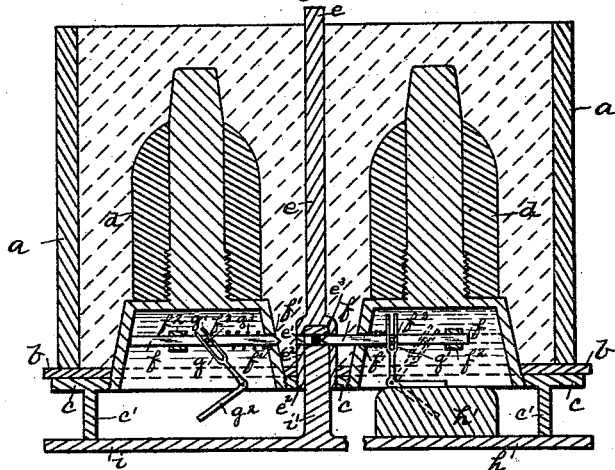


S. J. ADAMS.  
MOLDING APPARATUS.

No. 455,144.

Patented June 30, 1891.

*Fig. 1.*



*Fig. 2.*

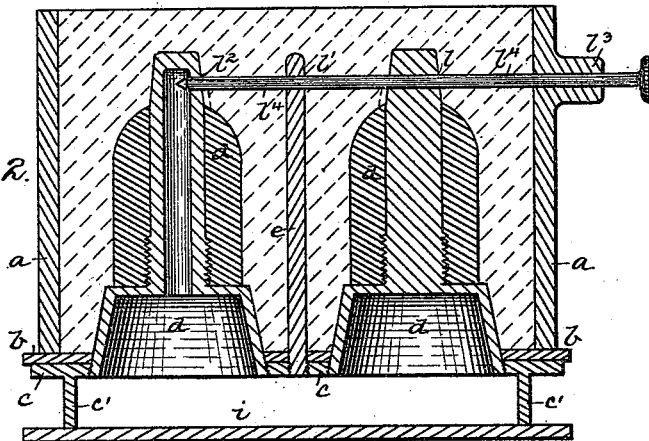
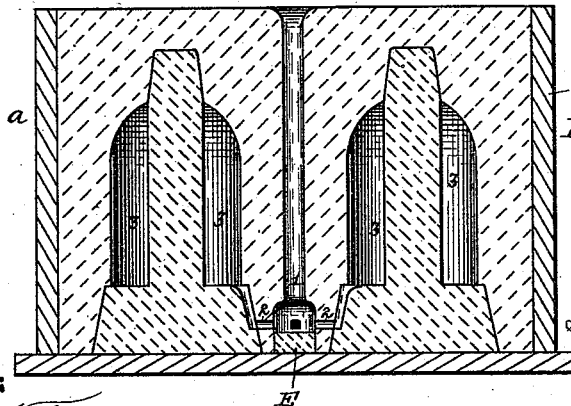


Fig. 6.



**Sicknesses:**

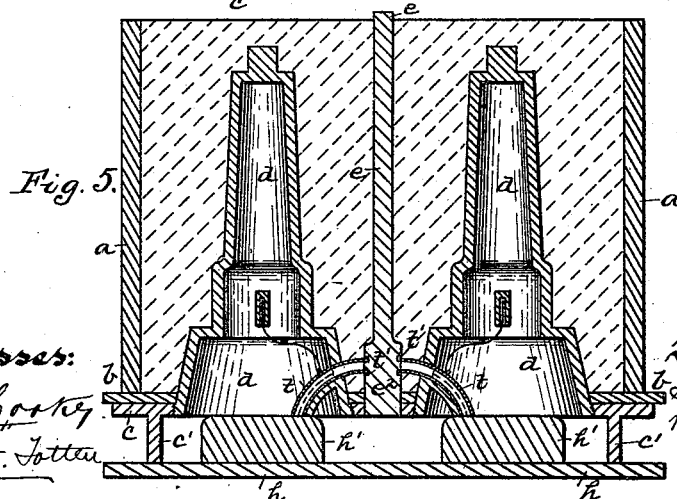
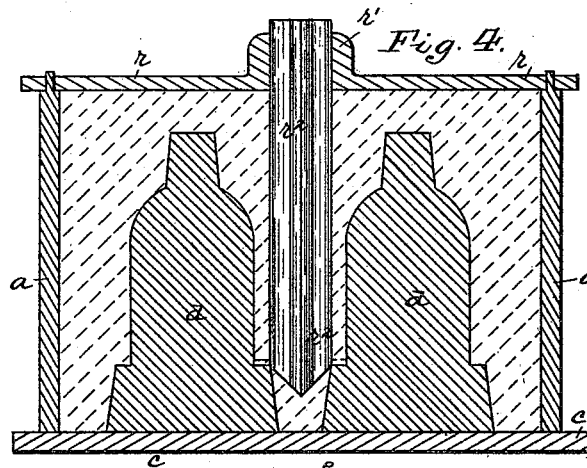
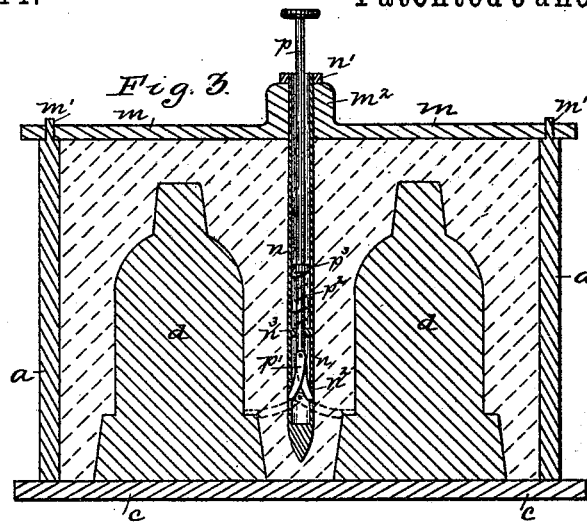
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# UNITED STATES PATENT OFFICE.

STEPHEN JARVIS ADAMS, OF PITTSBURG, PENNSYLVANIA.

## MOLDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 455,144, dated June 30, 1891.

Application filed November 26, 1890. Serial No. 372,687. (No model.)

*To all whom it may concern:*

Be it known that I, STEPHEN JARVIS ADAMS, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Formation of Sand-Molds; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the forming of sand-molds, and especially to the forming of molds for wagon-boxes, pipe-balls, and like tubular articles in single or one-part flasks. It is usual to form within these flasks two or more molds, the number varying according to the size of the flask and the size of the article to be cast, and to employ a central pouring-gate to feed the metal to the mold-cavities, and my present invention relates specially to the formation of the connecting-runners between the central pouring-gate and the mold-cavity, its object being to form such connecting-runners through the body of sand forming the mold, so that the metal can pass first into the pouring-gate and thence through such connecting-runners within the body of sand into the mold-cavity.

To these ends my invention consists, generally stated, in first compacting the sand within the flask to form the mold-cavities therein and then forcing a passage through the body of sand between the pouring-gate and mold-cavities, so as to form the connecting-runners between the pouring-gate and the mold-cavities, this being accomplished by suitable patterns or formers passing out from the pattern forming the mold-cavity or from the pattern forming the pouring-gate, and so connecting the pouring-gate and runner.

My invention also includes the apparatus employed and the mold formed, and the particular improvements comprising my invention will be hereinafter more particularly set forth and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figures 1, 2, 3, 4, and 5 are sectional views of molds illustrating different ways of carrying out my invention and the different mechanism suitable for the purpose; and Fig. 6 is

a like view showing a complete mold, such as formed with the mechanism illustrated in Fig. 1.

Like letters of reference indicate like parts in each.

My invention may be practiced in many different ways, the different figures giving several illustrations of the same, and I will, in order to illustrate my invention, describe it with the mechanism shown in said figures.

In Fig. 1 I employ the ordinary flask *a* and the stripping-plate *b* and the pattern-plate *c*, said pattern-plate having secured to it the patterns *d* for forming the molds of any desired shape and the pattern *e* for forming the pouring-gate, this pattern *e* generally extending to the top of the flask, so that the metal may pass down by the gate and enter the mold-cavities, as hereinafter described. The sand may be packed within the flask in any suitable way, either by ramming, jarring, or pressing, as found most desirable. The lower ends, at least, of the mold patterns *d* are formed hollow, and in the side thereof nearest to the pouring-gate I form a small passage *f'*, through which passes the runner-pattern *f*, this runner pattern in Fig. 1 being a straight bar, which moves in guideways within the pattern *d*, the passage *f'* generally acting as one guideway, while within the pattern is the guideway *f''*, said guideways holding the runner-pattern in proper line. The runner-pattern *f'* has formed thereon a lug or pin *f''*, and engaging therewith is an elbow-lever *g*, this elbow-lever having its upper end forked, as at *g'*, and said fork passing on each side of the lug *f''*, so that the runner-pattern *f* may be projected through the pattern by said lever *g*. The lever *g* is pivoted below the runner-pattern, as shown, and its free arm *g''*, when the runner-pattern *f* is withdrawn within the pattern *d*, extends down at an incline, as shown in the pattern to the left of Fig. 1. The pattern-plate *c* has an annular ring *c'* or a series of supporting lugs or feet *c'* extending down from it, so as to support the pattern-plate some distance above the molding-table *i*, on which it rests, and the lower end of the arm *g''* of the lever *g* when in its lowest position is slightly above the base of the ring *c'*, so that it will not come in contact with the table. I

generally prefer to employ a spring  $g^3$  to retract the runner-pattern as it is projected through the side of the mold-pattern. In line with the movement of the runner-pattern  $f$ , I form on the gate-pattern  $e$  openings  $e'$ , into which the ends of the runner-patterns pass at the end of their stroke, so preventing the wedging or packing of sand between the end of the runner-pattern and the gate-pattern and insuring a direct connection between the gate 1 through the runners 2, formed by the patterns  $f$ , and the mold-cavities 3, formed by the patterns  $d$ . In forming the mold, the pattern-plate  $c$  rests upon an ordinary table  $i$ , so that the spring  $g^3$  can force back the lever  $g$  and hold the runner-pattern within the mold-pattern  $d$ . After the formation of the mold, in order to project the runner-pattern and form the runner between the gate and mold, I place the flask containing the mold upon another table  $h$ , having blocks  $h'$  formed thereon, these blocks being adapted to press upon the lower arm  $g^2$  of the lever  $g$  and by raising the same, as shown to the right of Fig. 1, to cause said lever to project the pattern  $f$  and press it through the sand and into the pattern  $e$ , so forming the connection between the gate and mold.

It will be seen that the lower end of the gate-pattern  $e$  is enlarged, as at  $e^2$ , and that its base  $e^2$  is formed hollow, as at  $e^3$ , the openings  $e'$  extending through into the hollow part of the pattern, so that any sand forced through the runner-pattern can drop through the hollow base of the pattern  $e$ , and so insure the formation of a perfect runner between the gate and mold. While the mold is being compacted, however, there is liability of the sand passing through the openings  $e'$  and entering the hollow part of the pattern  $e$ , and in such case leaving the sand around said openings loosely packed, and to prevent this on the molding-table  $i$ , I generally form a pin or projection  $i'$ , which enters the hollow portion  $e^3$  of the pattern  $e$  and extends up within the same and closes the inner ends of the openings  $e'$ , so preventing such action of the sand.

In practicing my invention with such apparatus, the pattern-plate carrying the patterns and stripping-plate fitting around them is placed upon the table  $i$ , the pin  $i'$  extending up within the hollow way  $e^3$  of the gate-pattern  $e$ . The flask is then placed over the upper edge, resting upon the stripping-plate  $b$ , and the sand is compacted within the mold. As soon as this is accomplished, the molder simply lifts the pattern-plate, stripping-plate, flask, and mold from the table  $i$ , and places it upon the table  $h$  in such position that the blocks  $h'$  thereon will raise the lower arm  $g^2$  of the lever  $g$ , and so force out the runner-patterns  $f$ , which will pass through the body of sand and enter the openings  $e'$  in the base  $e^2$  of the gate-pattern and sand carried ahead of the runner being forced into such openings in the gate-pattern and dropping through the hollow base thereof. The pattern-plate and

flask can then be lifted from the table  $h$ , when the spring  $g^3$  will force back the lever  $g$ , so causing the withdrawal of the runner-pattern  $f$ , and the flask can then be lifted from the patterns or the pattern-plate with its patterns lowered from the flask, the runner-patterns being within the mold-patterns and offering no obstruction to the withdrawal of the patterns from the finished mold. In order to close the base of the gate 1, formed by the gate-pattern  $e$ , I employ a small core  $E$ , as shown in Fig. 6, and in pouring the mold the metal will pass down through the gate 1, and thence through the runners  $a$  into the mold-cavities 3.

In Fig. 2 I have illustrated the invention in connection with another means of forming the connecting-runners. In such case I employ the same patterns as above described; but the gate-pattern  $e$  need not extend entirely through the sand, as the mold formed can be poured with the heads or larger ends of the core extending upwardly. The patterns may be formed solid, as may also the gate-pattern; but in the upper ends thereof I form passages, as at  $l$   $l'$   $l^2$ , the passage  $l$  extending entirely through the upper end of one pattern, the passage  $l'$  extending entirely through the upper end of the gate-pattern, and the passage  $l^2$  either extending entirely through the upper end of the upper mold-pattern, or being simply a recess formed therein. The flasks or patterns are arranged in proper relative position the one to the other, and in the side of the flask I form a guideway  $l^3$ , this guideway being in line with other passages in the mold-patterns and gate-patterns, and I employ as a runner-pattern a bar  $l^4$ , which can be passed through the guideway  $l^3$  and forced through the passage  $l$  in one mold-pattern, thence through the passage  $l'$  on the gate-pattern, and finally through or into the passage  $l^2$  in the other mold-pattern, so forming the connecting-runners between the mold-patterns and the gate-patterns. These runners are generally formed in the part of the pattern which forms the lower core-seat for the core placed within the mold, and they may be made some little distance up in said part of the pattern, and the patterns be provided with ribs, as at  $d'$ , to form runners to connect the runners formed by the bar  $l^4$  with the mold-cavities. After the formation of the mold and the withdrawal of the bar forming the connecting-runners when the cores are placed within the molds, it is evident that the cores will cut off communication between the mold-cavity and the guideway  $l^3$  in the flask, so that all liability of the metal running out through such guideway is prevented.

In Fig. 3 of the drawings I have illustrated a method of forming these runners by the employment of a gate-pattern entering through the opposite end of a flask to which the mold-pattern enters, such construction doing away with the necessity of a core to close the base of the pouring-gate, since the

pouring-gate need not be formed entirely through the body of sand. In such case I employ the usual parts, the pattern-plate carrying the mold-patterns, stripping-plate fitting around the same, and the flask resting upon the stripping-plate, and I compact the sand in the flask in the usual way. After this is accomplished I place upon the upper end of the flask a plate or frame  $m$ , this plate being guided to proper relative position with the flask by pins and seats, as shown at  $m'$ , or in any other suitable way. Upon the plate or frame  $m$  is formed a guideway  $m^2$ , the passage therein being in proper line for the entrance of the gate-pattern  $n$ , which gate-pattern is forced through the guideway  $m^2$  down the proper distance within the mold, such distance being regulated by a lug or lugs at the upper end of the gate-pattern  $n$ , as at  $n'$ . The gate-pattern  $n$  is formed hollow, as shown, and extending through the same is a bar  $p$ , at the lower end of which are pivoted the runner-patterns  $p'$ , which pass through openings  $n^2$  in the gate-pattern  $n$ , so that when the bar is passed down within the gate-pattern the runner-patterns will be forced out through said openings  $n^2$  and through the sand into contact with the mold-patterns, so forming the connecting-runners between the gate-pattern and the mold-patterns. The runner-patterns may be again withdrawn within the gate-pattern by hand, or, if preferred, by means of a spring  $p^2$ , confined between a bar  $n^3$  in the gate-pattern and a collar  $p^3$  in the bar  $p$ . In practicing my invention with such apparatus I first compact the sand within the molds around the patterns, and then place upon the flask the plate or frame  $m$ , then force the gate-pattern  $n$  down into the sand the proper distance, and then press down the bar  $p$ , and so project the runner-patterns into the sand and form the connecting-runners between the gate and the mold. After withdrawing the runner-patterns and drawing out the gate-pattern the frame may be lifted off and the mold-patterns withdrawn from the mold and the cores inserted in place, when the mold is ready for pouring.

In Fig. 4 I have shown another and a simple way of forming the gate-pattern and the runner-patterns at one time, consisting in a guiding-frame, such as  $r$ , placed upon the flask after the compacting of the sand therein, said guiding-frame having a guideway  $r'$  therein, through which is forced a gate-pattern  $r^2$  of such width and cross-section, according to the number of patterns, as to extend between the patterns, and when this gate-pattern is forced down into the sand it forms a wide gate and passes down until it comes in contact with the mold-patterns, and so forms the connection between the gate and molds. This is a very simple form of the invention.

The runner-patterns may either be formed solid or hollow, and when formed solid their ends may either be formed pointed, so as to

press aside the sand, as in Fig. 2, or blunt, so as to force the sand ahead of the runner-pattern, in which case as the runner-pattern enters into the gate-pattern it will force ahead of it a heavy wad of sand, which can fall through the hollow part of the gate-pattern. In employing the blunt-ended runner-pattern, in order to smooth the sides of the connecting-runner I prefer to form the end of the pattern slightly tapering, as shown in Fig. 1, in order to compress the sand slightly and smooth the same.

In Fig. 5 I have illustrated the apparatus where a hollow tube is employed as a runner pattern, and in that case it is not necessary to form the base of the gate-pattern hollow, as the sand will pass into the tube and escape therefrom, the liability of forming any wad of sand which might prevent the formation of a clear passage between the mold-cavity and gate being thus overcome. In said figure the runner-pattern  $t$  is formed curved and is projected through the side of the mold-pattern in practically the same way as illustrated in Fig. 1—that is, by means of a block pressing against the base of the runner-pattern and projecting it through the side of the mold-pattern, the curved runner-pattern being withdrawn by a spring. In order to insure the formation of the passage entirely through the sand, I generally form in the side of the gate-pattern an annular recess, as at  $t'$ , into which the short annular end of the hollow runner-pattern enters, so as to cut a clear passage.

In the several figures of the drawings I have thus illustrated different apparatus for practicing my invention, all of which embody the same principle and illustrate some of the ways in which the invention may be practiced. The apparatus illustrated in some of the figures may also be employed where the runner-pattern is projected from one pattern to the other before the same is compacted and withdrawn after the compacting of the sand, and as so employed the apparatus is also included herein.

By my invention I am enabled to do away with the necessity of the employment of a two-parted flask or of a sand-bed on which to rest the molds and the formation of runners either on the lower face of the sand compacted within the flask or on the sand-bed, my invention therefore enabling me to provide the proper runners between the gate and the mold-cavities, and at the same time to employ the ordinary bottom boards for the molds and provide rapid and simple means for forming the connecting-runners between the gate and the mold-cavities through the inclosed body of sand within the flask.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The herein-described method of forming molds, consisting in first compacting the sand within the flask to form the mold-cavity therein and then forcing a connecting-runner

through the body of sand to connect the gate with the mold-cavity, substantially as and for the purposes set forth.

2. The herein-described method of forming molds, consisting in first compacting the sand within the flask to form the mold-cavity and gate and then forcing the connecting-runner through the body of sand between the gate and mold-cavity, substantially as and for the purposes set forth.

3. In apparatus for forming molds, the combination of a flask, mold-patterns therein, and a runner-pattern adapted to be forced out through the body of sand to connect the mold-cavity and the gate, substantially as and for the purposes set forth.

4. In sand-molding apparatus, the combination of the flask, a pattern-plate carrying a molded pattern and a gate-pattern, and a runner-pattern inclosed within one pattern and adapted to pass through the same to the other pattern, and so form connecting-runners between the mold-cavity and gate, substantially as and for the purposes set forth.

5. In molding apparatus, the combination of a flask, a pattern-plate carrying a mold-pattern, a gate-pattern, a runner-pattern mounted in guideways in one pattern and adapted to pass out to the other pattern, and a propelling-arm adapted to operate the runner-pattern, substantially as and for the purposes set forth.

6. In molding apparatus, the combination of a flask, a pattern-plate carrying a mold-pattern, a gate-pattern, a runner-pattern mounted in guideways in the one pattern, a lever engaging with said runner-pattern and having a free arm extending down below the same, and a block engaging with said lever to force the runner-pattern out through the side of the pattern in which it is mounted, substantially as and for the purposes set forth.

7. In molding apparatus, the combination of the flask *a*, the pattern-plate *c*, having a pattern secured thereto, the runner-pattern *f*, mounted in guideways in the main pattern, the lever *g*, spring *g*<sup>3</sup>, and block *h*, substantially as and for the purposes set forth.

8. In molding apparatus, the combination of the flask *a*, the pattern-plate *c*, carrying the mold-pattern *d* and gate-pattern *e*, one pattern having a hollow base and having openings *e'*, connecting therewith, a runner-pattern mounted within the other pattern and adapted to be projected therefrom and pass into the opening *e'*, substantially as and for the purposes set forth.

9. In molding apparatus, the combination of the flask *a*, the pattern-plate *c*, carrying the mold-pattern *d* and gate-pattern *e*, one pattern having a hollow base *e*<sup>3</sup> and having an opening *e'*, connecting therewith, a runner-pattern within the other pattern and adapted to be projected therefrom and pass into the openings *e'*, and a pin or projection on the molding-table entering the base *e*<sup>3</sup> of the pattern, substantially as and for the purposes set forth.

10. In molding apparatus, the combination of a mold-pattern and a gate-pattern, a connecting runner-pattern adapted to pass through the body of sand between said patterns, the end of said connecting runner-pattern being formed tapering, substantially as and for the purposes set forth.

In testimony whereof I, the said STEPHEN JARVIS ADAMS, have hereunto set my hand.

STEPHEN JARVIS ADAMS.

Witnesses:

J. N. COOKE,

ROBT. D. TOTTEN.