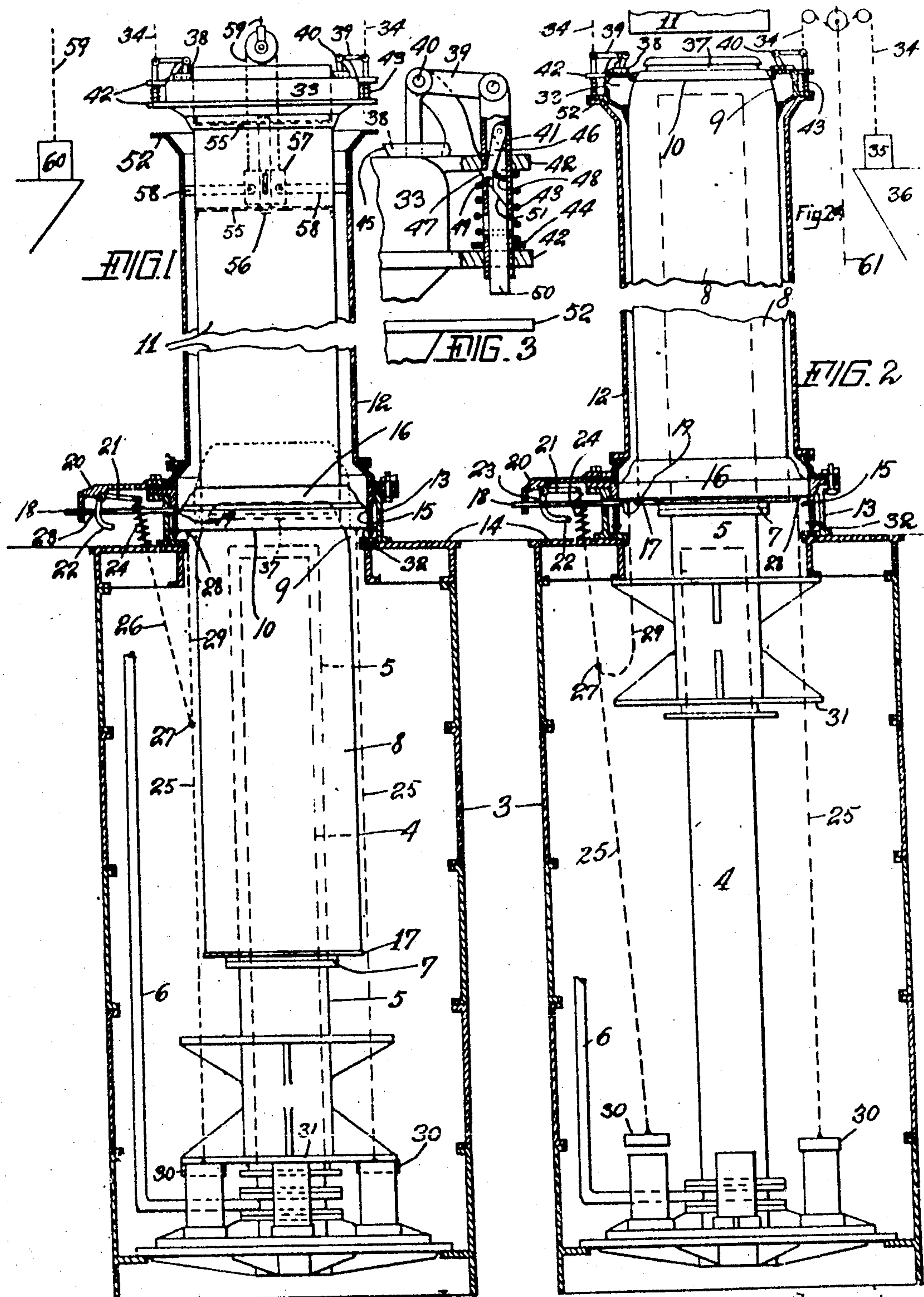


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MACHINE FOR FORMING SAND MOLDS.  
APPLICATION FILED JULY 5, 1906.



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# UNITED STATES PATENT OFFICE.

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## MACHINE FOR FORMING SAND MOLDS.

No. 878,470.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, WILLIS C. SWIFT, a citizen of the United States, residing at Hinsdale, in the county of Dupage, State of Illinois, have made a certain new and useful Invention in Machines for Forming Sand Molds, of which the following is a specification.

The invention relates to machines for forming sand molds.

10 The object of the invention is to provide a construction of machine for forming sand molds and accessory parts therefor which are simple and efficient in operation.

15 A further object of the invention is to provide means for automatically locking and releasing the socket pattern employed in machines of this character.

20 A further object of the invention is to provide means for automatically locking and releasing the spigot pattern employed in connection with the machine.

25 A further object of the invention is to provide means for automatically centering the displacing tube employed in connection with machines of this class.

Other objects of the invention will appear more fully hereinafter.

30 The invention consists substantially in the construction, combination, location and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the accompanying drawing, 35 Figure 1 is a view partly in elevation and partly in vertical central longitudinal section of a machine for forming sand molds, constructed in accordance with and embodying the principles of my invention, and showing 40 the parts in their initial position ready to start up the operation for forming a mold. Fig. 2 is a view similar to Fig. 1 the upper part of the flask and main pattern being broken off, showing the parts in the positions 45 occupied at the completion of the upward stroke of the mold forming mechanism. Fig. 2<sup>a</sup> is a broken view in section of the upper end of the flask and main pattern showing the manner of mounting, connecting and 50 disconnecting the spigot pattern. Fig. 3 is a detail view in section of the automatic locking and releasing mechanism for the spigot pattern.

55 The same part is designated by the same reference sign wherever it occurs.

In the construction of machines for forming sand molds, it has been proposed to employ an hydraulic plunger or piston upon which is carried the mold pattern, which is forced longitudinally through a suitably arranged flask containing the sand or other composition employed for the mold, whereby such sand or composition is pressed or packed into the desired shape within the flask to form the mold. In the operation of 65 a machine of this nature, it is customary to employ auxiliary patterns for giving to the mold the proper form to produce the desired shapes of the ends of pipe connections to be cast in the mold. Ordinarily the auxiliary 70 patterns employed are called the socket pattern and the spigot pattern, one of which may also be so constructed as to form the gate for the introduction of the molten metal in forming the casting. Where auxiliary pat- 75 terns are employed it is desirable to provide means for automatically locking the same in place, and for automatically releasing them when their work has been accomplished. In machines of this class it is usually the prac- 80 tice to employ what may be termed a displacing tube, which is inserted into the flask preliminary to the beginning of the operation of forming a mold, and which, with the interior surface of the flask, forms a chamber or 85 space to receive the sand or other composition employed. It is exceedingly desirable in the proper and accurate working of the machine to maintain the displacing tube in centered relation with respect to the flask, so 90 as to avoid any inequalities in the mold to be produced.

It is among the special purposes of my present invention to provide means for accomplishing these various purposes, and I 95 will now describe constructions embodying the principles of my invention, as illustrative forms of practical constructions, and the best forms in which I at present contemplate carrying out the principles of my invention, 100 but to which my invention is not to be limited or restricted.

In the drawing reference sign 3 designates a casing or frame in which is suitably supported a hollow stationary guide 4 with its 105 upper end open. Sleeved over this guide is a piston 5, adapted to slide thereon. Water may be admitted to the lower end of the hollow guide in any suitable or convenient manner to operate the piston, as for instance, 110



through a supply pipe 6 from any convenient source. My invention is not specially concerned with the construction of the guide and piston as many other constructions and arrangements for operating the piston may be employed without affecting the operation of the features of my invention. Carried by the piston, and near the lower end thereof, is a supporting flange 7, upon which is adapted to rest and to be supported a pattern 8. Preferably the upper end of the pattern is rounded, as indicated at 9. At a suitable point on the rounded portion of the upper end of the pattern is formed a shoulder 10, upon which is received and supported the lower end of a displacing tube 11, and a flask 12 is suitably supported upon and secured to a supplementary casing 13, which is mounted upon the top plate 14 of the main casing or frame 3, the flask when properly mounted in position above the top plate 14 being in true alinement with the guide 4, piston 5 and pattern 8.

Arranged within the supplementary casing 13, is an annular ring 15, forming a chamber or space within which is received and operates a socket pattern 16, being so relatively arranged and located as to be also in axial alinement with the piston and pattern and the displacing tube and flask, the main pattern working freely through said socket pattern, which to this end is provided with a cylindrical opening therethrough, and which also serves, in a measure at least, as a guide for the main pattern during the movements of the pattern and piston.

By employing a ring 15, independent of the supplementary casing 13, it is obvious that rings and socket patterns of different sizes may be readily inserted or removed for making in conjunction with varying sizes of patterns different sizes of molds, or molds for different diameters of castings. As above indicated, the upper end of the pattern is provided with a ledge or shoulder 10, which forms a support or seat to receive the lower end of the displacing tube, whereby the displacing tube is centered at its lower end. The upper end of the displacing tube is also required to be properly centered, and I will hereinafter describe means which I have devised for accomplishing that result. The parts so far described in the specific construction thereof, and in the details of their arrangement, form no part of my present invention, and the operation is as follows, the parts being in the relative positions illustrated by full lines in Fig. 1, with the piston and pattern occupying their lowermost positions, and a socket pattern of proper size and relation being placed within its holding ring 15. A flask 12 is placed in position and suitably secured in place. The displacing tube is then inserted through the flask until its lower end is received and rests

upon the shoulder or seat 10, formed in the upper end of the pattern. Before lowering the displacing tube, however, the piston and pattern are raised sufficiently for the upper end of the pattern to project somewhat above the upper edge of the socket pattern, and far enough above the top edge of the socket pattern to carry the curved portion of the end of the main pattern entirely through the socket pattern. This is accomplished by admitting the required amount of water to hollow guide 4, otherwise raising the piston according to the motive power employed. Now, with the parts in this position indicated by dotted lines in Fig. 1, and with the displacing tube lowered into position, the exterior surface of the displacing tube, the exterior surface of the end of the main pattern and the exterior surface of the socket pattern with the interior surface of the casing and of the flask form a chamber or space to receive the sand or other composition employed to form the mold. Into this space the sand or other composition is delivered through the upper end of the flask until the required amount of sand or composition is introduced, as measured by the displacing tube to completely fill the chamber or space referred to.

The machine is now ready for operation, and power is applied to the piston to raise the same thereby causing the main pattern to be advanced longitudinally through the flask, and through the socket pattern, thereby compressing the sand or other composition and ironing the inner surface thereof during the longitudinal movements of the pattern, the rounded or curved surface of the upper end of the main pattern effecting the compression of the sand or composition to the required density, while the cylindrical portion of the main pattern surface smooths and irons the compressed sand or composition upon the interior surface thereof. The advancing movement of the main pattern, of course, carries with it the displacing tube, which is thereby forced upwardly and out through the upper end of the flask, and when the displacing tube finally emerges completely from the flask it is raised or otherwise removed out of the way by hand or power as may be desired. As the pattern approaches the upper limit of its stroke, it is necessary to provide means whereby the socket pattern is engaged and raised from its lowermost position so as to accomplish its work of compressing and condensing the sand or other composition which occupies the enlarged space formed by the exterior surface of such pattern and the interior surface of the casing. This result is accomplished by forming a shoulder or flange, 17, upon the lower end of the main pattern 8, and which shoulder or flange engages the base of the socket pattern 16, when the main pattern is



advanced the required distance through such ring and thereafter the continued upward movement of the main pattern also raises the socket pattern into the position shown in Fig. 2, whereby it is enabled to accomplish its work of forming the socket end of the mold.

As above indicated, it is one of the special purposes of my present invention to provide means for automatically locking the socket pattern in its raised position, or in the position shown in Fig. 2. The object of thus locking the socket pattern in this position is to positively retain the same in that position during the return stroke or movement of the main pattern which might otherwise by friction cause the socket pattern to return too soon to its lowermost position, whereby the movement of the main pattern might cause the socket end of the mold or the sand or composition composing the same to become broken or disintegrated, thereby spoiling the mold. However, by maintaining the socket pattern in its raised position until the main pattern has been sufficiently withdrawn or lowered, this danger or liability of endangering or destroying the socket mold is avoided. In the accomplishment of this result I provide a sliding locking pin 18, arranged to slide radially through the supplementary casing 13, and ring 15, and have the inner end thereof to project under the socket pattern when the latter is in its raised position, thereby forming a locking stop for locking or holding such pattern in its raised position. While I have shown only one of the locking pins it is obvious that any desired number to accomplish the purpose may be employed. The inner end of the locking pin 18, is preferably beveled on its lower side, as clearly shown at 19, to facilitate the passage of the socket pattern in its upward movement, without obstruction so far as said locking pin is concerned. As soon as the lower edge or base of the socket pattern has cleared the end of the locking pin it is desirable that said pin snap into locking relation thereunder. I therefore employ means normally tending to yieldingly project the pin into the casing, and into engaged relation underneath the socket pattern. After the main pattern has been withdrawn and the socket pattern is ready to be withdrawn to its initial position, the locking pin 18, must be withdrawn to permit the socket pattern to be returned to its initial position; the withdrawal of the locking pin may be effected by hand or otherwise as may be desired. In practice I prefer to employ means for automatically withdrawing the locking pin, and in the accomplishment of this object I provide a construction and arrangement which I will now describe, but to which I do not desire to be limited or restricted in the specific details of such construction and arrangement. In the particular construction shown I provide a

casing 20, in which the locking bolt or pin 18 is mounted to slide. Suitably pivoted in this casing is a bell crank lever 21, pivotally supported at its angle. One arm 22, of this lever is arranged to extend through a slot 23, formed in the pin or bolt 18. By rocking the bell crank lever 21 in one direction or the other, the locking bolt is shifted or moved endwise. The arm 22 of the bell crank lever is preferably curved on the arc of a circle concentric with the pivotal axis of said lever, whereby when said lever is rocked the bolt 18 is shifted or moved endwise sufficiently to cause the inner end thereof to be withdrawn from supporting or locking relation with respect to the socket pattern while thereafter the continued rocking movement of the bell crank lever will perform no work so far as the shifting movement of the locking bolt is concerned. A spring 24 is arranged to exert its tension upon the bell crank lever in a direction to rock the same in a direction to project the bolt into the casing or into locking relation with respect to the socket pattern.

One of the chains or other connection 25, employed to withdraw the socket pattern to its initial position is provided with an auxiliary portion or connection 26, which is connected to an arm of the bell crank lever 21. The length of this auxiliary connection of the chain from the point 27, where it joins the connection 25 to its attachment to the bell crank lever 21, is so regulated with reference to the length of that portion of the chain which extends from the point 27, to the point of attachment of the end of the chain to the socket ring, as at 28, as that when the lower end of the chain is pulled the first result is to cause the bell crank lever 21 to rock, thereby effecting the automatic withdrawal of the locking pin or bolt 18, and this occurs before the pull on the chain is exerted upon the socket ring, that portion of the chain indicated at 29 extending from the point 27 to the point 28 being held slack, as indicated in Fig. 2, by the tension of the spring 24, when the locking pin 18, is in its locking position. The weight or other suitable form of stop 30, attached to the lower end of the chain 25, serves as a means to be engaged by a flange 31, of the piston, as it approaches its lowermost position, whereby a pull is exerted upon chain 25 in a direction to cause it to first withdraw the locking pin or bolt 18, through the chain connection 26, and thereafter the continued downward movement or pull on the chain effects the withdrawal of the socket pattern to its lowermost position. The operation of this part of my invention is as follows, assuming the parts to be in the positions shown in full lines in Fig. 1. The piston is raised slightly so as to carry the main pattern 8, into the position shown in dotted lines, and the sand or other composition is introduced into the upper end of the flask, and



into the space between the flask and the displacing tube. By raising the piston the flange 31, is raised so as to relieve the pull upon the chains or other connections 25. By thus slackening these chains or other connections the spring 24, is permitted to exert its pressure upon bell crank lever 21, to rock the same in a direction to constantly press the inner end of the locking pin or bolt 18 inwardly, the inward movement of such locking pin or bolt being prevented by the engagement thereof with the exterior surface of the socket pattern. Power is then applied to cause the piston and main pattern to rise longitudinally through the flask 12. As the main pattern and piston approach the limit of their upward stroke the flange 17, on the lower end of the main pattern engages underneath the socket pattern, thereby, with the continued upward movement of the main pattern, carrying the socket pattern upwardly with it, until the lower edge of the socket pattern clears the inner end of the locking pin or bolt 18, whereupon the tension of spring 24, becomes effective to project the inner end of the locking pin or bolt inwardly and underneath the socket pattern, thereby, positively locking the socket pattern in its raised position, and maintaining the same in such position until the main pattern and piston are withdrawn to their lowermost position, the socket pattern thereby protecting that portion of the mold which forms the socket end of the casting to be produced. As the main pattern and piston approach their lowermost position the flange 31 of the piston engages the stop or weight 30, thereby carrying the same downwardly with such piston and exerting a pull on the chain or other connection 25. The first effect of this downward pull on the chain or connection 25, is to rock the bell crank lever 21, against the tension of spring 24, and in a direction to effect the withdrawal of the locking pin or bolt 18, from beneath the lower edge of the socket pattern. Thereafter, and with the continued downward movement of the piston the stop or weight 30, is carried still farther downwardly, thereby imposing a pull upon the portion 29 of the chain or other connection 25, and hence positively withdrawing the socket pattern to its lowermost position. If desired, the lowermost position of the socket pattern may be adjustably regulated by means of pins 32, inserted through stop holes formed in the ring 15, or other support, for the socket pattern.

Having now described the construction and operation of the mechanism for forming the socket pattern, I will next describe the means for automatically locking, releasing and raising the pattern which forms the spigot and gate of the mold. The spigot pattern is designated generally by reference sign 33, and is in the form of a ring having

its interior surface concaved or curved, to correspond with and conform to the conical or curved taper end of the main pattern 8, and adapted to receive such conical, tapering or curved end of the main pattern and to be supported thereon, when the latter emerges above the upper end of the flask. This spigot pattern 33, is, when not required for use, and when in position ready for application to the end of the main pattern, sustained or supported over the upper end of the flask in any suitable or convenient manner. I have shown a simple and efficient arrangement for accomplishing this purpose, wherein suspending chains or other connections 34, are connected to the spigot pattern, and after leading over suitable guide sheaves or pulleys, have suspended weights 35, attached thereto, forming counterbalancing weights for suspending the spigot pattern. The weights 35 are designed and adapted to be supported upon suitable brackets 36. The displacing tube 11, is designed to be lowered into position upon the shoulder 10, on the main pattern 8, as above explained, said displacing tube passing freely through the spigot pattern. After the main pattern has completed its upward stroke, thereby carrying the displacing tube completely out of the flask, the displacing tube is removed or supported in any suitable manner out of the way. The spigot pattern is suspended in such position as to receive the upper end of the main pattern, when it emerges a sufficient distance above the upper end of the flask, said spigot pattern being received and raised upon the curved tapering or conical surface of the end of the main pattern, as clearly shown. In order that the spigot pattern, when received upon the end of the main pattern, may be automatically locked thereon, and automatically released from locking relation with respect thereto, and again raised to its initial suspended position, I have provided a very simple and efficient mechanism which I will now describe, although I do not desire it to be understood that my invention is to be limited or restricted to the exact details of construction shown and described for performing these operations.

In the peripheral surface of the curved or conical end of the main pattern, I provide a groove or seat 37. Suitably carried by the spigot pattern is a sliding locking bolt or pin 38, connected to one arm of a bell crank lever 39, said lever being pivoted at its angle, as at 40, and having a sleeve 41, pivotally connected to the other arm of said bell crank lever, said sleeve depending therefrom and extending through openings formed in flanges 42, of the socket pattern, and operating loosely therethrough, the suspending chains or other connections 34, are also attached to the same arm of the bell crank



lever. A spring 43, interposed between a washer or shoulder 44, formed on or carried by the sleeve 41, and the underside of the upper flange 42, of the spigot pattern normally exerts its tension upon said sleeve, to force the same downwardly, thereby rocking the bell crank lever 39, in a direction to move or project the locking pin or bolt 38, in one direction, namely, in a direction to enter the peripheral groove 37, in the end of the main pattern at the proper point in the operation of the device. The suspension weight 35, and the tension of the spring 43, are so relatively proportioned that when the socket pattern is held in suspension over the end of the flask, the bell crank lever 39 is rocked in a direction to hold the locking pin or bolt 38, in withdrawn position, the weight 35, being slightly raised above its supporting bracket 36. Now, when the upper end of the main pattern 8, is raised into the spigot pattern, such pattern is raised with the upward movement of the main pattern, a sufficient distance for the suspending weight 35, to descend and to be received upon its supporting bracket 36. Thereafter the further raising movement of the main pattern causes the weight of the spigot pattern to be imposed upon the main pattern, and consequently the suspending chain or other connection 34, becomes slack, thereby enabling the tension of spring 43, to come into play to rock bell crank lever 39, in a direction to project the locking pin or bolt 38, into the groove 27, in the end of the main pattern, thereby automatically locking the spigot pattern to the main pattern.

To facilitate the movement of the curved end of the main pattern past the inner or locking end of the pin or bolt 38, as the end of the main pattern advances through the spigot pattern, said inner end of the locking pin or bolt is beveled on the under side thereof, as indicated at 45. In order to positively lock the locking pin or bolt 38, in locking relation with respect to the peripheral groove 37, in the end of the main pattern, I provide a shouldered catch 46, within the sleeve 41, and arrange the nose or shoulder 47, of said latch to engage underneath the flange 42, when the sleeve 41 is moved downwardly a distance sufficient for the engaging end of locking bolt or pin 38, to enter the groove 37. A spring 48 serves to yieldingly press the catch 46 in a direction for the nose or shoulder 47 thereof to snap under flange 42. The lower end of catch 46 is beveled as indicated at 49. Arranged to slide within sleeve 41 is a pin 50, having its upper end beveled as at 51, in opposite relation with respect to the beveled end 49, of the catch, so that when pin 50, is moved upwardly through sleeve 41, the catch 46, is rocked in a direction to withdraw its shoulder or nose 47 from engaging relation with respect to

flange 42, through the engagement of the cooperating beveled surface 49 and 51. After the spigot pattern is locked to the main pattern, as above explained, the piston and main pattern are reversed and begin their downward stroke, thereby carrying the spigot pattern with them and toward the upper flared end of the flask, thereby compressing the sand or other composition between the exterior surface of the spigot pattern, and the interior surface of the flange at the upper end of the flask, the exterior surface of the spigot pattern being so shaped and formed as to produce the spigot and gate in the mold. As soon as the spigot pattern has completed its work, and in order to avoid arresting the movement of the main pattern and piston in their downward stroke, thereby involving loss of time and interruption of the operation of the machine, it is desirable to provide means for automatically unlocking the spigot pattern from the end of the main pattern, and to permit the spigot pattern to be again returned to its elevated or raised position ready for the next operation. Of course, it will be understood that after the locking pin or bolt 38, has been projected into locking relation with respect to the peripheral groove in the end of the main pattern, and after the catch 46 has become locked underneath the flange 42, the downward movement of the spigot pattern with the main pattern and during the initial stages of the downward stroke of the latter effects a pull upon the suspending chain or connection 34, sufficient to raise the weight 35, from its bracket 36, but without effecting a withdrawal of the locking pin or bolt 38, since the latter is locked positively in position by the catch 46, as the spigot pattern continues to move downwardly eventually the end of pin 50, is brought into contact with the flange 52, of the upper end of the flask, and thereafter the further downward movement of the spigot pattern causes pin 50 to be projected upwardly within a sleeve 41, thereby engaging and releasing catch 46. The instant this catch is released the pull of weight 35, is sufficient to rock bell crank lever 39 in a direction to withdraw locking bolt or pin 38, thereby automatically releasing the spigot pattern from the main pattern. In case the pull of weight 35, is insufficient to effect the withdrawal of the locking pin or bolt 38, the continued downward movement of the spigot pattern brings the lower end of sleeve 41 into engagement with the flange 52, of the flask, thereby positively projecting the sleeve 41 upwardly, and hence insuring a rocking of bell crank lever 39, and the withdrawal of the locking pin or bolt 38, and consequently releasing the spigot pattern from the main pattern, and permitting the suspension weight 35, to withdraw or elevate or raise the spigot pat-



tern to its initial position ready for the next operation, and with the suspension weight resting upon its supporting bracket. It is believed that the operation of the spigot pattern and the automatic locking and releasing mechanism therefor will be fully and completely understood from the foregoing description taken in connection with the accompanying drawing.

10 While I have shown and described the socket of the mold formed at the lower end thereof and the spigot of the mold formed at the upper end thereof, it is obvious that my invention is not to be limited in this respect, 15 as either portion of the mold may be formed at either end thereof.

As above indicated, in the practical operation of a machine of this class, it is exceedingly desirable to maintain the displacing or 20 measuring tube 11, in proper centered relation with respect to the flask pattern. By the lower end of the tube 11, being received and resting upon the shoulder 10, formed near the upper end of the main pattern, it 25 will be evident that said lower end of the displacing tube will thereby be properly centered. I propose to employ means for also automatically centering the upper end of the displacing tube. To this end I suitably 30 mount supports or bars 55, which are suitably spaced apart within the upper ends of the displacing tube, and I support centrally by said bars 55, a vertical guide rod 56, upon which is mounted to slide a weight sleeve 57, 35 to which are pivotally connected at one end a series of arms 58. The free ends of said arms 58 are designed to operate through peripheral openings in the tube 11. Suspension devices 59 are connected to the weight sleeve 40 57, the weight thereof being counterbalanced through such suspension devices by a counterbalancing weight 60. The tension of the suspending weight 60, is normally exerted to maintain the sleeve weight 57 in raised position upon its guide rod 56, thereby main- 45 taining the free ends or centering arms 58, withdrawn into the tube 11. When, however, the suspension weight 60, is relieved of its pull upon the connections 59, the sleeve weight 57, is permitted to descend upon its 50 guide rod 56, thereby causing the free ends of centering arms 58 to project, through the openings in tube 11, and to contact with the interior surface of the flask 12, as clearly 55 shown in Fig. 1, thereby properly centering the upper end of the displacing tube. The pull of suspending weight 60, may be relieved in any suitable or convenient manner to enable the weight sleeve 57, to accomplish its 60 work of causing the centering arms to protrude through the openings in the displacing tube to effect the centering of said tube. After the tube has been properly centered and the necessity no longer exists for the use 65 of the centering mechanism, that is, after the

sand or other composition, has been introduced into the flask, the tension of suspension weight 60 may be again imposed upon the weight sleeve 57, to release the centering mechanism. 70

Whenever it may be desired to raise the spigot pattern by hand, a hand rope or other connection 61, may be connected to the suspending connection 34. The same or similar 75 arrangement may also be employed for raising the suspension weight 60 of the centering mechanism.

While I have shown and referred to means for automatically returning or withdrawing the socket pattern to its initial position, and 80 also means for adjustably regulating the initial position of the socket pattern, I make no claim herein to these features, as the same form the subject matter of another application. 85

From the foregoing description it will be seen that I provide a construction of machine for forming sand molds, which, except for the preliminary raising of the main pattern and the filling of the flask with the sand or other 90 composition, is automatic, the main pattern being advanced through the flask, the socket pattern being raised therewith during the latter portion of its raising movement, and automatically locked in its raised position, 95 the spigot pattern being automatically applied to the upper end of the main pattern, and automatically locked thereto so that when the main pattern begins its return stroke the spigot pattern is carried downwardly there- 100 with to perform its function, and when that function has been performed, being automatically released from the main pattern, and automatically elevated or raised out of the way, while the main pattern continues its 105 downward stroke without interruption, the socket pattern being automatically released, and before the main pattern reaches its lowermost position and positively withdrawn into its lowermost position ready for the 110 next operation of the machine.

It is obvious that many variations and changes in the details of construction and arrangement might readily occur to persons 115 skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described; but

Having now set forth the object and 120 nature of my invention, and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is: 125

1. In a machine of the class described, a flask to receive the sand or other composition, a main pattern, and means for moving the main pattern longitudinally through said flask, in combination with an auxiliary or 130



socket pattern, means for moving the same up to its work, and means for locking the same in its working position.

2. In a machine of the class described, a flask to receive the sand or other composition, a main pattern and means for moving the same through said flask, in combination with an auxiliary or socket pattern, means for moving the same up to its work, and means for automatically locking the same in its raised position.

3. In a machine of the class described, a flask, a main pattern and means for moving the main pattern into and out of said flask in combination with an auxiliary or socket pattern, means for moving the same up to its work, means for locking the same in its working position, and means for releasing said locking means.

4. In a machine of the class described, a flask, a main pattern and means for moving the same into and out of said flask, in combination with an auxiliary or socket pattern, means for locking the same in its working position, and means for automatically releasing said locking means to permit said auxiliary or socket pattern to be returned to its initial position.

5. The combination with a flask and a main pattern, and means for moving said pattern into and out of said flask, of an auxiliary or socket pattern through which said main pattern operates, means for moving said auxiliary or socket pattern into its working position, and a spring pressed locking bolt or pin arranged to engage said auxiliary or socket pattern and lock the same in its working position.

6. The combination with a flask and a main pattern, and means for moving the latter into and out of said flask, of an auxiliary or socket pattern, through which said main pattern operates, means for moving said auxiliary or socket pattern into its working position, a spring operated locking pin or bolt for locking said auxiliary or socket pattern in working position, and means for automatically releasing said locking pin or bolt to permit the withdrawal of the auxiliary or socket pattern.

7. The combination with a flask, a main pattern and means for moving the latter into and out of said flask, of a socket pattern, through which said main pattern operates, means carried by said main pattern for engaging the socket pattern to move the latter into its working position, means for locking said socket pattern in its working position, and means for automatically releasing said locking mechanism.

8. The combination with a flask, a main pattern and means for moving the latter into and out of said flask, of a socket pattern through which said main pattern operates, means carried by the main pattern and ar-

ranged to engage the socket pattern to move the same into its working position, a locking pin or bolt, an operating bell crank lever therefor, a spring operating upon said lever to normally project said pin or bolt into locking engagement with said socket pattern to maintain the same in its working position, and means for automatically rocking said bell crank lever in opposition to said spring to release said locking pin or bolt.

9. The combination with a flask, a main pattern and means for moving the latter into and out of said flask, of a socket pattern, through which said main pattern operates, means carried by said main pattern and arranged to engage said socket pattern and move the same into working position, a locking pin or bolt for locking said socket pattern in its working position, means connected to said socket pattern and operated automatically by the return of the main pattern to initial position for positively withdrawing said pattern from its working position, and means connected with said withdrawing means and operating in advance of said withdrawing means for automatically withdrawing said locking pin or bolt.

10. The combination with a flask, a main pattern and means for moving the latter into and out of said flask, of a spigot pattern, means for suspending the same in position to receive the end of said main pattern, and means for automatically locking the same upon said main pattern.

11. The combination with a flask, a main pattern, and means for moving the latter into and out of said flask, of a spigot pattern, means for supporting the same in position to receive the end of said main pattern, means for locking said spigot pattern to the main pattern, and means for automatically releasing said locking means.

12. The combination with a flask, a main pattern and means for moving the latter into and out of said flask, of a spigot pattern, means for supporting the same in position to receive the end of said main pattern, a locking pin or bolt carried by one of these parts and arranged to engage the other whereby said parts are locked together, and means for automatically releasing said locking pin or bolt.

13. The combination with a flask, a main pattern and means for moving the latter into and out of said flask of a spigot pattern, means for supporting the same in position to be received on the end of said main pattern, a locking pin or bolt for locking said parts together, a latch for locking said bolt in locking position, means for automatically releasing said latch, and means for automatically releasing said locking pin or bolt.

14. The combination with a flask, a main pattern and means for moving the latter into and out of said flask of a spigot pattern,



means for supporting the same in position to be received on the end of said main pattern, a locking bolt carried by said spigot pattern and adapted to be moved into and out of engagement with the main pattern to lock said parts together, a bell crank lever for operating said bolt, a counterbalance connected to said lever and tending to rock the same in a direction to withdraw said bolt and a spring arranged to exert its tension in opposition to said counterbalance.

15. The combination with a flask, a main pattern, and means for moving the latter into and out of said flask, of a spigot pattern, means for supporting the same in position to be received upon the end of said main pattern, a locking bolt carried by said spigot pattern, a bell crank lever, having one arm thereof connected to said bolt, a counterbalance connected to the other arm of said lever, and normally tend to rock said lever in a direction to withdraw said bolt, a sleeve also connected to said bell crank lever, a spring operating upon said sleeve to rock said lever in opposition to said counterbalance and an auxiliary catch for locking said bolt in locking position, and means for automatically releasing said auxiliary catch.

16. The combination with a flask, a main pattern, and means for moving the latter into and out of said flask, of a spigot pattern, means for supporting the same in position to be received upon the end of said main pattern, a locking bolt, a bell crank lever for operating the same, a suspending counterweight connected to said lever, a sleeve also connected to said lever, a spring operating on said sleeve and in opposition to said counterweight, a catch carried by said sleeve and operating to automatically lock said bolt in locking position and means for automatically releasing said locking catch and for positively withdrawing said locking bolt.

17. The combination with a flask, a main pattern, having a peripheral groove in the upper end thereof, and means for moving the latter into and out of said flask, of a spigot pattern, means for supporting the same in position to be received upon the grooved end of said main pattern, and carrying a locking pin or bolt adapted to be projected into said groove to lock said parts together, and means for automatically withdrawing said locking bolt to release said parts.

18. The combination with a flask, a main pattern, and means for moving the latter into and out of said flask in combination

with a displacing tube, adapted to be received within said flask and supported at one end upon said pattern and means arranged within the flask for centering said tube with reference to said flask.

19. The combination with a flask, a pattern and means for moving the latter into and out of said flask, of a displacing tube adapted to be received within said flask and resting and supported at one end by the end of said pattern, and centering arms arranged within said tube and means for operating the same to engage the flask to center said tube with reference to said flask.

20. The combination with a flask, a pattern having a peripheral shoulder near one end thereof, and means for moving said pattern into and out of said flask, of a displacing tube, arranged to be received within said flask and to rest at the lower end thereof upon the shoulder upon the end of said pattern whereby the lower end of such tube is centered, and means arranged within the flask for centering the upper end of said tube within said flask.

21. The combination with a flask, a pattern and means for moving the latter into and out of said flask and resting at one end upon the end of such pattern, a guide mounted within said tube adjacent the other end thereof, a sleeve operating upon said guide, and arms pivotally connected at one end of such sleeve, the free ends of said arms arranged to project through openings in said tube and to impinge against the inner surface of said flask, whereby said tube is centered at its upper end, and means for moving said sleeve.

22. The combination with a flask, a main pattern having a rounded tapering or conical upper end, and means for moving said pattern into and out of said flask, of a spigot pattern having a bore conforming to the contour of the end of said main pattern, means for supporting said spigot pattern in position to receive the end of said main pattern, means for automatically locking these parts together, and means for automatically releasing said locking means.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 29th day of June, A. D. 1906.

WILLIS C. SWIFT.

Witnesses:

EWD. H. MILLER,  
S. E. DARBY.