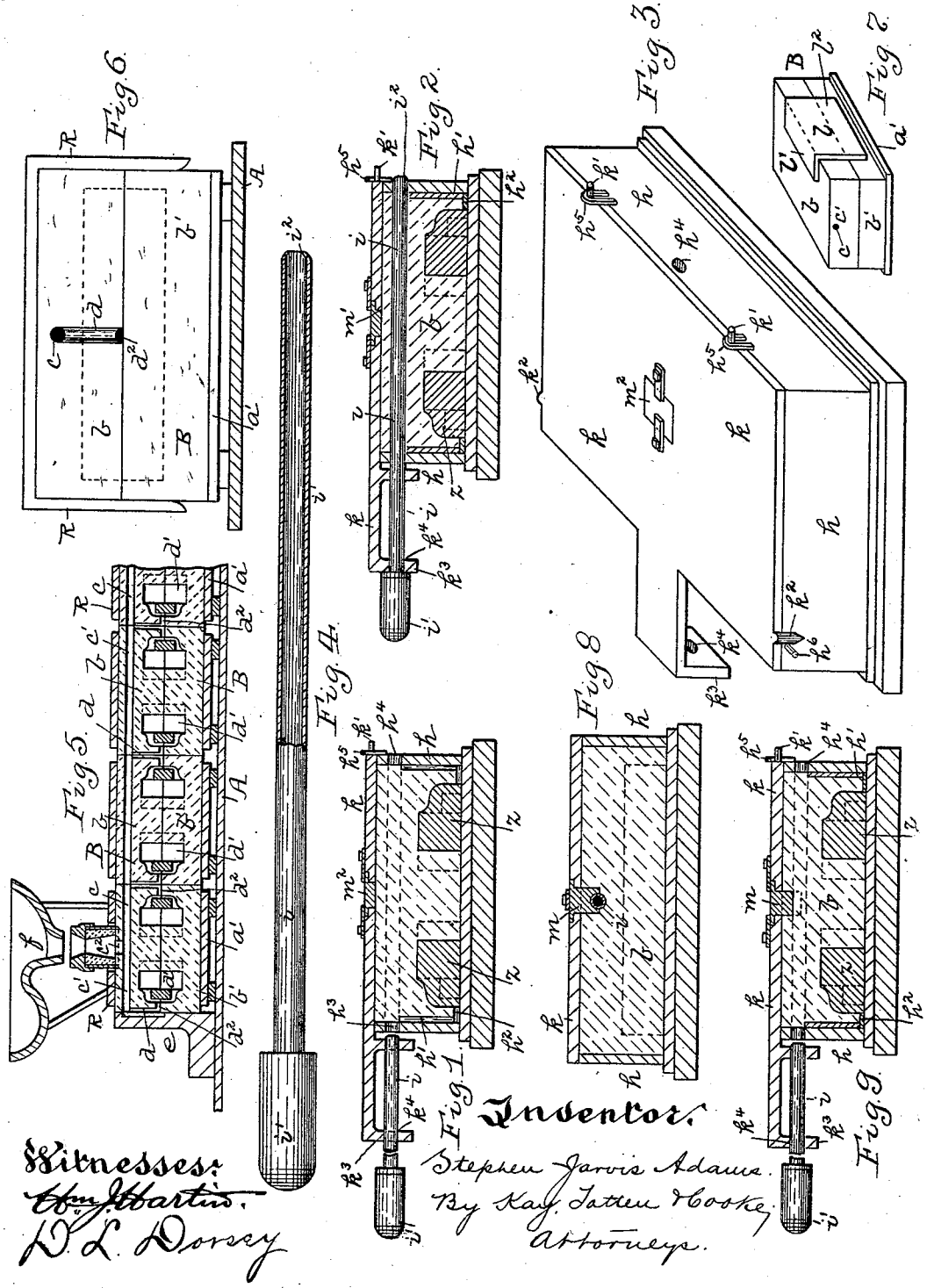
(No Model.)

S. J. ADAMS.

APPARATUS FOR FORMING MOLDS.

No. 521,520. Patented June 19, 1894.



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APPARATUS FOR FORMING MOLDS.

SPECIFICATION forming part of Letters Patent No. 521,520, dated June 19, 1894.

Original application filed October 24, 1892, Serial No. 449,905. Divided and this application filed May 8, 1893. Serial No. 473,357. (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 Apparatus for Forming 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 having continuous inclosed runners passing through the sand thereof, which molds when placed together form a continuous runner for the entire length of the series of molds, and to the formation of down-take runners leading from such continuous runner to the mold cavities and certain other improvements in the making of this class of molds; the class of molds to be formed being illustrated and described in application for Letters Patent filed by me October 24, 1892, Serial No. 449,905, of which this application is a division. The said application, Serial No. 449,905, describes a continuous inclosed runner passing through the body of sand of the mold above the mold cavities so that the hot metal is protected from contact with the atmosphere and the spilling of the metal from the runner, as would be liable to take place in the exposed runners, is prevented, and a suitable head or body of confined metal is obtained to confine the metal within the mold cavities and prevent the escape of gases from such mold cavities through the molten metal in the runner, and, by forcing such gases through the sand walls of the mold, insure the formation of practically perfect castings. For the formation of such continuous inclosed runner it is necessary to employ certain apparatus, which apparatus forms the special subject matter of the present application and are particularly set forth in the claims.

The general invention consists in a flask having guide openings in its side walls and in which the sand mold is formed and confined, a guideway in line with such guide walls, and a runner former fitting in the guideway and adapted to be forced from the same through the guide holes in the flask and sand of the mold so as to form a continuous passage or runner through that particular mold which, when placed in contact with another like mold, forms a continuous passage extending through any number of molds thus formed.

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

Figure 1 is a cross section illustrating the formation of the mold which is taken to illustrate generally the invention desired to be covered, said Fig. 1 showing the formation of the cope of the mold and illustrating the positions of the parts before the runner is formed in the sand. Fig. 2 shows the position of the parts upon completing the formation of such runner. Fig. 3 is a perspective view of the flask showing the application of the continuous runner forming device thereto, and also illustrating generally the construction of the same. Fig. 4 is a separate view of the cutter for forming such continuous runner or passage. Fig. 5 is a longitudinal section of a series of molds in position for pouring, only a short series of such molds being shown and it being understood that a large number of molds may be arranged in like manner. Fig. 6 is an enlarged end view of one of the molds shown in Fig. 5. Fig. 7 is a perspective view showing the mold protector employed for handling the finished mold while arranging it in line with the others; and Figs. 8 and 9 are sectional views illustrating the formation of the continuous runner in the end molds of the series so as to form communication between the feeding basin or like device and the continuous runner.

Like letters of reference indicate like parts in each of the views.

The general form of molds desired to be produced, and the manner in which they are employed, are shown in the longitudinal section Fig. 5, and in order that the construction of the molds desired to be formed by the invention may be more clearly understood, I will describe generally that figure. The mold employed may be any suitable cope and drag mold, though it is evident that it may well be employed with single part molds. These molds are mounted on a suitable even floor which is preferably made rigid, being generally formed of metal or like plates A of the

length to receive the several molds. The bottom boards a' are also preferably made of metal so as to insure an even and regular support for the molds which will not warp, burn, or get out of shape. The molds B are shown as composed of the cope b and drag b', and, as seen by said figure, the molds fit closely against each other without the employment of any flask, which is the preferable way to arrange the molds, the sand joint being formed between the several molds which will prevent the escape of the metal between the molds during the pouring operation. The molds shown are for brake-shoes, being illustrated in connection with the casting of these articles because they have heretofore been employed in forming the same. Extending continuously through the series of molds is the inclosed runner or passage c which, as is apparent in the drawings, leads through all the different molds placed in line and communicates by the down-take passage d with the mold cavities d' of each mold. It will be noticed that the vertical runners d extend down from the main passage c between the several molds, and leading from them are the cross passages or runners d^2 which feed into the mold cavities. It will also be noticed that as illustrated these down take runners are as large as the main runner passage, this being intentional so as to provide for the flow of the metal into the mold cavity or cavities fed by the first down-take runner before the metal enters the next down-take runner, or to provide so that the metal is only feeding into a limited number of the down-take runners at the same time. The principle on which the runners are made is that the down-take runners shall be of sufficient size to receive so much of the metal from the continuous runner that only a limited number of down-take runners shall be receiving the metal at one time, and the metal shall not chill in heating up the continuous runner, and therefore that the metal first passing through any section c' of the continuous runner shall pass into the next down-take runner. By constructing the down-take passages of practically the same size as the continuous runner this is accomplished. As illustrated in the drawings the continuous runner is made to pass entirely through each mold, and where there are two mold cavities in each mold, each mold cavity is fed by the down-take runner formed in the side of the mold nearest to the mold cavity; therefore such down take runners extend down on each side of said mold, and to close the down take runners at the end of the series of molds abutments e are provided which in some suitable way not necessary here to describe are held firm so as to close the end of the down take runners and the end of the continuous runner and sustain the pressure at the end of the series of molds.

In order to feed the metal into the molds, I provide the feeding basin or reservoir f which communicates by any suitable passage c^2 with the continuous runner c, the special construction of which it is not necessary now to describe. A like reservoir or riser is generally employed at the other end of the series of molds. It will be understood that in the pouring of the metal into these molds, the metal flows from the feeding basin or reservoir f into the passage c^2 and into the continuous runner c and thence into the down-take runners d and by the cross runners or passages d^2 into the mold cavities, each mold being fed in this way, the metal gradually passing along the continuous runner until the entire series of molds is filled, this being generally indicated by the metal rising in the reservoir at the other end of the series of molds. A further description of the casting operation is not considered necessary.

Having thus described the invention particularly set forth in said application, Serial No. 449,905, I will now proceed to describe particularly the invention forming the subject matter of this application, that is, the method and means of producing molds with these continuous runners, the down take runners, and other like requirements for molds of that class. The drag b' of the mold can, of course, be formed in any suitable way, being molded by hand or machinery and being supported upon the bottom board a'. The cope b is molded and placed upon the drag, the cope flask and drag flask being guided into proper relative position by suitable means and then removed from the finished mold. In forming the cope, the cope flask h is placed over the patterns z and guided to place and the sand compacted therein by suitable means. It will be noticed that extending along the cope flask are the ribs h' which form the vertical runners d above described, and that leading from such ribs h' to the patterns are the ribs h^2 upon the feeding runners communicating with the mold cavities which are formed by the patterns z. After the compacting of the sand in the flask, the only necessary step to complete the same is the formation of the section c' of the continuous runner c in that mold, and for this purpose I employ the sand confining plate shown in Figs. 1 and 2, and in the perspective in Fig. 3. It will be noticed that the flask h has the openings h^3 h^4 formed therein in line with each other and just above the ribs h' forming the down-take runners. It will also be noticed that the flask is provided with the loops h^5 at one end thereof. The sand confining plate k is of such size as to fit over the entire mold formed, and it has the pins or projections k' which enter the loop h^5 and also has on each side thereof the vertical lip k^2 adapted to pass on each side of the flask so as to direct the sand confining plate to exact position thereon, the lips k^2, if necessary, having inclined lower ends which by passing along pins or lugs h^6 on the flask force the projections k' into the loop h^5 and the plate k into the exact position desired. At the

opposite end of the plate from the projections k' is the guide k^3 which has formed through it a guide passage k^4, which, when the plate is brought into position on the flask, is exactly in line with the holes h^3 h^4 in the flask body. When the parts are brought to this position, the mold is ready for the formation of the continuous runner through the same which is accomplished by a runner cutter passed through the guide-way k^4 and forced through the sand of the mold, the preferable form of cutter being shown in Fig. 4. For this purpose any suitable solid or tubular cutter may be employed, the same being simply forced through the guide way k^4 and thence through the sand of the mold so as to form the continuous runner through the same. I prefer, however, to employ a hollow or tubular cutter, such as the cutter i, which has a handle i', the forward end of the cutter being sharpened as at i^2, and, if desirable, spun in a little so that as it receives the sand, a free space for the reception of the sand within the cutter body will be obtained. To form the runner it is therefore only necessary for the operator, after having placed the plate k in position, to grasp the tubular cutter i and force it through the passage k^4 and thence through the sand of the mold until it passes out of the hole h^4, withdraw the same and by a blow drop the sand out of the tubular cutter. He then removes the plate k, withdraws the pattern, places the cope flask upon the drag flask, so completing the mold, the cope and drag flasks being then opened and taken from the finished mold which is ready to be placed upon the bed plate A. When the mold is completed, any fins or loose sand which might have been formed may be easily removed as the vertical runners are exposed at the side of the mold.

As above stated, it is important that the mold so formed and resting upon the bottom board shall be held intact, and especially that the face where the end of the continuous runner opens shall be properly protected, but in carrying the mold it is very liable to strike against the body of the workman and even such slight pressure is, liable to crack or break off the upper edge of the mold where the continuous runner ends. To prevent this I employ the shield or mold protector shown in Fig. 7, consisting of a light angular shield l, part of which, as at l', rests upon the top of the mold, while the other part l^2 extends down the side thereof which would be liable to strike against the body of the workman, and such angular shield so prevents injury to that part of the mold body while it permits the workman to support it against his own body in carrying the mold out to its place on the plate A. It also gives a surface for the workman to press against in placing the mold in close contact with the mold previously made, so as to form a sand joint between the bodies of the two molds, this being practically the only careful work required in the molding operation. The workman places each mold in close contact with the preceding one, so that the runner section c' extending through the body of the same will be in communication with the like runner section c' in the adjoining mold and that the surfaces are brought to close contact to prevent leakage of the metal. In so doing he forms the continuous runner through the series of molds, and the vertical runner or down-take channel extending down between the molds and communicating with the cross gates leading to the mold cavities.

Each mold in the series is formed in the manner above described, except, possibly, the end molds of the series. The metal may be fed to the continuous runner from any suitable reservoir or basin, which communicates with such runner c. That illustrated in the drawings is a reservoir f supported upon the end mold of the section, as shown in Fig. 5, the reservoir being arranged to communicate with the continuous runner by a passage formed through the top of the mold. When such device is employed, such inlet passage, as at c^2, can be easily formed in connection with the plate k. In such cases I connect to said plate the block m which fits in the seat in the plate k and is held there by suitable clamps, the lower face of the block corresponding in shape to that of the tubular cutter, and as the plate k is forced down to the position in which the cutter is passed through the mold, this block m forces the sand downwardly so as to form a depression therein, so that when the tubular cutter is forced through the mold, as its movement is in line with the face of the block, it passes along such face, the result being the formation of the passage c^2 communicating with the continuous runner c. Such block can be employed in forming the end molds, the flat plate m^2 being inserted in the seat m' of the plate k in forming the other molds of the series. In such case the reservoir f to receive the metal and form a head for the same, as above stated, may be simply formed of a short tubular flask lined with sand, or of a tile having the same shape. These reservoirs are supported on the mold bodies above the openings c^2, like reservoirs f being preferably employed at each end of the series of molds, the one to direct the metal into the continuous runner, the other to receive the metal therefrom at the end of the series of molds, the two together holding a surplus of metal to supply any metal during the shrinking necessary to fill out the molds and by the weight or head of metal to insure solid castings. The metal may be poured directly into the feeding reservoir f, the reservoir being made of the proper shape to receive it, or suitable removable hoppers, as shown in Fig. 5, may be employed to direct the metal into the reservoir. After the series of molds has been completed, they are prop-

erly confined in any suitable way, such as by the abutments *e* and by suitable covers R which may extend over one mold or a series of molds, as may be desired, it not being considered necessary to describe the same in connection with the present application. The molds are then ready to pour, and the metal is fed to the same in the manner above described entering from the reservoir *f* into the continuous runner and passing along the same to the different down-take runners and filling the mold cavities, this being continued until the entire series of molds is filled, and the metal being prevented from chilling within the continuous inclosed runner by the carrying of the metal which first passes through any one section of the runner down into the next mold on account of the size of the down-take runner which is unable to receive that metal and to carry it into a mold cavity before it is chilled and before it can clog the continuous runner.

The method herein described of forming the molds has been found of very considerable value as a means of rapidly forming practically perfect continuous runners through the body of sand, as it requires very little more labor than the usual labor of forming the molds and yet enables me to provide a continuous runner without the cost of an extra body of sand to hold the same.

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

1. In sand molding apparatus, the combination of a flask, a pattern and pattern plate closing the lower end thereof, a confining plate closing the upper end thereof, the flask having guide-holes in its side walls above the pattern, a guideway in line with the guide-holes of the flask and forming a guide course parallel with the confining plate, and a runner former fitting in said guideway and adapted to be forced through said guide-holes and through the sand within the flask, and so form a runner extending through the mold above the mold cavity, substantially as set forth.

2. In sand molding apparatus, the combination of a flask, a plate adapted to be applied to and confine the sand in the flask, and having a guide at one end, and a runner former adapted to be forced through said guide and through the sand within the flask in line with the confining plate, substantially as and for the purposes set forth.

3. In sand molding apparatus, the combination of a flask having ribs thereon to mold gates or runners, and a confining plate adapted to be applied to the flask, a guide in line with said ribs, and a runner former adapted to be forced through said guide and through the sand within the flask, in line with said ribs, substantially as and for the purposes set forth.

4. In sand molding apparatus, the combination of a flask having guide holes in the side walls thereof, a guideway in line with said guide holes, and a tubular cutter fitting in the guideway and adapted to be forced through the flask and cut a runner therein and carry out the sand therefrom, substantially as set forth.

5. A tubular cutter for forming runners within sand molds, having a beveled cutting edge and of smaller interior diameter at the cutting edge than in its body, substantially as and for the purposes set forth.

6. In sand molding apparatus, the combination of a flask, a confining plate adapted to be applied thereto having a pattern or block adapted to be forced into the sand and provided with a guide in line with said pattern or block, and a runner former adapted to be forced through said guide and through the sand in the flask and in line with said block and confining plate, substantially as and for the purposes set forth.

7. In sand molding apparatus, the combination of the flask *h* having the loop h^5 and the runner forming plate *k*, having the pin *k'* engaging therewith, and provided with the guide k^3, substantially as and for the purposes set forth.

8. In sand molding apparatus, the combination of the flask having the loop h^5 and the holes h^3 h^4, and the runner forming plate *k*, having the pin *k'* engaging with the loop, and provided with the guide k^3 in line with said holes in the flask, substantially as and for the purposes set forth.

9. In sand molding apparatus, the combination of the flask *h* having the loop h^5 and lugs h^6 and the runner forming plate *k* having the pin *k'* engaging with said loop, and the lips k^2 engaging with said lugs, and the guide k^3, substantially as and for the purposes set forth.

10. In sand molding apparatus, the combination of the flask *h*, the runner forming plate *k* having the guide k^3, and the block or pattern *m* removably attached to said plate in line with said guide, substantially as and for the purposes set forth.

11. In sand molding apparatus, the combination with the mold support, and the sand mold resting thereon, of a protecting shield having a horizontal portion adapted to rest upon the sand mold and a vertical portion adapted to extend down the side thereof and prevent direct contact therewith, 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,
J. N. COOKE.