(No Model.) 3 Sheets—Sheet 1.

# S. J. ADAMS.

## METHOD OF FORMING SAND MOLDS.

No. 455,145. Patented June 30, 1891.

Fig. 1.

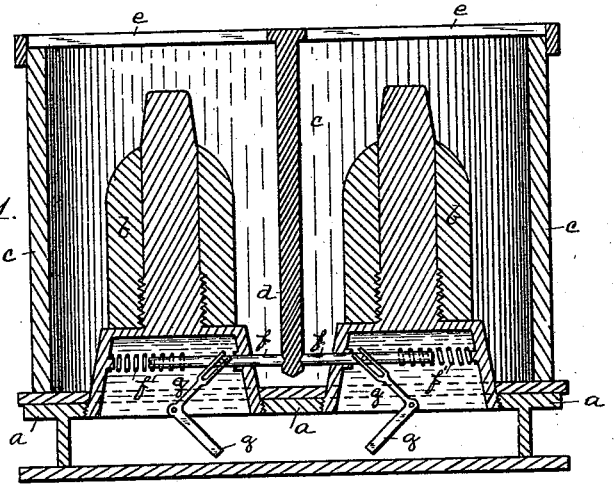



Fig. 2.

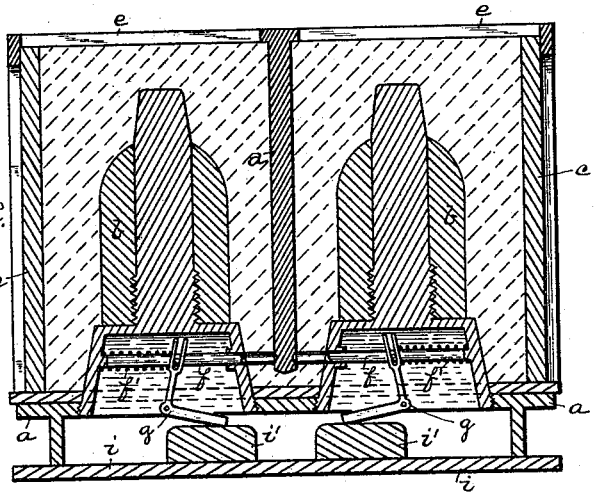
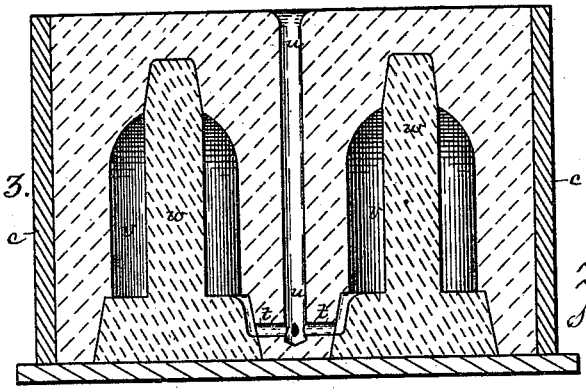



Fig. 3.

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(No Model.) 3 Sheets—Sheet 2.

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## METHOD OF FORMING SAND MOLDS.

No. 455,145. Patented June 30, 1891.

Fig. 7.

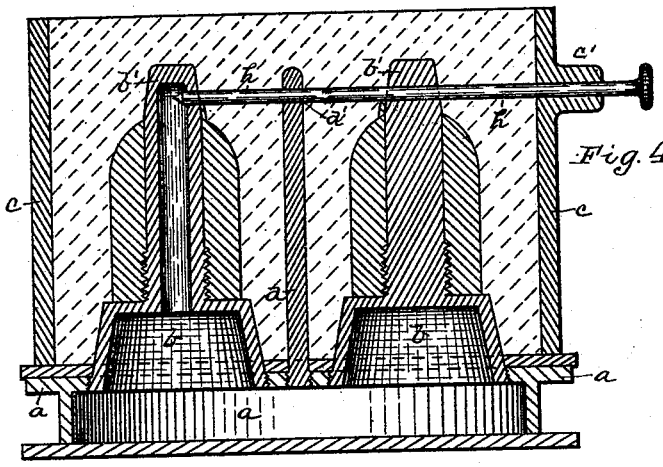
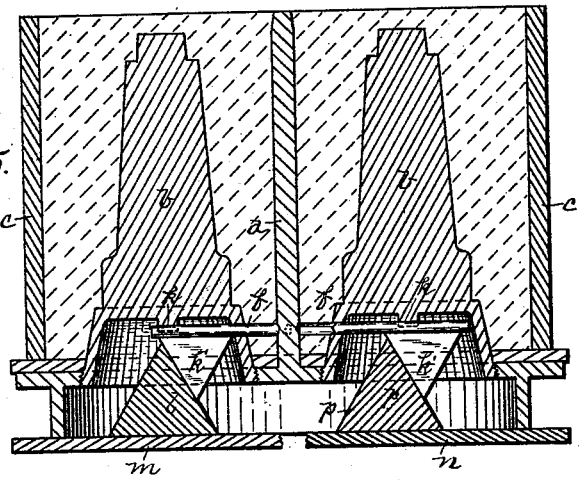


Fig. 4.

Fig. 5.



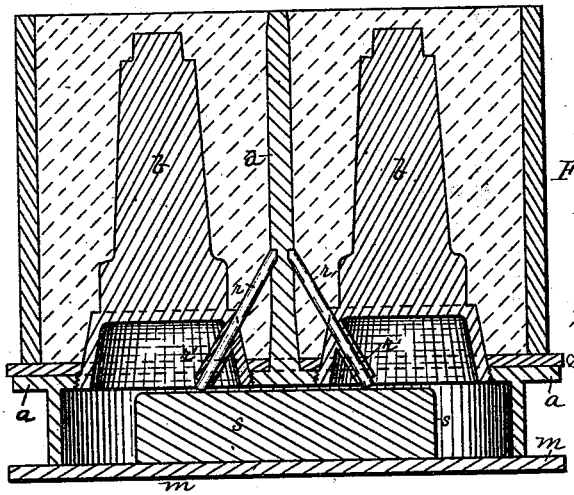


Fig. 6.

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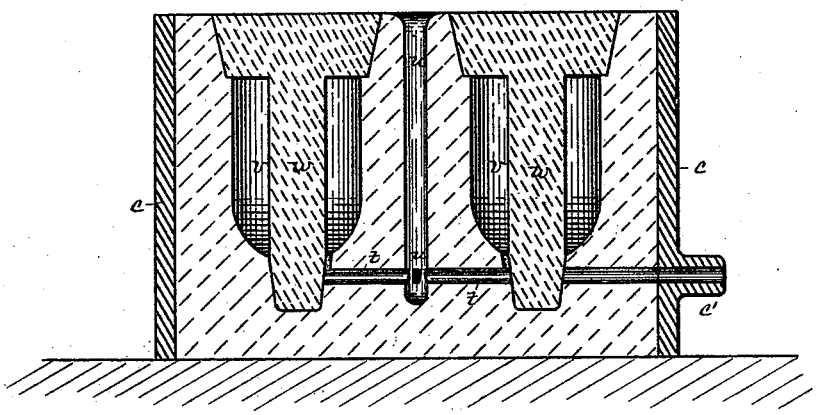
# S. J. ADAMS.

## METHOD OF FORMING SAND MOLDS.

No. 455,145. Patented June 30, 1891.

*Fig. 8.*

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# UNITED STATES PATENT OFFICE.

STEPHEN JARVIS ADAMS, OF PITTSBURG, PENNSYLVANIA.

## METHOD OF FORMING SAND MOLDS.

SPECIFICATION forming part of Letters Patent No. 455,145, dated June 30, 1891.

Application filed November 26, 1890. Serial No. 372,688. (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 the 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 wagon-boxes, pipe-balls, and like tubular castings 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 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 molds with connecting runner leading from such pouring-gate to the mold-cavity.

To these ends my invention consists, generally stated, in forming molds for such tubular castings and the feeding-gates and runners thereto by inserting the main pattern and the gate-pattern within the flask and passing the runner-pattern from the one to the other, then compacting the sand around the main pattern, gate-pattern, and runner-pattern, then withdrawing the runner-pattern, and subsequently withdrawing the main pattern and gate-pattern, leaving the mold formed with the gate and with a runner extendiug through the body of sand leading from such gate to the mold-cavity.

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—

Figure 1 is a vertical section showing a pattern in position for the compacting of the sand within the same. Fig. 2 shows the mold formed with the runner-patterns withdrawn. Fig. 3 shows the finished mold. Figs. 4. 5, and 6 are views of other forms of molding apparatus suitable for practicing my invention. Fig. 7 is an enlarged cross-section of the runner-pattern, and Fig. 8 is a view of the finished mold as formed in Fig. 4.

Like letters of reference indicate like parts in each.

Some forms of the apparatus which may be employed in practicing my present invention are illustrated in an application of even date herewith, Serial No. 372,687, in which is described and claimed a method of forming such molds, consisting in first compacting the sand within the flask and so forming the mold-cavities, and then forcing a passage through the body of compacted sand between the pouring-gate and mold-cavities, so as to form the connecting gate between the pouring-gate and mold-cavities. In my present application, therefore, I will but briefly describe the apparatus and describe such forms more especially relating to the present invention. As a general form of such apparatus, I employ the pattern-plate *a*, to which are secured any suitable number of patterns *b*, which extend up within the flask *c*, said flask being placed upon the pattern-plate in proper position thereto, so that the parts are held in proper line. I may either employ a gate-pattern *d*, extending up from the pattern-plate *a*, as in Figs. 4, 5, and 6, or a gate-pattern which is secured to a skeleton frame and which enters the opposite end of the flask and extends only part way down through the same, as illustrated in Figs. 1 and 2.

In Figs. 1 and 2 the second form above referred to is illustrated, the gate-pattern *d* being secured to what may be termed a "cage" or "skeleton frame" *e*, resting upon the flask *c*, and from which the gate-pattern *d* depends within the flask. This skeleton frame *e* may be supported in any other suitable way, and, if desired, may be supported separate from the flask—for example, being provided with arms extending down from the outer ends of the frame, so as to pass around the flask and rest upon the pattern-plate *a*, such being indicated in Fig. 2. Where the mold is formed by jarring, it is usual to employ a frame to hold the flask and pattern-plate down upon the jarring-table. Such gate-pattern *d* might be secured to that frame and thus supported within the flask, such frame being substantially the same as the frame *e*, but being forced down upon the flask by means of an adjusting-screw passing through a yoke secured to the jarring-table. Mounted in suitable guides in the main patterns, or gate-pattern—for example, in Fig. 1 in the main pat-

terns *b*—are the runner-patterns *f*, these runner-patterns being adapted to be projected from the main patterns to the gate-pattern, as shown, so that when the sand is compacted around them they will form the connecting-runners between the gate and the mold-cavities. The runner-patterns may be projected in any desired way, being either held out by springs *f'* and withdrawn by suitable levers *g* or like mechanism, such as shown in Figs. 1 and 2, or being forced out by suitable cam mechanism or withdrawn by the same, or, as in Fig. 4, the runner-pattern consisting in a bar connecting the main patterns and gate-patterns and withdrawn through the side of the mold. In either case the runner-pattern is projected so as to extend between the main pattern and gate-pattern before the sand is compacted within the flask, and upon the compacting of the sand within the flask at the same time that the mold-cavity and the gate are formed the runner is formed, such runner forming a passage connecting the gate to the mold-cavity.

In order to permit of the proper compacting of the sand around such runner-patterns, I generally form the same with sloping sides, or, as it might be described, oval in cross-section, being of greater height than thickness, so that the sand may pass around the pattern and be compacted below it, as shown in the enlarged view, Fig. 7. Practical experience in connection with such patterns where the molds are formed by jarring proves that the sand can be properly compacted below such shaped pattern. During the compacting of the sand, as above described, the patterns *f* in Fig. 1 are held out to place by the springs *f'*, and as soon as the mold is thus formed by placing the pattern-plate on another table, such as a table to withdraw the patterns, as at *i*, having lugs *i'* thereon, the lugs press on the levers *g*, and so withdraw the runner-patterns *f* into the bodies of the main patterns *b*, after which the main patterns and gate-patterns may be withdrawn vertically from the mold. When the cores are placed therein, as in Fig. 3, the mold is ready for casting.

In Fig. 4 I form the runner pattern or patterns of a bar *h*, which passes through the side of the flask, as at *c'*, this bar extending through the smaller print *b'* of the one main pattern, through the gate-pattern, as at *d'*, and into the smaller print *b'* of the other main pattern, so that when the sand is compacted around the same the connecting-runner between the mold-cavities and gate will be formed. In such construction the bar forming the runner-pattern simply remains within the flask during the compacting of the mold, and is withdrawn by hand after the compacting of the sand, when the other patterns are withdrawn vertically. Upon the insertion of the cores the mold is completed, the core cutting off the cavity formed by the bar between the flask and mold-cavity and the metal in casting passing down the gate through the runners and up the sides of the cores into the mold-cavities.

In Fig. 5 I have shown practically the same construction of runner-pattern as in Fig. 1, the runner-patterns being mounted in horizontal guideways in the bases of the main patterns, as at *k*, and the runner-patterns having formed thereon the wedges or cams *k'*, which depend through openings in the pattern-plate *a*, said wedges coming in contact with wedges or cams *l* on the jarring-table *m*, which force them forward, projecting the same through the main patterns to the gate-pattern and holding them in that position during the formation of the mold, and when the pattern-plate carrying the finished mold within the flask is placed upon the lowering-table, as at *n*, said lowering-table has also the wedges or cams *p* thereon, which will act in connection with the wedges *k'* to draw back the runner-patterns *k* within the main patterns, so that the main patterns may be lowered vertically from the finished mold.

In Fig. 6 practically the same construction is shown, except that the runner-patterns *r* extend up at an incline, being mounted in inclined guideways *r'*, so that they will join to the gate-pattern and upon the compacting of the sand around the same form the runners or passages between the gate or mold cavity. Any suitable block upon the molding-table *m*, as at *s*, may be employed to project them, and they may be retracted by springs or other suitable means when the mold is lifted from such table.

In all the different constructions shown it is thus evident that the runner-pattern forms the connection between the main pattern and the gate-pattern throughout the entire molding operation, so that the sand may be compacted by jarring or other suitable way around the runner-pattern, and that in order to remove the main pattern and gate-pattern it is first necessary to withdraw the runner-pattern from the one within the other, so leaving the runner, as at *t*, formed between the two, when the gate-pattern and the main pattern may be withdrawn from the mold, leaving the gate *u* and the main mold-cavity *v*, in which the core *w* is to be placed, the core, if necessary, forming a leader from the runner or passage *t* through the sand into the mold-cavity.

The different figures in the drawings are taken as illustrations of different ways in which my invention may be practiced.

It is to be understood, of course, however, that my invention is not limited to the use of such molding apparatus.

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

1. The herein-described method of forming molds for tubular castings and the feeding gates or runners thereto, consisting in inserting the main pattern and gate-pattern within the flask, passing a runner-pattern from the

one to the other, compacting the sand around the main pattern, gate-pattern, and runner-pattern, then withdrawing the runner-pattern and subsequently withdrawing the main pattern, and gate-pattern, substantially as and for the purposes set forth.

2. In molding apparatus, the combination of a flask, a main pattern and a gate-pattern entering the flask, and a runner-pattern extending through the side of the flask and connecting the main pattern and gate-pattern, substantially as and for the purposes set forth.

3. In molding apparatus, the combination of a flask, a main pattern and a gate-pattern entering the flask, and a runner-pattern connecting the main pattern and gate-pattern, the sides of said runner-pattern sloping gradually downward from the thickest part thereof, substantially as and for the purposes set forth.

4. In molds for forming tubular castings, the combination of a flask, a mold formed therein having a mold-cavity, a gate, and a cavity for forming the runner extending from the side of the flask to the print of one mold-cavity and thence to the gate, and a core entering the mold-cavity and seated in the print thereof and closing off that part of the runner-cavity between the mold-cavity and flask, 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.