flush with said pattern-plate, and guard-strips at the sides of said fingers and adapted to prevent the entry

of sand between said frame and the upper ends of said fingers.

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