(No Model.) 2 Sheets—Sheet 1.

# S. J. ADAMS.

## METHOD OF AND APPARATUS FOR FORMING SAND MOLDS.

No. 574,052. Patented Dec. 29, 1896.

Fig. 2

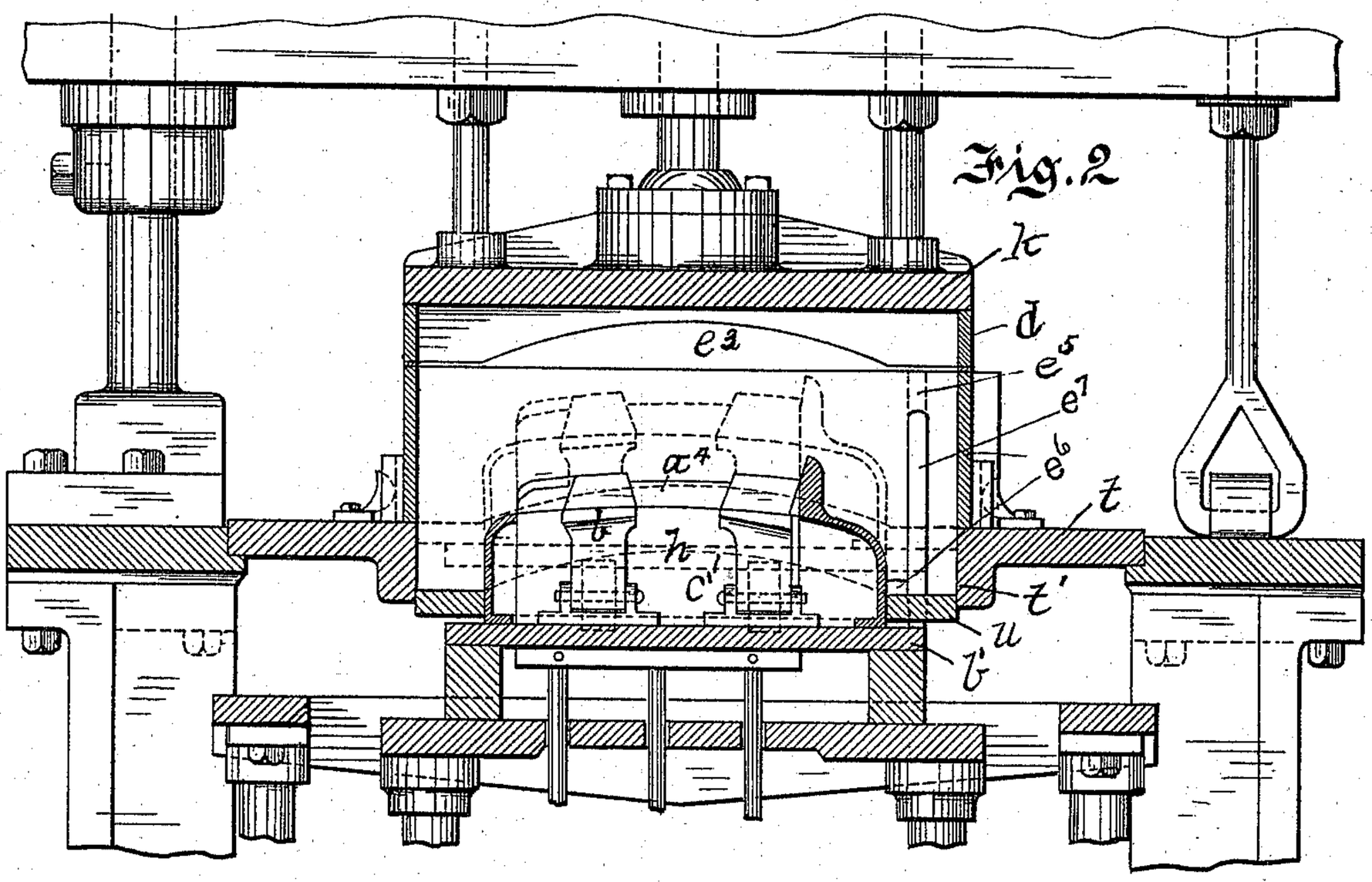



Fig. 3

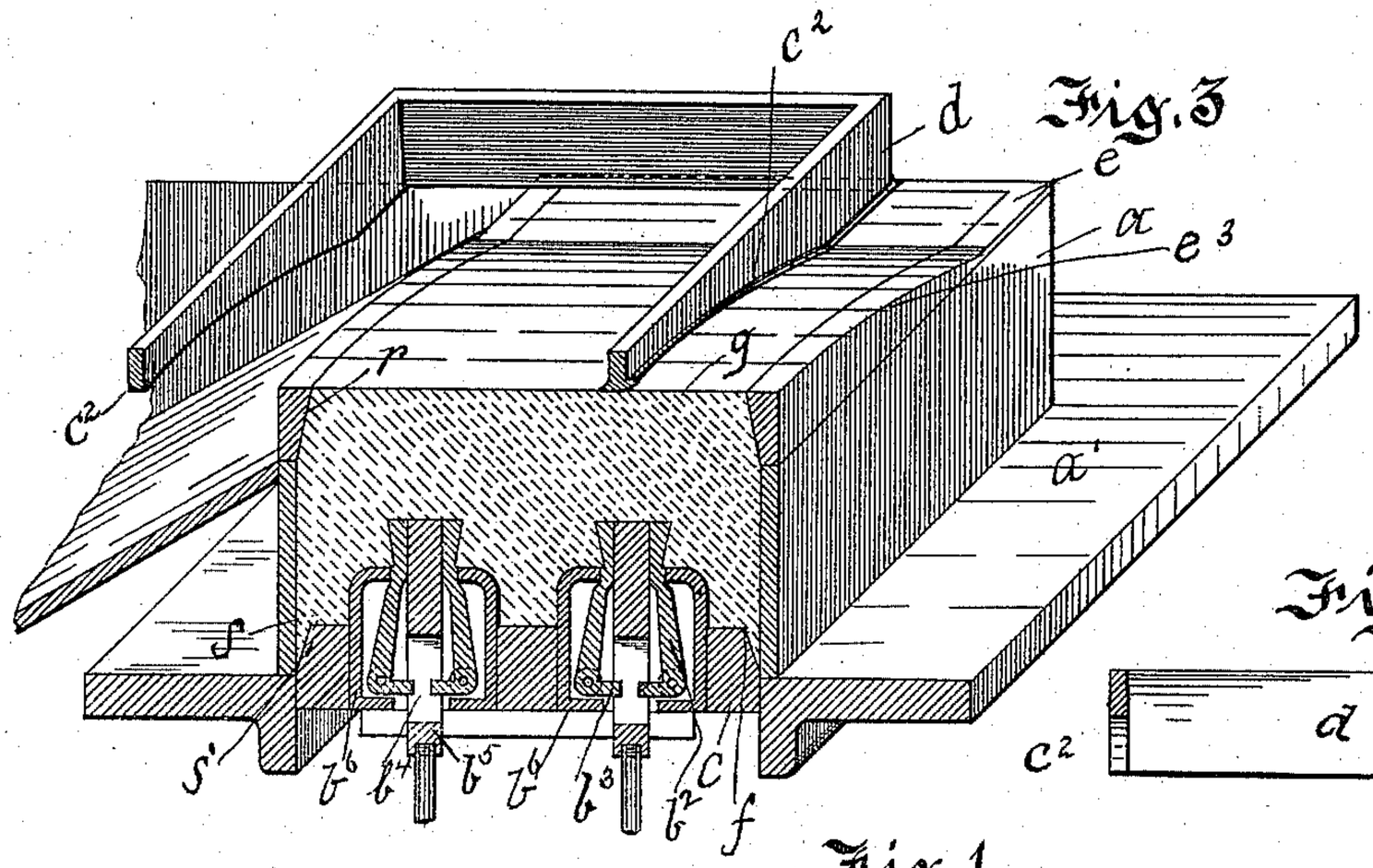
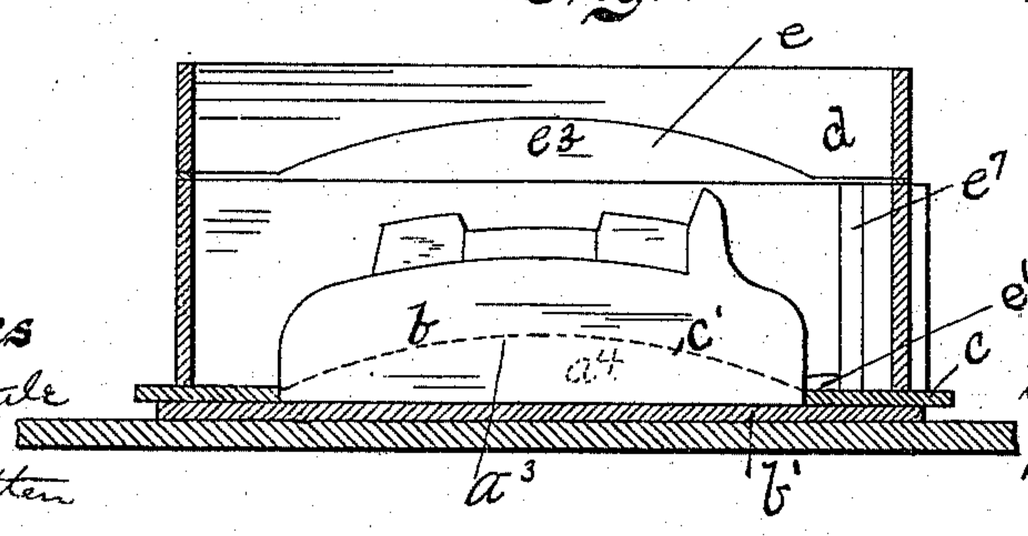



Fig. 4




Fig. 1

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(No Model.) 2 Sheets—Sheet 2.

# S. J. ADAMS.

## METHOD OF AND APPARATUS FOR FORMING SAND MOLDS.

No. 574,052. Patented Dec. 29, 1896.

Fig. 5

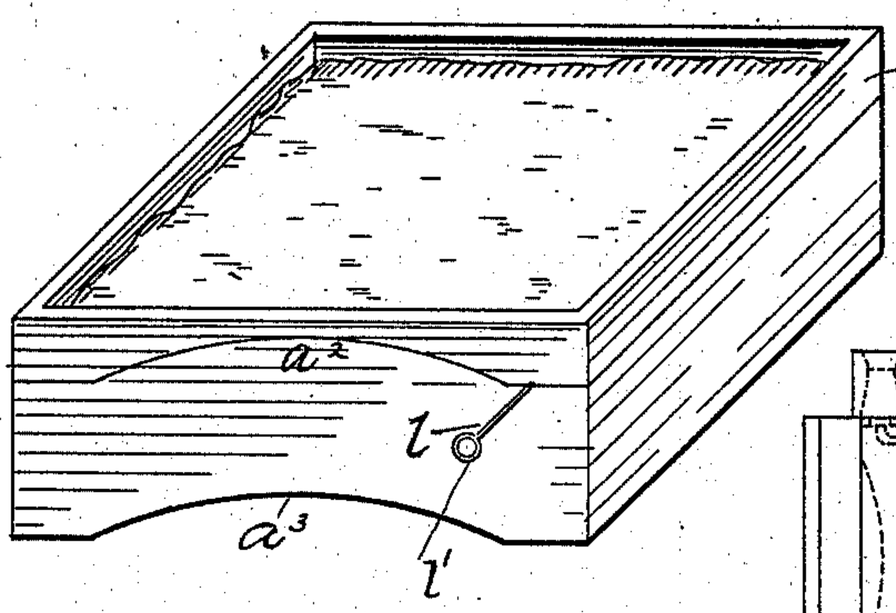



Fig. 8

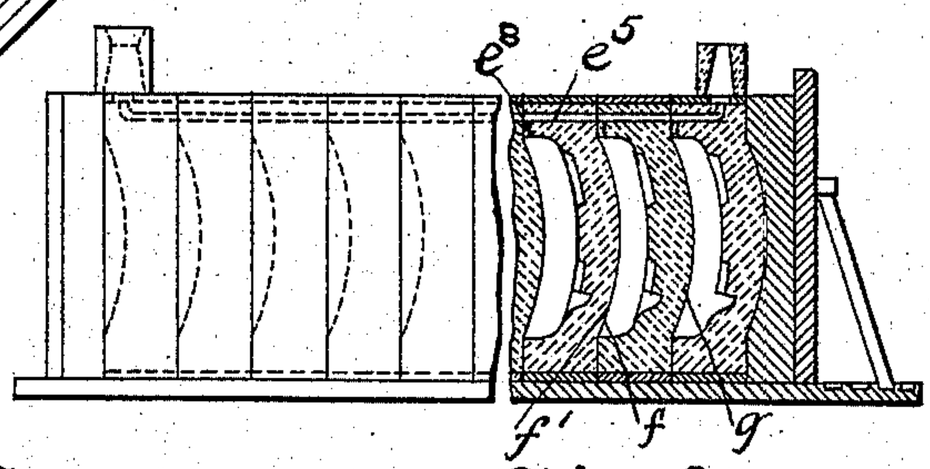



Fig. 6

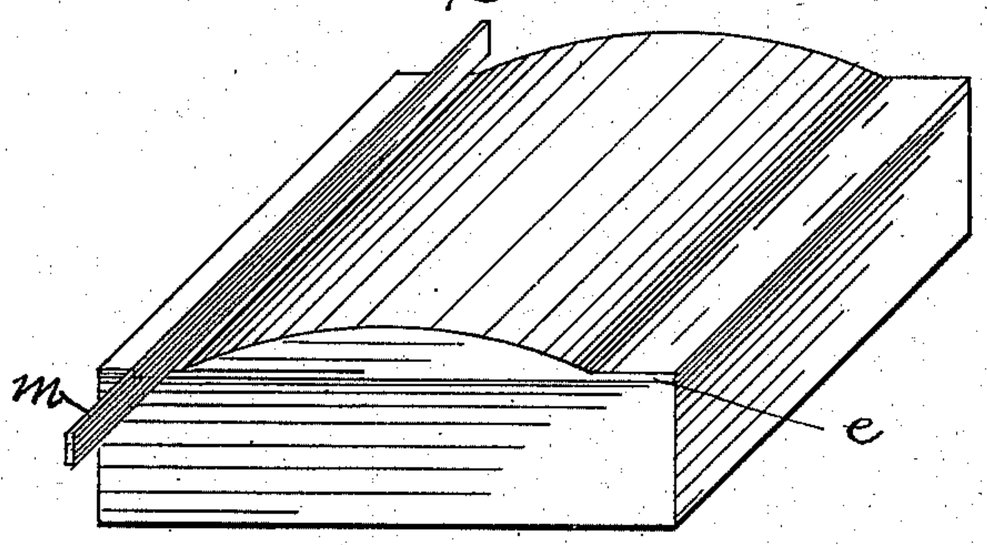
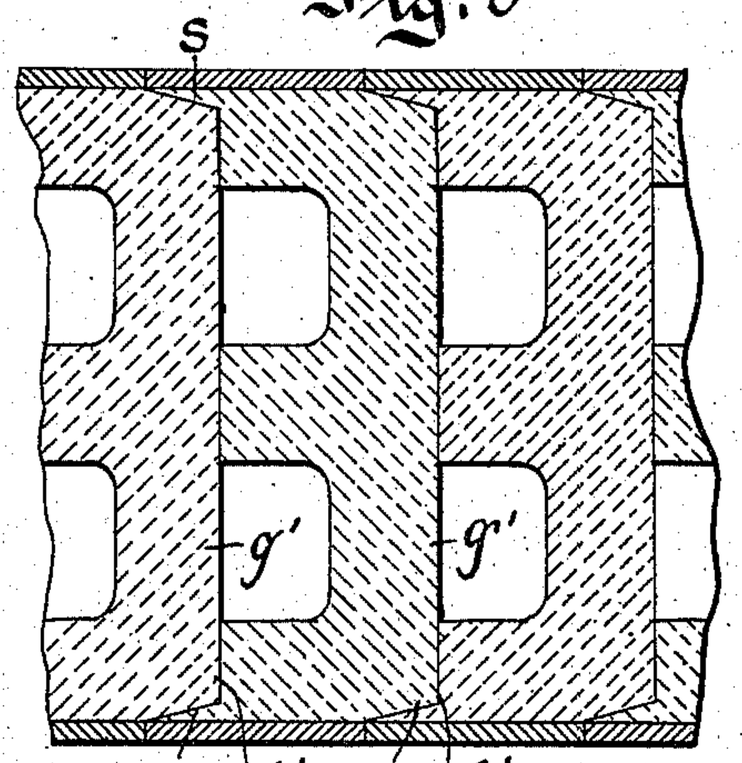



Fig. 9



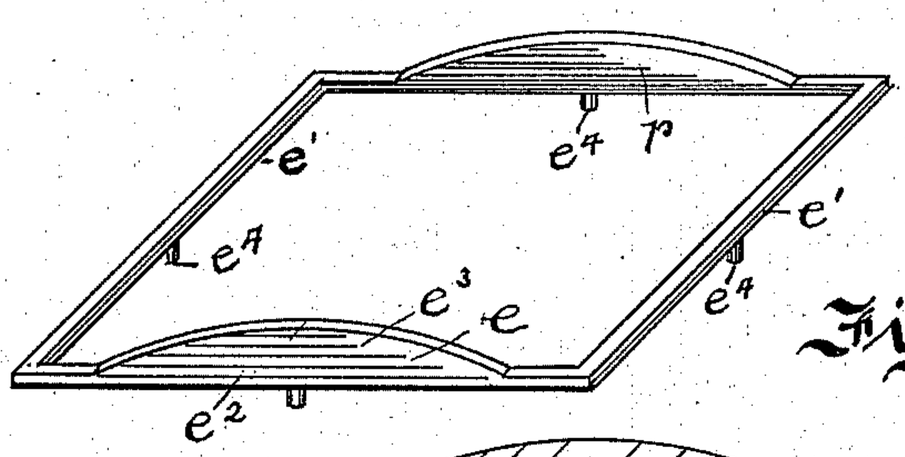
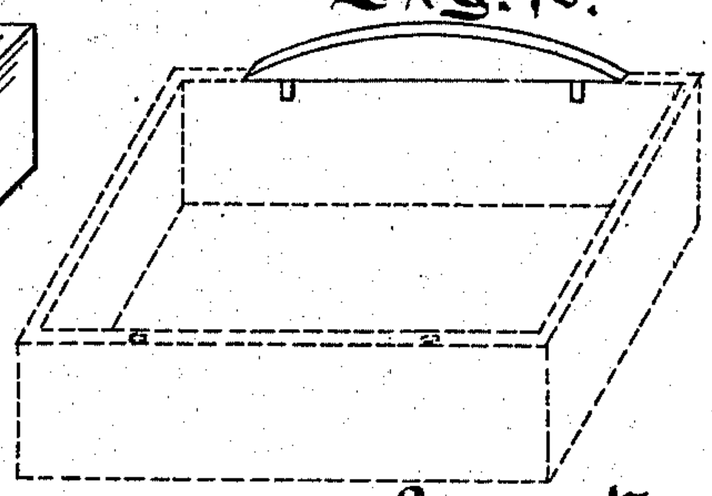
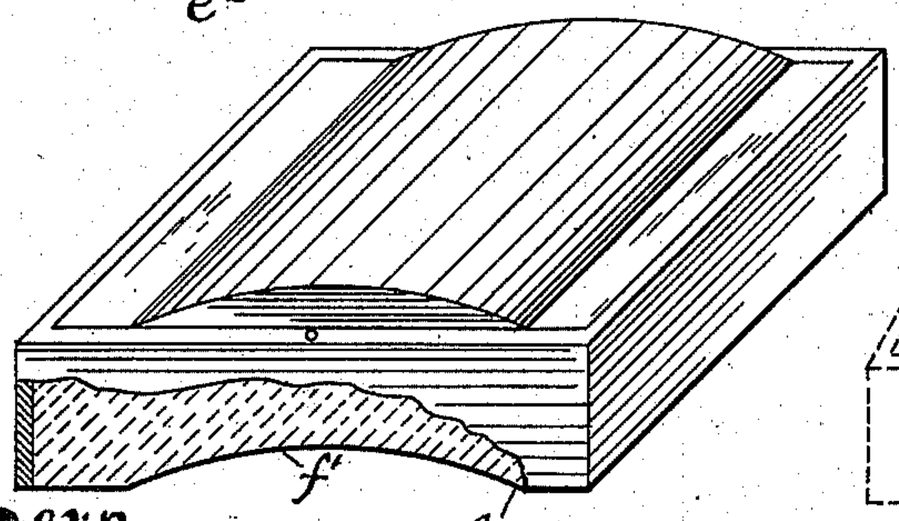




Fig. 7

Fig. 10.






Witnesses

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# UNITED STATES PATENT OFFICE.

STEPHEN JARVIS ADAMS, OF PITTSBURG, PENNSYLVANIA.

## METHOD OF AND APPARATUS FOR FORMING SAND MOLDS.

SPECIFICATION forming part of Letters Patent No. 574,052, dated December 29, 1896.

Application filed March 21, 1895. Serial No. 542,614. (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 Methods of and Apparatus for Forming Sand Molds; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the making of sand molds, its object being to provide a method of and apparatus for the making of molds having mold-faces on both sides thereof each composing part of the walls of a mold-cavity, such, for example, as molds for brake-shoes, in which one face has a convex projection, part of which forms the surface for casting the concave wearing-face of the brake-shoe, while the other face has a concave depression corresponding to the convex projection and a cavity below the same corresponding to the shape of the shoe to be formed, a series of such molds being placed in contact with each other, as described in application for patent filed by me the 24th day of October, 1892, Serial No. 449,904. Such form of mold well illustrates the invention, though the invention may be employed in forming other molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold-cavity.

To these ends my invention consists, generally stated, in compacting the sand in the flask around the pattern to form one mold-face and then cutting off the compacted sand to an irregular shape, corresponding to the other mold-face to be formed.

It also consists in compacting sand within the flask around the pattern and within a reservoir above the flask and then cutting off the sand to form the opposite side of an irregular shape, such as by sliding the reservoir across the flask or sand-holder.

It also consists in certain improvements in the molding apparatus, as 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—

Figure 1 is a longitudinal section of a mold, illustrating the invention where the mold is compacted in the ordinary way. Fig. 2 is a like view of a mold, illustrating the invention where the mold is compacted by an upward movement of the pattern into the sand within the flask and reservoir, as more fully described in application filed by me on the 11th day of May, 1894, Serial No. 510,846. Fig. 3 is a view of the flask and reservoir, illustrating the movement of the reservoir in the cutting off of the sand. Fig. 4 is a view of the reservoir, partly broken away, illustrating the construction thereof. Figs. 5 and 6 illustrate other ways of cutting off the top surface of the mold to the finished shape desired. Fig. 7 is a perspective view showing the finished mold within the flask, which is partly broken away, said figure also showing the templet above the flask. Fig. 8 is a combined side view and longitudinal section illustrating the series of molds together. Fig. 9 is a horizontal cross-section of the same, and Fig. 10 is a view of a removable guide-piece to be used with the flask.

Like letters of reference indicate like parts in each.

My invention is illustrated in connection with molds for casting brake-shoes because that is the form of mold with which it has been employed, and it well illustrates the invention, but it is to be understood that the invention can be employed in forming any mold one face of which is irregular in one direction but regular in the other direction, so that it can be formed by cutting off.

I will first describe the simplest form of invention, where the mold is made by compacting the sand in a stationary flask, *a* being the flask, resting on the table *a'*, *b* the pattern, *c* the stripping-plate, and *d* the reservoir.

The flasks employed may be made to correspond in shape to the two faces of the mold, which are to rest against adjacent molds, and may have projections on them, as shown at $a^2$, fitting into depressions $a^3$ in the adjoining flask, such flasks being shown in Fig. 5, but as it is desirable in many cases to employ the ordinary rectangular flask without such projections I find it desirable to employ what I term a "templet" *e*, which is simply a hollow skeleton frame such as shown in perspective in Fig. 7, corresponding in shape to the flask

and formed of the side bars $e'$ and end bars $e^2$, the under face of which templet is flat or straight, while the upper face has formed on it projections $e^3$, corresponding to the projections $a^2$ of the special flask, the templet having guide-posts $e^4$ thereon to fit over the body of the flask, and the straight flask and templet together forming the sand-holder, and the projections thus formed by means of the templet corresponding with the irregular shape of the upper mold-face to be formed.

Instead of having projections on the templet, it may be formed with depressions therein corresponding to the mold-face to be formed. The templet may also be composed of separate removable guide-pieces, such as shown in Fig. 10, to be secured on the top of the flask on each side thereof and forming the guiding means for the cutting off of the top surface of the flask. As the two mold-faces are to fit against each other the lower mold-face $f$ must, of course, be made of the same irregular shape as the upper mold-face $g$, and in case a special flask (shown in Figs. 1 and 5) is employed the table $a'$ has projections $a^4$, (shown in dotted lines in Fig. 1,) corresponding to the depressions $a^3$ of the flask and fitting into the same when the flask is placed upon the table, so closing the flask at those points. In order to form the depressed face of the mold, the stripping-plate $c$ has projections $c'$ thereon, corresponding to the depression formed in the mold-face, such projections fitting around the pattern or patterns $b$, which extend up through the stripping-plate.

Instead of the table having projections $a^4$, the lower ends of the flask at the depressions $a^3$ may be closed by the stripping-plate itself, the projections $c'$ of which are made wider for this purpose, and in the simple form of molding, as shown in Fig. 1, that would be the natural course. Where a plain rectangular flask is employed, the projections $c'$ of the stripping-plate extend up within such flask, forming the depression $f'$ in the lower face within the rectangular flask, as shown in Figs. 3 and 9.

The reservoir $d$ corresponds in size to the flask, and rests either directly upon the flask or upon the templet $e$, according to the shape of the flask employed, that is, it rests upon the sand-holder, whether that is composed of the flask itself or the flask and templet. The lower edge of the reservoir corresponds to the shape to be given to the upper mold-face $g$, having in the mold shown the depressions in its edges corresponding to the projections $a^2$ of the flask or $e^3$ of the templet. Where the reservoir is employed as a cutting means, as illustrated more fully in Figs. 3 and 4, one edge of the reservoir is made either square or with the projecting cutting edge, so as to cut off the sand after it has been compacted in the sand-holder and reservoir, such cutting edge being shown at $c^2$; and back of the same I prefer to form the base of the reservoir rounded slightly, so as to form a slicker $c^3$, which will act when drawn over the surface of the mold after it has been cut off by the cutter $c^2$ to smooth or slick up the surface of the mold and bring it to finished shape.

When forming the mold where the sand is compacted around the stationary pattern, as more fully illustrated in Fig. 1, the stripping-plate $c$ is placed around the pattern $b$ and the pattern and stripping-plate placed upon the table, and the flask $a$ is placed upon the stripping-plate, the templet $e$ upon the flask, the two together forming the sand-holder, and the reservoir $d$ is placed upon the templet. The sand is then compacted within the sand-holder and reservoir by ramming or some suitable means, and the operator then slides the reservoir $d$ over the templet, so that its cutting edge $c^2$ cuts off the sand to the irregular shape of the base of the reservoir and the upper surface of the templet. The cutting edge $c^2$ may be formed a little large, say not a close fit on templet, (a little space left between,) so leaving just sufficient or additional sand for the slicker side of the reservoir $c^3$ to finish the face of the mold. In order to smooth up the surface so cut to irregular shape, he can then slide the reservoir over the surface of the mold one or more times and by means of a slicker $c^3$ bring it to smooth shape, either depending upon the sand on the surface of the mold, some of which may project above the flask to provide the sand for slicking, or upon the sand still within the reservoir, which will provide a surplus for such slicking operations, or, if he so desires, he can sprinkle fresh sand or pulverulent plumbago or like substance upon the surface of the mold and then smooth up the mold by the slicker, so as to insure a perfectly smooth and finished surface on the compacted mold. He then lifts off the templet and withdraws the pattern through the stripping-plate and lifts the completed mold within the flask from the stripping-plate. It is of course to be understood that if there are any wing-patterns, such as for forming dovetail recesses, which are required in certain forms of brake-shoes, such wing-patterns are carried by the main pattern and are operated so as to be drawn together by mechanism within the pattern before the pattern is drawn from the mold.

In case the mold is formed in a flask of irregular shape, such as is shown in Fig. 5, it is of course to be understood that templet $e$ is not employed, the flask itself supporting the sand-reservoir and its edges giving the necessary shape for the cutting off of the upper surface of the mold in the same way that the templet operates, as above described. In case the mold is made with a continuous runner passing through it, as illustrated at $e^5$, this runner can be formed by means of a bar or runner pattern $e^7$, extending up from the pattern-plate $b'$ to the upper surfaces of the sand-holder and being withdrawn with the pattern from the mold, and the runners

leading therefrom to the mold-cavity, such as at $e^8$, may be formed in the under surface of the mold by means of ribs $e^6$ on the stripping-plate.

Where the mold is formed by the upward movement of a pressing-pattern and stripping-plate, as more particularly described in the said application, Serial No. 510,846, the apparatus shown in Fig. 2 may be employed, the same flask, templet, and reservoir being employed. The pattern *b* (shown in this figure) is used simply as an illustration of any suitable pattern and is what might be termed a "collapsible" pattern, such as described in my said application, Serial No. 510,846, having the pattern-shell $b^6$, the hinged wings $b^2$, forming the dovetail portions, which wings are hinged within the shell $b^6$ near the base thereof and having lugs $b^3$, extending inwardly within a slot $b^4$ in the vertically-moving spreader $b^5$ of the collapsible pattern, said spreader acting when forced upwardly to spread the dovetail portions and when drawn downwardly to collapse or draw in said portions. In such case I employ the flask-plate *t*, the upper edge of which corresponds in shape to the lower edge of the flask, while the flask-plate has the depending flange *t'*, within which a stripping-plate *u* fits, such depending flange forming the reservoir to receive the sand below the flask and around the pattern, and pattern *h* extending up through the stripping-plate, both the pattern and the stripping-plate being connected to suitable operative mechanism below the table, so that they may be forced upwardly in the formation of the mold. The flask is placed upon the table, the templet upon the flask, and the reservoir upon the templet. Sand is fed into the flask and reservoir and a top confining-plate *k* placed upon the reservoir and held securely there, and the pattern and stripping-plate are then forced upwardly to compact the sand within the flask to form the compacted mold. The confining-plate *k* is then removed and the reservoir *d* is moved across the templet *e*, so as to cut off the sand within the reservoir, and, if necessary, the upper surface of the mold is slicked in the manner above described. The pattern is then withdrawn through the stripping-plate and the finished mold removed.

The cutting off of the sand to the irregular shape desired for the upper mold-face can also be accomplished in other ways, such as illustrated in Figs. 5 and 6. In Fig. 5 a cutting-wire is employed, as at *l*, this wire being simply a flexible wire, having a handle *l'* at each end, which is drawn between the reservoir and sand-holder and follows the irregular course between the two, so as to cut between the reservoir and sand-holder and to bring the upper surface of the sand mold to the desired shape. In such case the mold is compacted in either of the ways above described, and before the reservoir is withdrawn the operator takes the wire *l*, grasping one end with each hand, and passes the wire between the end of reservoir and sand-holder, as illustrated in Fig. 5, and draws it along between the two, following the irregular course between the reservoir and sand-holder. This wire cuts a clean course and leaves the mold-surface in practically a finished condition, though, if desired, it may be subsequently slicked by any suitable means.

In Fig. 6 I employ a bar to cut off the upper surface of the compacted mold, and I may compact the mold with or without the employment of a reservoir, as desired. In the former case the sand is compacted within the reservoir, which is then withdrawn, leaving the compacted sand extending above the sand-holder, and the bar is then passed over the sand-holder, being guided in its movement by the top edges of the flask or templet and the upper face of the mold being thus brought to the desired form. In the latter case I ram the mold a little higher than the top surface of the sand-holder, and with the bar *m* I cut off the surplus sand to bring the mold-surface to the desired shape.

Where an ordinary rectangular flask is employed and a projection *g'* of the mold-face extends beyond the same, as it might be difficult to enter such projection between the sides of the flask on each side of the depressions *f'* of the opposite mold-face, I prefer to form the side faces *p* of the projection *g'* of the mold-face tapering inwardly, as clearly illustrated in Fig. 9, so that it may more easily enter into the depressions *f'*. This I accomplish by forming the inner faces *r* of the projections $e^3$ of the templet *e* thicker at the top than at the bottom and tapering between the top and the bottom on the inner faces thereof, so molding the sides *p* of the projecting mold-face *g'* tapering, as above described, and when the molds are placed together such tapering sides *p* of the projections will be more easily directed to place. If desired, the corresponding sides *s* at the ends of the depressions *f'* in the other mold-face may also be made correspondingly tapered. When the molds are formed in the ordinary rectangular flask, it will be seen that as the projection-faces *g'* enter the depressions or seats *f'*, formed for them in the adjoining flasks, the molds are entirely inclosed by the flask-bodies.

In all cases it will be seen that the molds are formed by compacting the sand around and above the pattern to form one mold-face and compacting it above the other mold-face and then cutting off the compacted sand to the irregular shape of the other mold-face, such formation of the other or upper irregular mold-face being made possible because that face is straight in one direction, though irregular in the other direction. In this way a finished mold can be produced with irregular faces on both sides, either by the ordinary hand operation or by machine molding, and all the advantages be obtained of the formation in the one flask of a mold having mold-

faces on both sides thereof, each composing part of the walls of a mold-cavity, and the molds can be built up or placed in line with each other, so as to reduce the number of molds to be formed to about one-half the number usually employed in forming such mold-cavities, the cost of the mold therefore being reduced and the molds as formed being properly supported during the pouring of the metal in forming the castings.

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

1. The herein-described method of forming molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold-cavity, consisting in compacting the sand in the sand-holder around a pattern to form one mold-face and then cutting off the compacted sand to irregular shape corresponding to the other mold-face to be formed, substantially as set forth.

2. The herein-described method of forming molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold-cavity, consisting in compacting the sand in the sand-holder around a pattern to form one mold-face, and then cutting off the compacted sand to irregular shape corresponding to the other mold-face to be formed, and then slicking the surface of the mold-face so formed by cutting off the sand, substantially as set forth.

3. The herein-described method of forming molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold-cavity, consisting in compacting the sand in a reservoir above the sand, in the sand-holder around a pattern to form one mold-face and then cutting off the compacted sand to irregular shape corresponding to the other mold-face to be formed, substantially as set forth.

4. The herein-described method of forming molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold-cavity, consisting in compacting the sand in a reservoir above the sand, in the sand-holder around a pattern to form one mold-face and sliding the reservoir across the sand-holder, and thereby cutting off the upper mold-face to irregular shape corresponding to the other mold-face to be formed, substantially as set forth.

5. The herein-described method of forming molds having irregular mold-faces on both sides thereof, each composing part of the walls of the mold, consisting in compacting the sand in the sand-holder around a pattern to form one mold-face and in a templet above the flask, and then cutting off the opposite mold-face to irregular shape corresponding to the templet to form the other mold-face of the mold, and removing the templet leaving such mold-face projecting beyond the flask, substantially as set forth.

6. The combination of a flask, a pattern extending up into the same and a templet fitting on the top edge of the flask, and having its upper edge of irregular shape corresponding to the irregular shape to be given to the upper mold-face, substantially as set forth.

7. The combination of a flask, a pattern extending up into the same, and a templet fitting on the top edge of the flask, and having its upper edge of irregular shape corresponding to the irregular shape to be given to the upper mold-face, and a reservoir having its lower edge corresponding to the templet and resting thereon, substantially as set forth.

8. The combination of a flask, a pattern extending up into the same and a templet fitting on the top edge of the flask, and having its upper edge of irregular shape corresponding to the irregular shape to be given to the upper mold-face, the inner faces of the projections of the templet being inwardly flaring, substantially as set forth.

9. The combination of a pattern, a sand-holder having its upper edge of irregular shape corresponding to the irregular shape to be given to the upper mold-face, and a reservoir fitting on the sand-holder, and having its lower edge corresponding in shape to the sand-holder, and having a cutting edge formed along one lower edge of the reservoir, substantially as set forth.

10. The combination of a pattern, a sand-holder having its upper edge of irregular shape corresponding to the irregular shape to be given to the upper mold-face and a reservoir resting on the sand-holder, and having its lower edge corresponding to the irregular shape thereof, and having a curved slicker formed along the lower edge of the reservoir, substantially as set forth.

11. The combination of a rectangular flask, a separate templet placed thereon and having its upper irregular edge corresponding to the shape of one mold-face, a pattern entering the flask and a stripping-plate around the pattern, having a portion thereof entering the rectangular flask and corresponding in shape to the irregularity of the templet, so as to form a mold-face corresponding to that formed by the templet, substantially as set forth.

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

STEPHEN JARVIS ADAMS.

Witnesses:
J. M. BOSSERT,
ROBERT C. TOTTEN.