

S. J. ADAMS.  
SAND MOLD.

Patented Sept. 8, 1891.

Fig. 2.

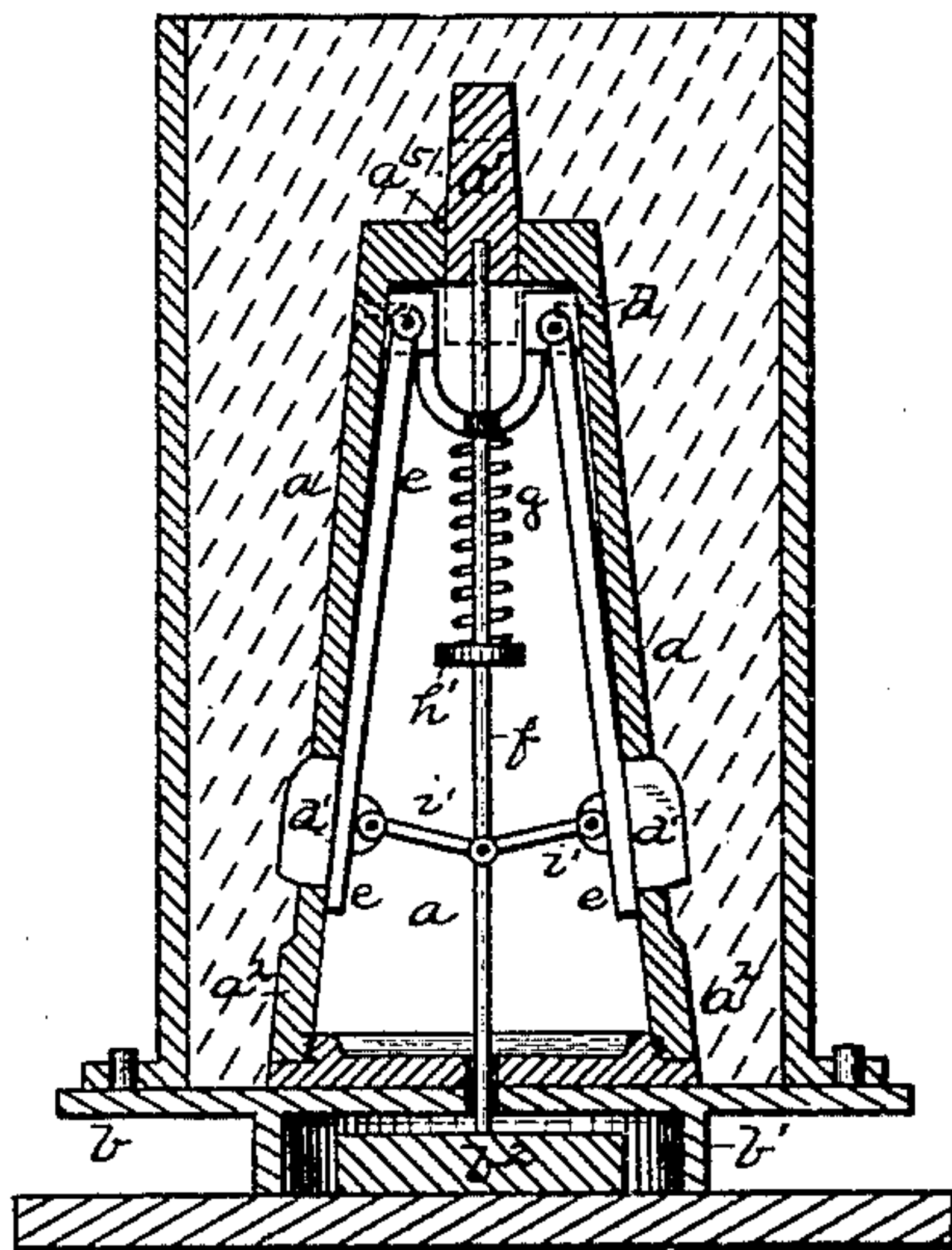
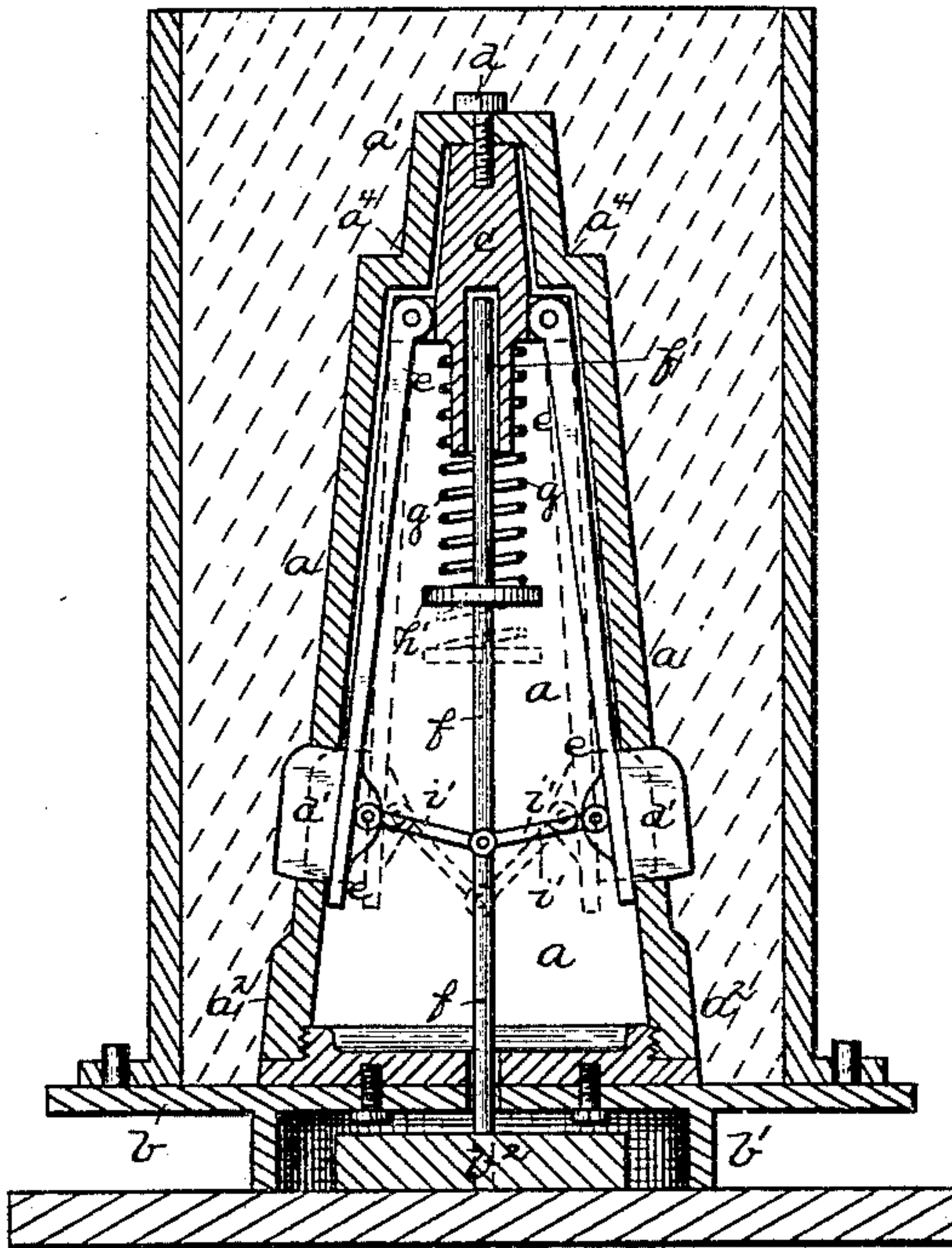
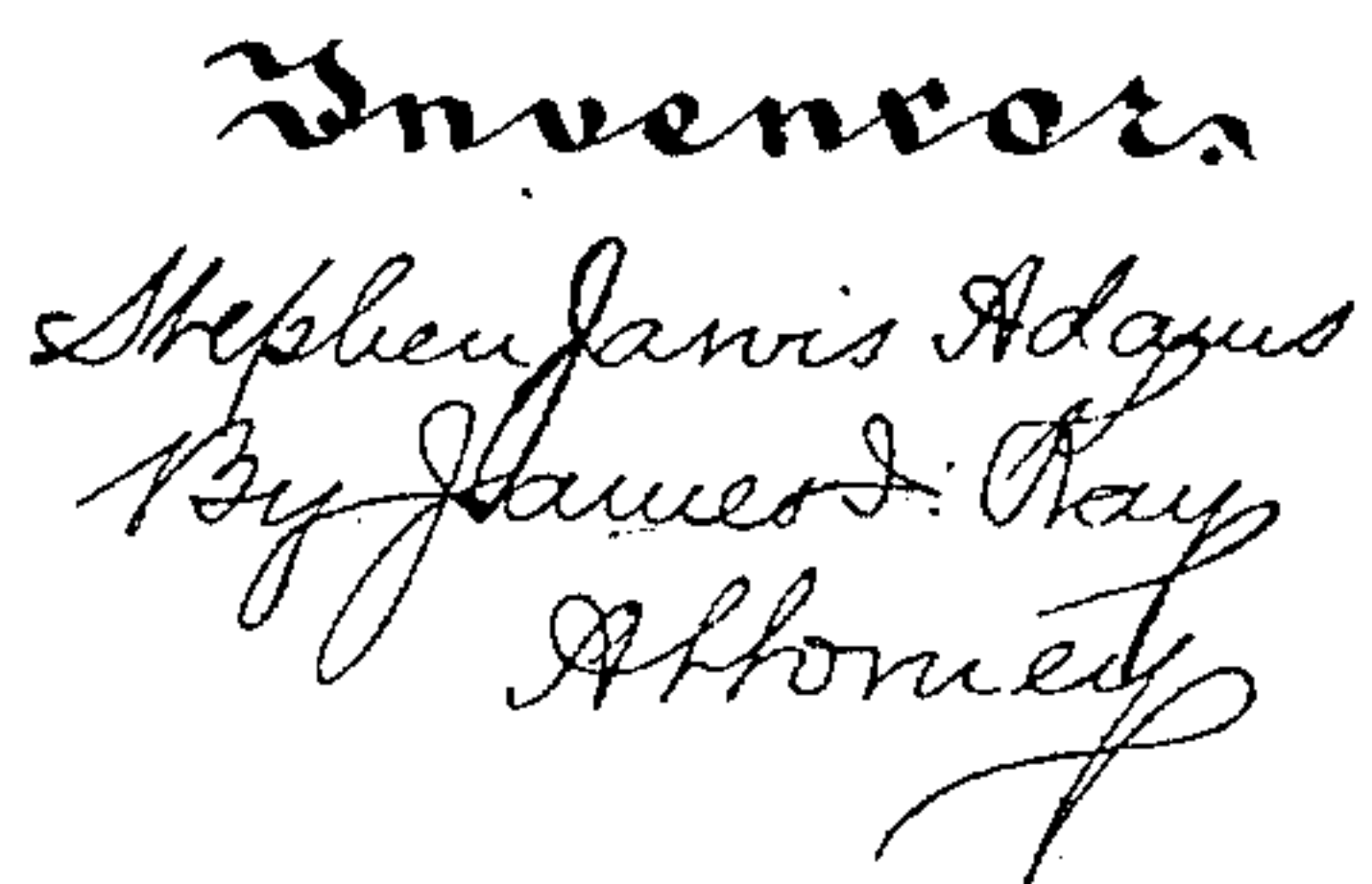


Fig. 4.

*Fig. 5.*





# UNITED STATES PATENT OFFICE.

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## SAND MOLD.

SPECIFICATION forming part of Letters Patent No. 459,103, dated September 8, 1891.

Application filed July 9, 1890. Serial No. 358,122. (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 Sand Molds; and I do hereby declare the following to be full, clear, and exact description thereof.

My invention relates to apparatus for molding sand for castings, and more especially those in which the mold is made in a vertical position, and there are wings or offsets from the body of the mold-cavity, which are above the end from which the pattern is withdrawn from the mold.

Heretofore in the making of the mold for this class of articles they have been generally produced by forming one half the mold at a time with the pattern in a horizontal position, then placing the two parts of the mold together to form the completed mold. The great objection to this method is that it forms a seam or fin along the length of the casting on each side at the line of juncture of the two half-molds, which seams must be ground off to produce a well-finished article. It is also practically impossible to make perfectly-round castings, as the sand packed along the seams at the sides of the mold will not be rammed as hard as that on the top, and the sand will consequently be pressed out at such softer places by the weight of the molten metal. Then, again, the mold being divided through at seam (or center of casting) is not rigid, like a solid mold, and will naturally spread more or lap from the weight of molten metal. When, however, the molds are made by the pattern in a vertical position, a seamless and perfectly-cylindrical casting is obtained; but to make in this way a mold in which there are wings and offsets extending out from the body of the mold-cavity at a point above the lower end of the mold, or that at which the pattern is withdrawn from the mold, it is essential that some means by which that part of the pattern which molds these offsets will be withdrawn into the pattern, so that nothing projects beyond the main surface of the pattern to hinder its withdrawal when the mold is completed.

One of the objects of my invention is to

provide an apparatus by which this may be effected.

In making these molds with the pattern in a vertical position I also find that where there is a projecting part on the upper end of the pattern, such as that necessary to produce the core-print on a pipe-ball or wagon-box, the sand is liable to stick in the corners of the pattern where this extension springs from the body of the pattern, and where the pattern is withdrawn from the mold the walls of the latter will be broken at this point, causing a defective casting. This I propose to obviate in the same manner as the difficulty with wing-patterns above referred to by giving to the projecting part of the pattern a slight withdrawing movement after the formation of the mold to overcome the adherence of the sand thereto and prevent the pattern from breaking off any sand and carrying the sand out with it when the pattern is withdrawn from the mold.

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

Figures 1, 2, 3, and 4 are sectional views showing molding apparatus embodying my invention, and Fig. 5 is a view of an apparatus for molding pipe-balls embodying a part of my invention.

Like letters indicate like parts.

In the drawings I have shown my invention applied to the making of wagon-box molds and pipe-balls; but it may be applied to making molds for other articles where the same effects are to be produced. In the molding of molds where there is a sectional enlargement or offset from the body of the mold at one or more points, which enlargements are above the end of the mold—such, for instance, as the wings on a wagon-box—I make a hollow pattern *a* of the usual form—that is, with the projection *a'* thereon at the upper end thereof—for molding the core-print, and the collar *a*<sup>2</sup> at the base for molding the cope-print, the whole being secured to a pattern-plate *b* in any suitable manner. In the upper end of this hollow pattern *a* is a block *c*, which is secured to said pattern by screws *d*, passing down from the top, as shown in Figs.



1 and 2; or, if desired, other means of attachment may be employed. Pivoted to this block *c* are arms *e*, each of which extends down within the hollow pattern and carries  
 5 on its lower end the wing-pattern *d'*, forming the movable part of the main pattern *a*, these wing-patterns forming the offsets in the mold. The pattern *a* has openings *a*<sup>3</sup> therein to permit the wing-pattern or part *d'* to be moved  
 10 out beyond the surface of the main pattern during the molding operation. The position of these holes *a*<sup>3</sup> is of course determined by the position which the offsets are to occupy on the casting. To hold these movable pattern parts out or projecting beyond the surface of the body of the pattern during molding and withdraw them when the mold is completed, I have shown in Figs. 1 and 2 two forms of mechanism, which are, however, substantially the same in principle.

In the construction shown in Fig. 1 a rod *f* extends up through an opening in the pattern-plate *b* into the body of the pattern *a*, and resting at its upper end in a recess *f'* in the block *c*, and coiled around said rod is a spring *g*, which bears at one end against the block *c*, and at its other end against a loose nut or washer *h* on said rod, the nut being prevented from moving down the rod by inwardly-inclined arms or wings *i*, with one secured to or formed on each side of the rod *f*. Each of these arms *i* has a slot *k*, into which enters the end of the arm *e*, that carries the movable pattern part *d'*, and in consequence  
 35 of the inward inclination of the arms *i*, when the rod *f* is forced downward by the force of the spring *g*, the arms *e* are drawn inward and the pattern parts *d'* thus drawn back into the pattern; but if the rod is forced upward the outward inclination of the lower ends of the arms *i* will force the pattern parts *d'* outward to the position shown in Figs. 1 and 2, this being their proper position during the formation of the sand mold. This forcing up of the  
 45 rod *f* against the resiliency of the spring *g*, so as to cause the pattern parts *d'* to project beyond the pattern *a*, I usually accomplish by resting the pattern-plate down on the molding-table, or, if not sufficiently heavy, pressing it down thereon and holding it there, thus forcing the rod *f* up until it is even with the bottom of the pattern-plate and holding it in that position until the apparatus is again lifted from the table, when the springs are free to  
 55 act and withdraw the movable patterns. Where the molds are formed by the jarring process, it is preferable to fasten the apparatus to the table to prevent the bouncing of the apparatus during the molding operation and to prevent movement of the main pattern from jarring table, which would disarrange loose parts of the pattern.

In the construction shown in Fig. 2 the rod *f* extends up through the pattern-plate as before and rests at its upper end in the recess in the block *c*; but the coiled spring *g*, instead of bearing against a loose nut *h* on the rod,

bears against the collar *h'* thereon, and the ends of the arms *e* are connected directly to the rod by links *i'*, which form a sort of toggle-joint.

As the lower ends of the rods *f*, if allowed to project below the under surface of bottom plate, are likely to be bent and broken off in case the apparatus is not set squarely on the  
 75 table, I prefer to form on the bottom of the pattern-board *b* an annular-shaped support-flange *b'*, which has a greater depth than the distance that the rod *f* projects beyond the surface of the pattern-plate when it is in its  
 80 lowest position, which prevents the rod from being affected when the apparatus is placed upon a table or the floor. To secure the upward movement of the rod *f* when the apparatus is placed on the table for molding, a  
 85 filling-block *b*<sup>2</sup> of smaller size than the flange is placed on the table before the apparatus is placed thereon, the depth of this block being just sufficient to force the movable pattern parts *d'* to the proper position for molding  
 90 when the apparatus is placed on this block, the flange and the block requiring that the apparatus shall be squarely placed, and not put down sidewise. This arrangement has the further advantage that when the apparatus is lifted from the table and the block *b*<sup>2</sup>  
 95 it may be set down again anywhere without affecting the rod *f*, as it is protected by the flange *b'*. In the making of molds with these vertical patterns the sand is likely to stick  
 100 around the corners *a*<sup>4</sup> of the extension *a'* of the pattern *a*, which forms the core-print, and when the pattern is withdrawn from the mold the sand is carried with the pattern at this point, breaking the walls of the mold and forming a defective casting. To avoid this, I make this extension loose and operate it in substantially the same manner as the wing-patterns *d'* above referred to, holding it in position during the molding operation, but as soon  
 110 as the molding is completed withdrawing it slightly from the cavity made by it in the mold, so as to free it from the sand, the slight withdrawing motion imparted to this extension *a'* while the sand is firmly supported by  
 115 the main body of the pattern overcoming the sticking or binding of the sand to the pattern in this annular depression, and it consequently allows the whole pattern to be withdrawn without carrying with it any of the  
 120 walls of the mold. This in the apparatus heretofore described is effected by extending the rod *f* up and screwing onto its upper end the block or exterior part *a'*, which fits accurately in an opening *a*<sup>5</sup> in the upper end  
 125 of the pattern *a* and effects the molding of the core-print, so that when the apparatus is placed in position on the molding-table the extension *a'* will be forced up into and held in its molding position at the same time that  
 130 the movable pattern parts *d'* are forced out, as above described. Where, however, it is not necessary to mold any wings or offsets the rod *f* simply has attached to its upper end



the extension  $a'$ , projecting through the opening  $a^5$  in the pattern  $a$ , as shown in Fig. 4. The simplest form of this part of my invention is shown, however, in Fig. 5, as applied to a pattern for making pipe-balls, in this construction the extension  $a'$  being made in the form of a long loose rod which extends down through a passage  $a^6$  in the body of the pattern  $a$  and in the pattern-plate  $b$ , and which, when the apparatus is placed upon a table, as heretofore described, the extension being forced upward until it is in position for molding. After the completion of the molding when the apparatus is lifted from the table this extension drops down by its own weight, or is pushed down by pressure on the end projection through the top of the mold, so as to free itself from the sand around it.

In carrying on the operation of molding with my improved apparatus the latter is placed on the molding-table, which causes the movable pattern part  $d$  to be forced out beyond the surface of the body of the pattern  $a$  and the extension  $a'$  to be forced up to its molding position in the manner heretofore described, and if the jarring process is to be employed to pack the sand the pattern-plate  $b$  should be firmly secured to the table by yokes or any suitable means. The flask  $o$  is then placed on the pattern-plate  $b$  and secured thereto in the usual manner and the packing of the sand around the pattern in the flask commenced, this packing being performed by jarring or any other suitable method. When it is completed, the pattern-plate is released from the table and the apparatus lifted from the latter, which allows the spring  $g$  to withdraw the wing-patterns or other movable pattern parts  $d$  within the mold, leaving the pattern free to be withdrawn from the finished mold, and draw the extension  $a'$  down to overcome the binding of the sand around it, as heretofore explained. The patterns can then be withdrawn from the finished mold by dropping them out, by lifting them out after the flask is inverted, or by other suitable means, and as the movable parts or wing-patterns  $d'$ , which formed the offsets in the mold, have been withdrawn into the body of the mold there is no obstruction

to the withdrawal of the pattern, and as the extension  $a'$  has freed itself from the surrounding sand there is no breaking or marring of the walls of the mold on account of the sand sticking to the pattern at the point.

By the use of my invention I am thus enabled to form with vertical or longitudinally-withdrawn patterns molds for castings having wings, offsets, or enlargements at any desired places on the sides thereof, and so overcome the formation of fins or irregularities on the finished casting formed by the meeting edges of the two parts of the mold, the mold for cylindrical articles being formed so true as to practically require no grinding. I also prevent the marring of the ends of the castings and so overcome the necessity of trimming the ends thereof before use, practical use of my invention showing that the castings made in the molds formed thereby require no surface dressing.

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

1. In molding apparatus, the combination, with a main pattern or body, of a pattern-plate carrying the same and having a supporting-flange on the under side thereof, a movable pattern adapted to project beyond the pattern-body, a bar connected to the movable pattern and projecting beyond the base of the pattern-plate, and a block fitting under the pattern-plate and within said supporting flange or flanges, substantially as and for the purposes set forth.

2. In molding apparatus, the combination, with the main pattern or body  $a$ , rigidly secured to the pattern-plate  $b$ , of the arms  $e$ , pivoted therein and carrying the movable patterns  $d'$ , the longitudinally-moving bar  $f$ , projecting through said pattern-plate, and connections between said bar and said pivoted arms, 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:

JAMES I. KAY,  
ROBT. D. TOTTEN.