(No Model.)

M. R. MOORE.

SAND MOLDING MACHINE.

No. 408,386. Patented Aug. 6, 1889.

Fig: 1

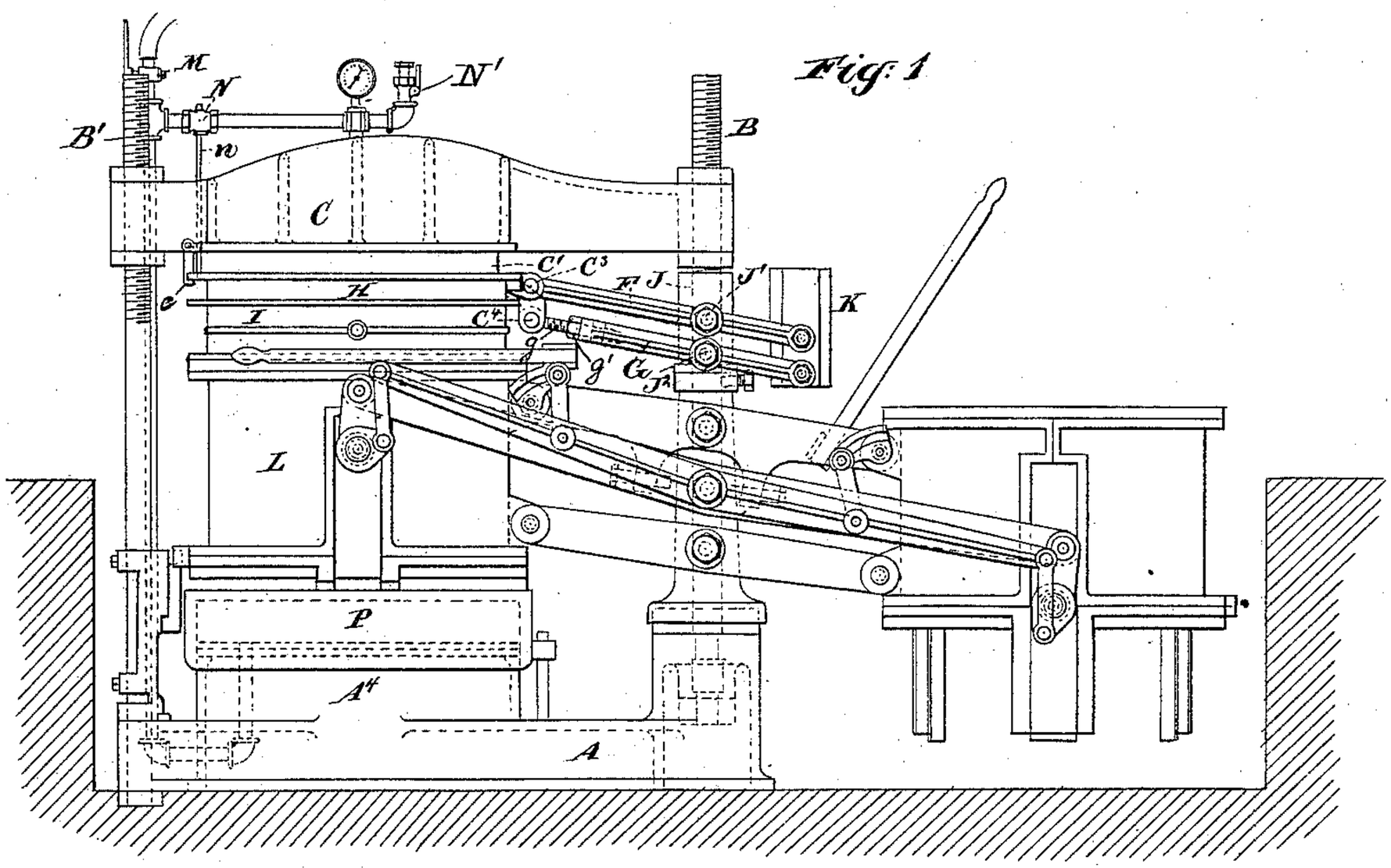


Fig: 2.

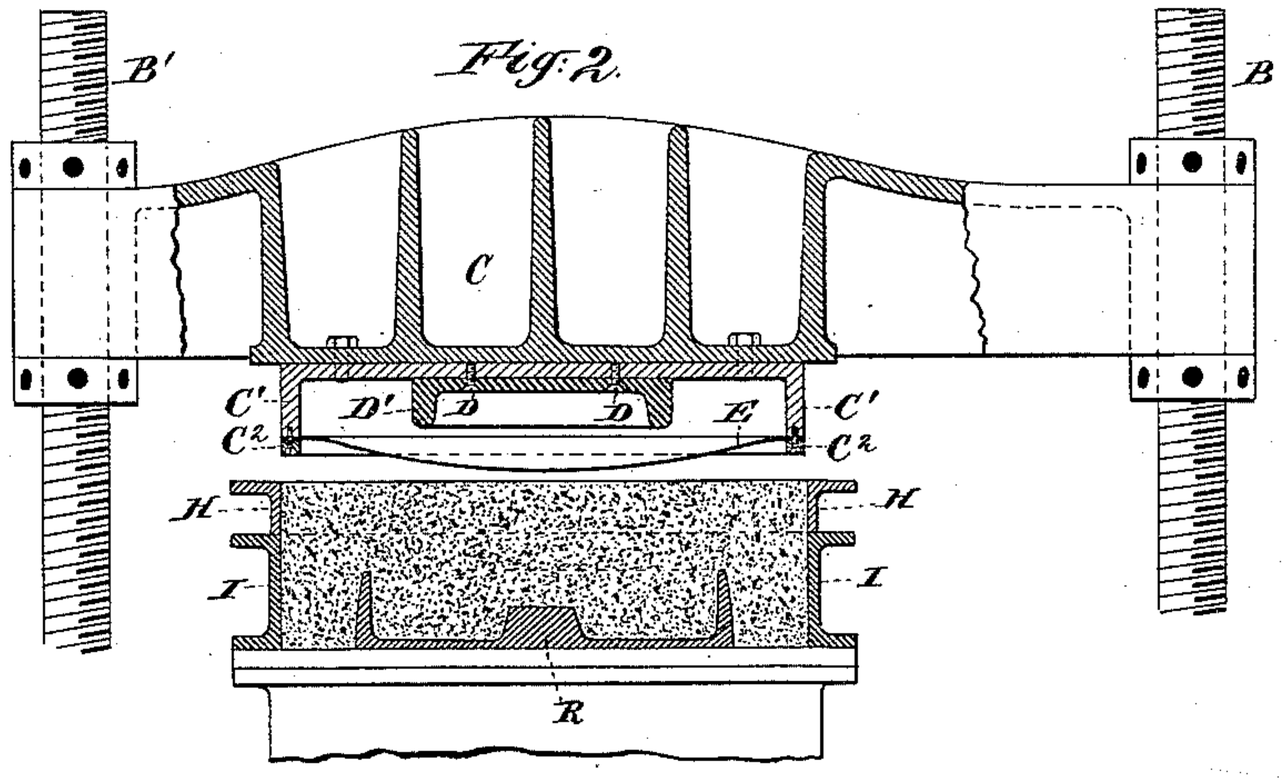


Fig: 3.

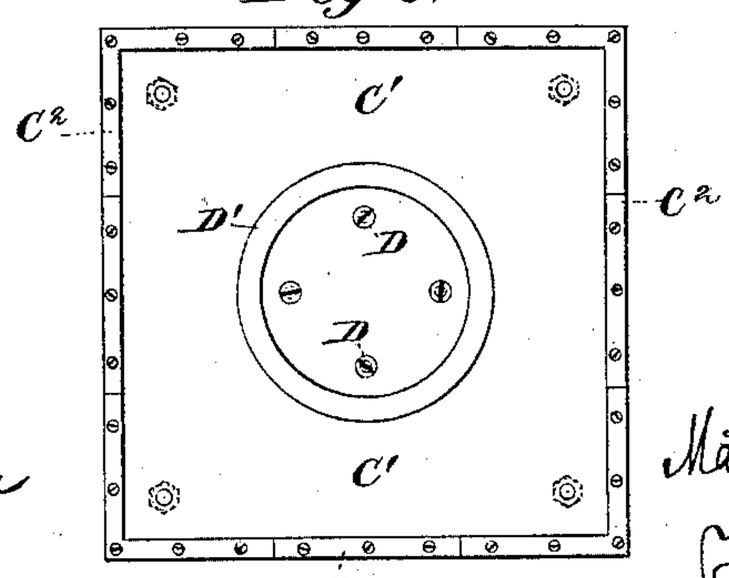
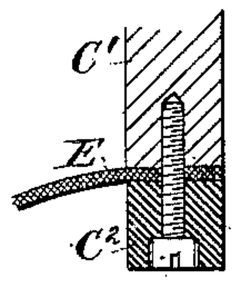


Fig: 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

MATTHEW ROBERT MOORE, OF INDIANAPOLIS, INDIANA.

SAND-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 408,386, dated August 6, 1889.

Application filed October 6, 1887. Serial No. 251,585. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW ROBERT MOORE, of Indianapolis, in the county of Marion and State of Indiana, have invented a certain new and useful Improvement in Sand-Molding Machines, of which the following is a specification.

There have been many machines to facilitate the manufacture of sand moldings for casting metals. One, acting by the pressure of a fluent substance or material whose particles can change their relative positions under the influence of pressure exerted through a flexible diaphragm, is set forth in a patent to me dated July 22, 1884, No. 302,349. In several later patents I have provided for giving greater pressure at certain points, especially along the edges and at the corners, so as to overcome the friction and adhesion between the sand and the interior of the flask; but the greater pressure has always been a yielding pressure.

My present invention combines with provisions for giving a yielding pressure over the main surface provisions for giving an unyielding pressure at certain points. I overcome the adhesion of the sand to the flask by a hard rim or tucking-plate extending down from the platen and adapted to match closely within the sand-box which overlies the flask and is of the same size as the flask. The yielding pressure may be successfully used in the form of a diaphragm extending loosely across the whole flask, with a certain amount of water or any fluent substance or material whose particles can change their relative positions under the influence of pressure strongly confined above it. I prefer to thus work; but the fluid may, if preferred, be admitted and discharged at each operation, being introduced under any desired pressure. However the yielding presser shall be applied, the hard rim in combination affords a reliable means for pressing down the sand by a positive action around the exterior of each mold. The flask is always so much larger than the pattern that the pattern is never struck by this rigid rim. The relative amounts of pressure to be exerted upon the sand through the rigid parts and through the flexible diaphragm may be readily adjusted by varying the quantity of yielding material above or within the diaphragm, for it is obvious that if the diaphragm be filled to the extent of projecting beyond the rim it will come sooner in contact with the sand, so that at least some portions of sand within the rim must be compressed further than that on which the rim presses. On the contrary, if the quantity of yielding material be small the rim will project so far in advance of the diaphragm that it will transmit most of the pressure, while little or none will be brought to bear through the diaphragm. It is thus practicable to compress the outer parts of the mold either more or less than the inner portions, as may be desired. The yielding material is simply allowed to flow into or out of the diaphragm until the desired effect is produced.

The operation of the machine by bringing the platen down upon and into the sand-box and flask, or, what is obviously the same thing, by forcing upward the sand-box and its attachments, so as to receive the platen within it, causes the hard and unyielding rim to act on the properly-selected and dampened earth, technically designated "sand," to compress the sand by a positive motion in a narrow border around the interior of the flask, and causes the flexible diaphragm to yield upward and downward to allow the upper surface of the sand within this border to be irregular. The flexible diaphragm, subject only to the pressure of the yielding material confined above it, will, unless something further is added, give an equal amount of pressure in pounds per square inch over the whole surface of the flask within the previously-compressed border. Such action will depress some parts of the surface more than others, those points over the high portions of the pattern being less depressed than the others. It is found by experience with such machines that when the pressure on the diaphragm is thus equal at all points the best results are not always reached. It is frequently desirable to bring to bear a heavier pressure on some parts of the mold than others, so as to compress the sand harder where required, to prevent the mold from "straining" or to overcome the resistance to compression offered by friction in narrow and deep parts of the mold between high projections of the pattern.

I provide for this by extending down from the hard platen above the diaphragm substantial and unyielding parts in any required form, which shall extend down and sustain certain portions of the diaphragm in addition to the pressure of the yielding material. These internal tuckers may extend down to the same depth as the rim or external tucker, or to a less extent, or to a greater, if such should be necessary or expedient in any case. My experiments indicate that it is sufficient if the internal tuckers extend down to points somewhat above the plane of the lower edge of the rim. The internal tuckers are preferably movable, so that they may be readily shifted in position or removed and exchanged, according as required by the forms of the articles to be cast; but this part of the machine is intended more especially for work where a large number of castings are required in succession, all exactly alike, in which case there is no occasion for changing the position of any part, except at long intervals.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a side elevation of the entire machine. The remaining figures are on a larger scale. Fig. 2 is a vertical section of certain portions, partly in elevation. Fig. 3 is a plan of certain portions seen from below. Fig. 4 is on a still larger scale. It is a vertical section through a portion.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A is the bed, B the central post, and B′ an outer post holding firmly by suitable strong nuts at an adjustable height the rigid platen C. This platen is made of cast-iron or other suitable material.

C′ is a rim of a size but little less than the interior of the sand-box H and flask I, which are to be used therewith. This rim C′ serves both as a tucking-rim to compress the sand under it and as a means for attaching the diaphragm E, of vulcanized india-rubber or other suitable material, which extends loosely across. In several patents heretofore granted to me I have described the flexible diaphragm as being urged against the sand by the admission of air, steam, water, or other fluent substance behind it.

I have discovered that I can attain the desired yielding pressure by introducing a sufficient quantity of any fluent material, as water, to remain inclosed during the entire operation, the flexible diaphragm E, lying below, the platen C, standing rigidly above, and the rim C′ extending rigidly around the platen C, and the flask I being urged together by any suitable means.

C^2 C^2 are a series of bottom pieces applied below the edge of the diaphragm. They may, by being pressed up firmly against the diaphragm by bolts or other suitable means, serve to hold the edge of the diaphragm strongly and tightly in contact with the part C′. These parts C^2 constitute, in effect, a further exchangeable extension of the part C′. It is the portion which acts on the sand just within the border of the flask to compress it to variable degrees greater than the other portions of the sand.

D′ is an exchangeable piece secured to the part C′ by screws D D, the function of which is to depress the sand at certain points over the inner portion of the mold more strongly or at an earlier period than it would be compressed at those points by the diaphragm if acted on by the fluent substance alone.

Varying the quantity of liquid or fluent material varies the relative pressure exerted by the fixed pressers and by the yielding presser. In order to make the yielding presser act with more force relatively to the other parts, the quantity of water or other fluid above the diaphragm should be increased by admitting additional water through the cock N to lie in the space above the diaphragm. This may be easily done while the flask is down, so as to exert no resistance against the diaphragm.

When it is desired that the pressure exerted by the yielding presser shall be less, a portion of the water or other fluent material above the diaphragm should be allowed to flow out. This can be easily effected by opening the valve N′ while the sand is offering strong resistance below the diaphragm, tending to raise the latter. After the quantity is adjusted by either means the cocks N N′ are again tightly closed.

The sand-box H matches upon the top of the flask I. Its inner faces are flush with the inner faces of the flask. When, by the action of the fluid over the piston A^4 below, the pattern-box L is raised, carrying strongly upward the flask I and sand-box H, previously filled with sand, the diaphragm E is hanging loosely and idly. It may touch the sand at various points; but it exerts no pressure thereon. The external tucking-rim C′, on the contrary, acts strongly on the sand immediately under it. As the pattern-box and its load continue to rise, the border of the sand is strongly compressed by this tucking-rim. At the same time downward extensions D′ of the internal tucker act also on their respective portions of the diaphragm and compel a corresponding depression of their several parts of the sand. These extensions D′ may be proportioned so as to depress the sand to the same extent as the rim C′ or even greater, if desired. They are arranged according to the article to be produced, being placed so as to act on the diaphragm over those portions of the surface of the sand which require to be most strongly compressed. As the flask is raised, the sand ultimately comes in contact with the diaphragm over the whole surface. When this latter condition is attained, the mobility of the material over the diaphragm

becomes available in distributing the pressure equally over the whole remaining surface of the diaphragm. Those portions of the surface of the sand which are held up most strongly by reason of a high portion of the pattern lying under them lift the diaphragm, such lift being accommodated by the flow of the water or other fluent substance from those portions to other portions of the diaphragm, where, the pattern being less high, the sand is less strongly supported and can afford to yield downward with less resistance. The fluent substance accommodates itself to all the inequalities in the resistance of the sand, and when the flask has been fully raised the portions of the sand under the tucking-rim C′ and under the interior tucker D′, and also the sand in all the other portions of the flask, has been compressed to the proper degree of firmness at all points. Next the flask I and sand-box H are lowered, and the flask I, with the pattern-box, is moved laterally by the turning of the system on the central post B. The sand-box H, being prevented from following the flask in this manner by a stop *c* on the platen C, strikes off the surplus sand from the top of the flask and drops it, the action being similar to that in the machine set forth in my patent of July 27, 1886, No. 346,381. The pattern R being drawn downward out of the flask either all at once or in as many parts as may be provided, the flask with its compacted sand may be lifted off the machine and an empty flask put in its place. Meanwhile the other pattern-box of the system, which is double, having come into the filling position, the sand-box H is moved backward to the top of the empty flask thereon, sand is supplied from a suspended hopper, the system revolved to bring this pattern-chest under the platen C, and the operation of compressing the sand in the flask gone through with, as before described. This second flask, having been swung around to the "taking-off" position and being provided with the necessary sprue and gate, is applied to its mate, and the completed mold is ready to receive the melted metal. I provide for balancing the weight of the sand-box and for holding it in its proper horizontal position while raising and lowering it as well as moving it laterally. This is attained by means of the two sets of levers F and G, the uppermost set F being connected to eyes C^3 at high points on the sand-box and pivoted at corresponding high points J′ on the sleeve J, carried on the central post, while the lower levers G are connected to lower eyes C^4 on the sand-box and to corresponding eyes J^2 on the sleeve. One of the levers has a screw-adjustment comprising the screw *g* and nut *g′* in this instance, whereby the sand-box may be kept in the horizontal position notwithstanding the wear which may take place in the lever-joints. Both sets of levers are connected to a weight K, which may be a vessel open at the top to allow weights to be added or removed, so as to nearly or quite balance the weight of the sand-box.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. It has been already stated that the internal tucker D′ is exchanged at will. I can substitute a tucker having a greater or less number of projections or rims D′, or I can substitute a larger or smaller tucker, or can remove the internal tucker altogether, according to the different forms of patterns employed.

I claim as my invention—

1. In a sand-molding machine, the flask-support P and platen C, with suitable means for moving them forcibly together, in combination with each other and with the flask I and sand-box H, having flush interior surfaces, and with a rim C′, rigidly attached to the platen and arranged to be received within the sand-box, and a yielding presser E, covering the area within such rim and adapted to yield irregularly to conform to the pattern, all substantially as and for the purpose herein specified.

2. In a sand-molding machine, the supplementary removable tucking-pieces C^2 C^2, in combination with the tucking-rim C′, the yielding presser E, and the platen C, the parts being arranged, as shown, so that the tucking-pieces C^2 C^2 will extend down and depress the surface of the sand beneath them sooner or to a greater depth than the adjacent portions of the surface, as herein specified.

3. In a sand-molding machine, the interior tucking-piece D′, in combination with the platen C and yielding presser E, said interior tucker being arranged to depress predetermined portions of the surface of the sand to positive extents while other parts are subjected to the yielding presser, as herein specified.

4. In a sand-molding machine, a rigid platen C, rim C′, supplementary tucking-pieces C^2, and an interior tucker D′, in combination with each other and with a yielding presser E, arranged substantially as shown, whereby the relative pressures on different parts of the surface of the flask may be adjusted by varying the quantity of fluent material between the yielding presser and the platen, as herein specified.

5. In a sand-molding machine having a yielding presser acting over a portion of the sand, combined with unyielding pressers exerting a greater pressure on certain portions, the cock N, controlling the communication to the space above the yielding presser, adapted to admit or discharge the fluent material and afterward confine a fixed quantity to act through the medium of the yielding presser, substantially as herein specified.

6. In a sand-molding machine, the post B, sleeve J, sand-box H, supported by the two sets of levers F and G, pivoted to said sleeve, and a balancing-weight K, combined and ar-

ranged, as shown, so that the sand-box may be moved vertically and laterally while preserving a horizontal position, as herein specified.

7. In a sand-molding machine, the post B, revolving sleeve J, sand-box H, and weight K, in combination with the two levers F G, pivoted at different levels at one end to said sand-box, at the other end to the weight, and intermediately to said sleeve, one of said levers being provided with the screw *g* and nut *g'*, for adjusting its length, as and for the purpose specified.

In testimony whereof I have hereunto set my hand at Indianapolis, Indiana, this 15th day of September, 1887, in the presence of two subscribing witnesses.

MATTHEW ROBERT MOORE.

Witnesses:
ROLLIN DEFREES,
HENRY HUGH HANNA.