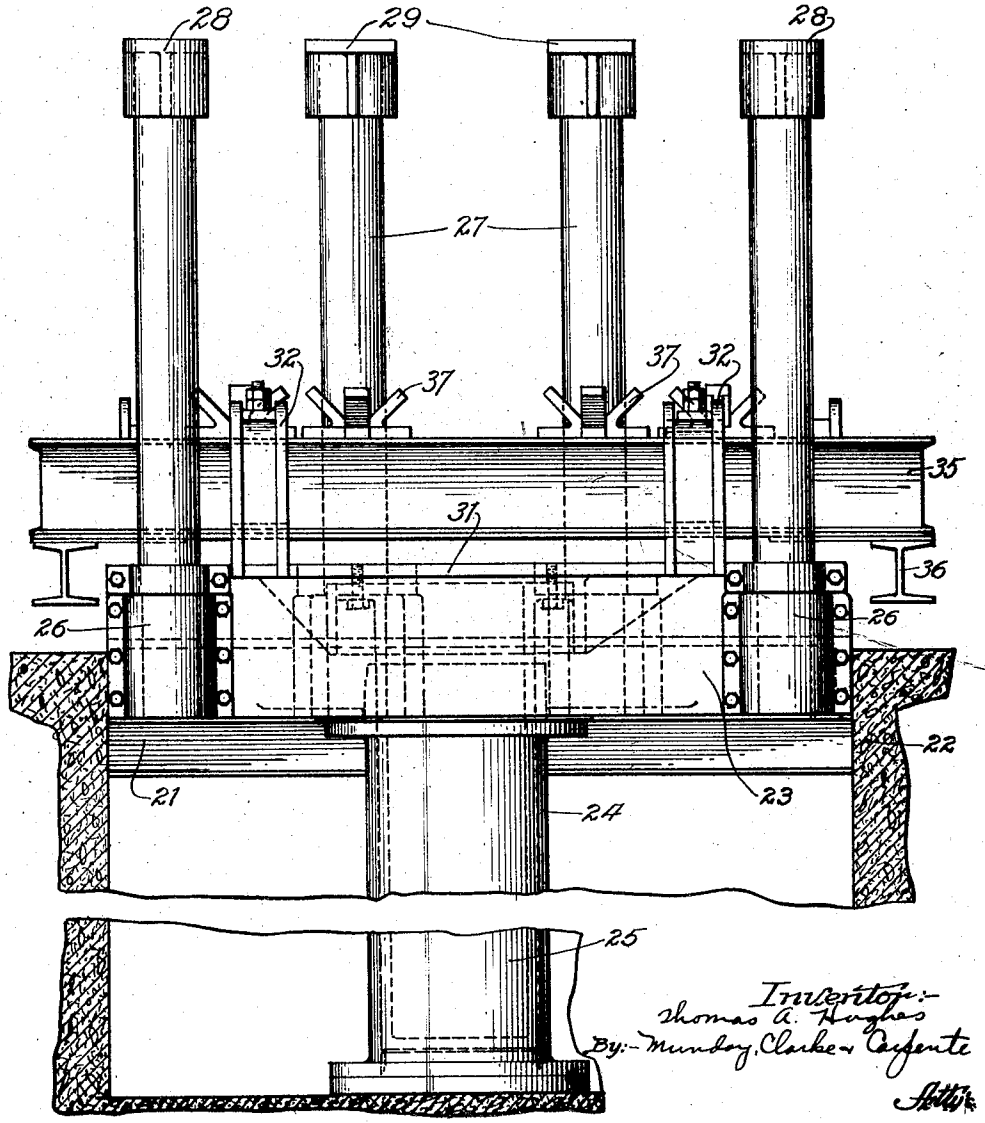
Aug. 10, 1926. 1,595,784

T. A. HUGHES

PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 1

Fig-1



Inventor:-
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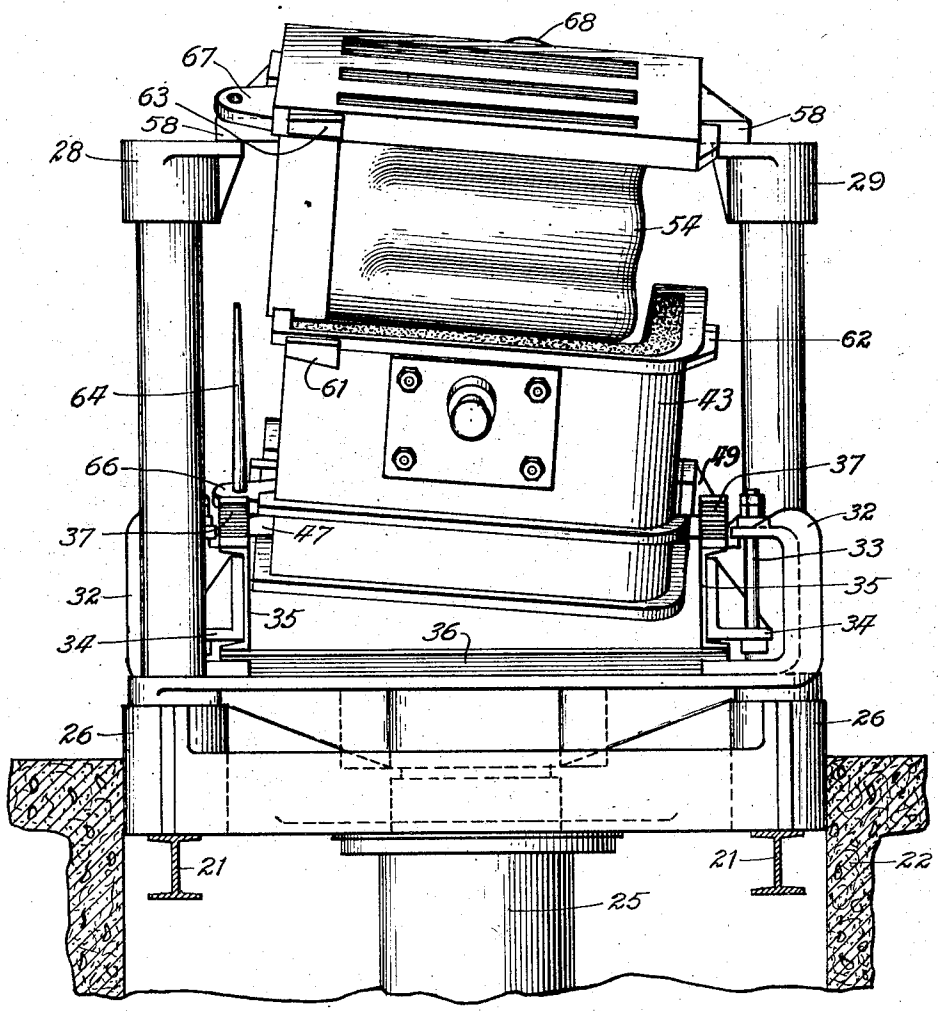
Aug. 10, 1926. 1,595,784

T. A. HUGHES

PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 2

Fig-2



Inventor:-
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Attys.

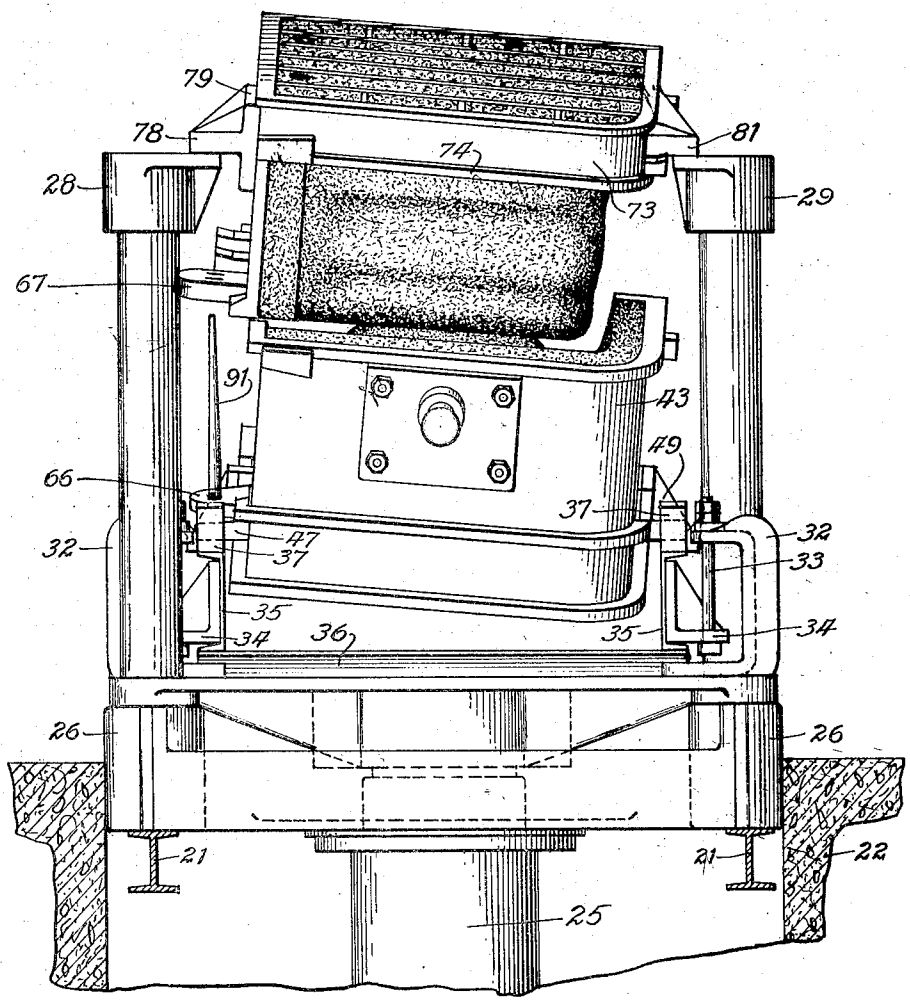
Aug. 10, 1926. 1,595,784

T. A. HUGHES

PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 3

Fig-3



Inventor:-
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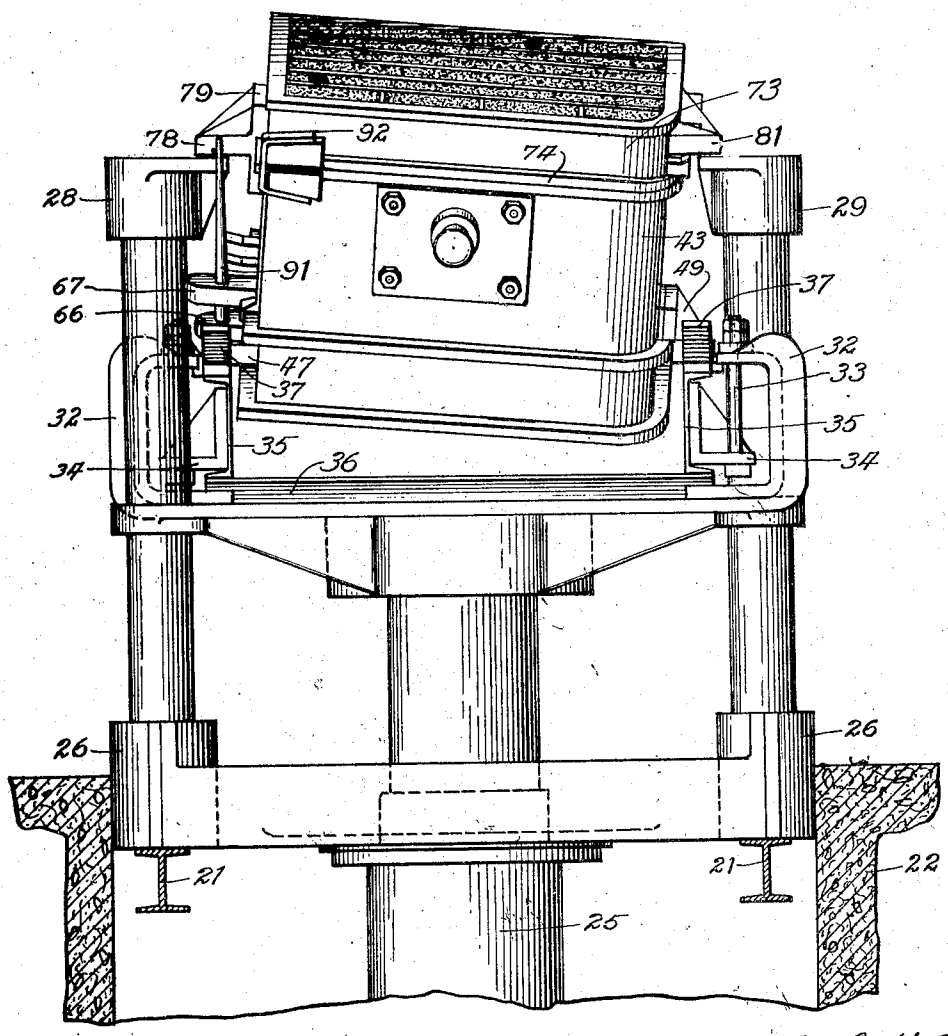
Aug. 10, 1926. 1,595,784

T. A. HUGHES

PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 4

Fig. 4



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Aug. 10, 1926. 1,595,784

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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 5

Fig-5

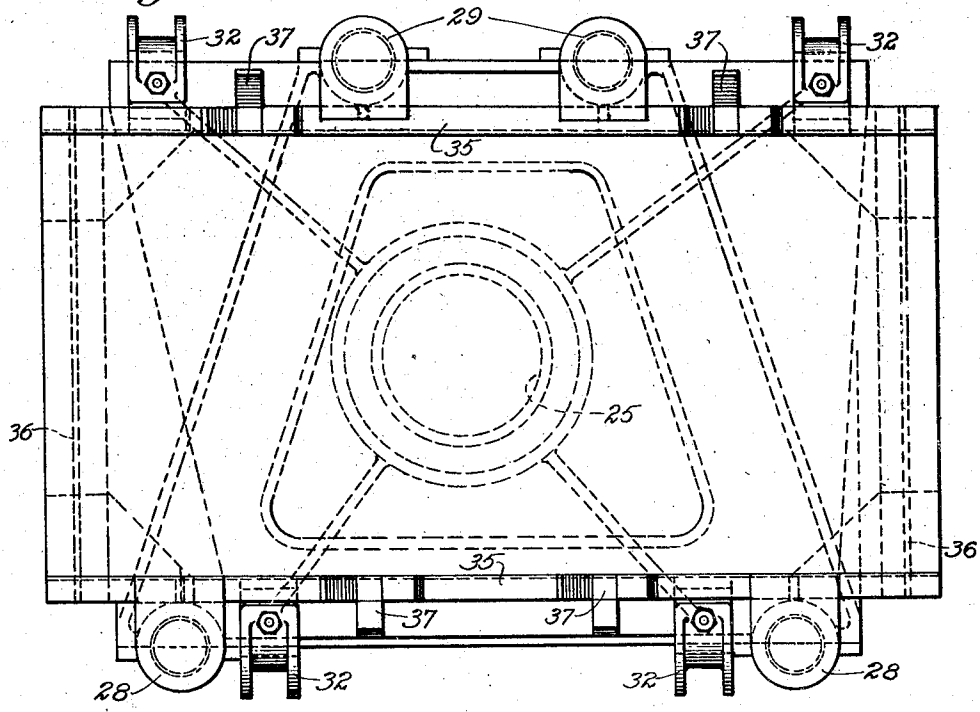


Fig-15

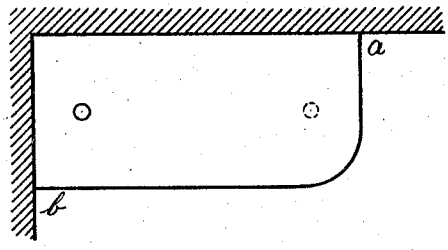


Fig-16

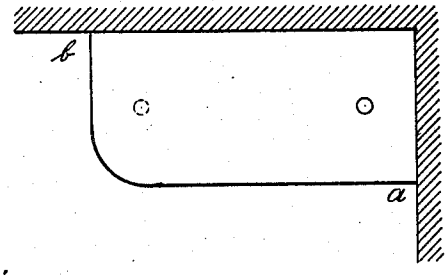
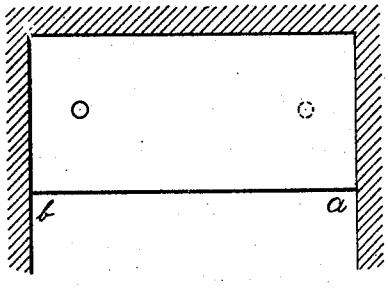


Fig-17



Inventor:-
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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 6

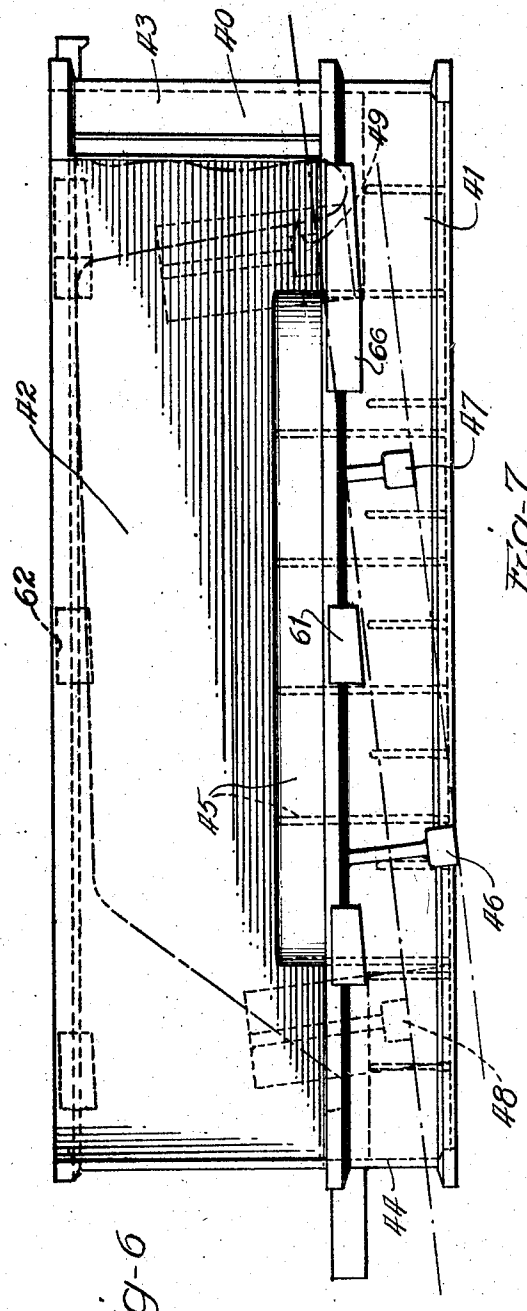


Fig-6

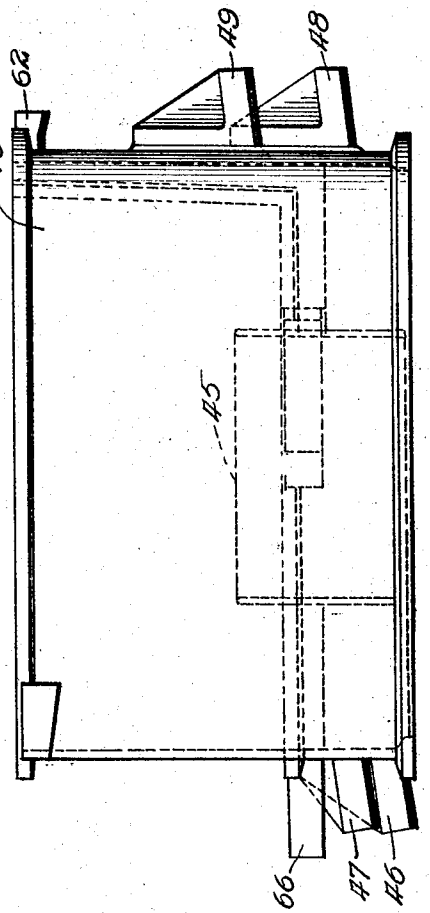


Fig-7

Inventor:-
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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 7

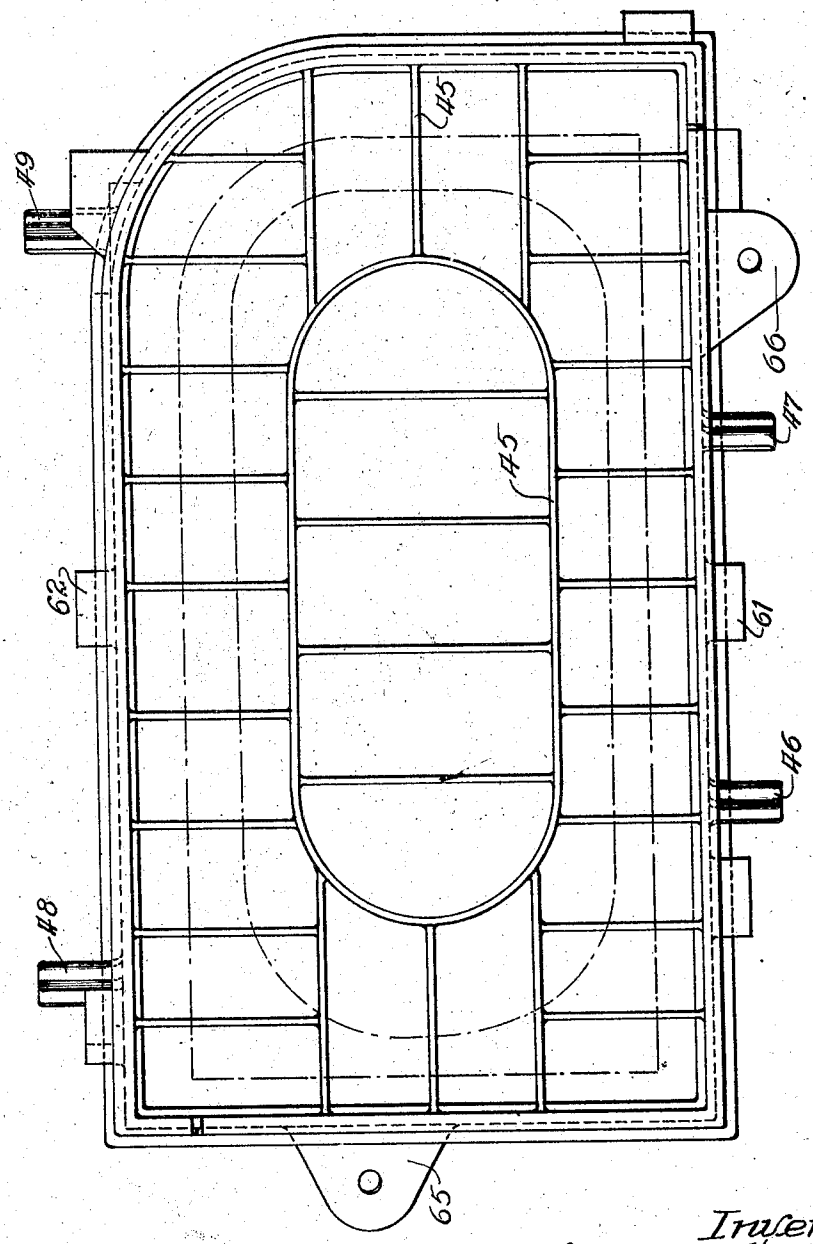


Fig-8

Inventor:-
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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

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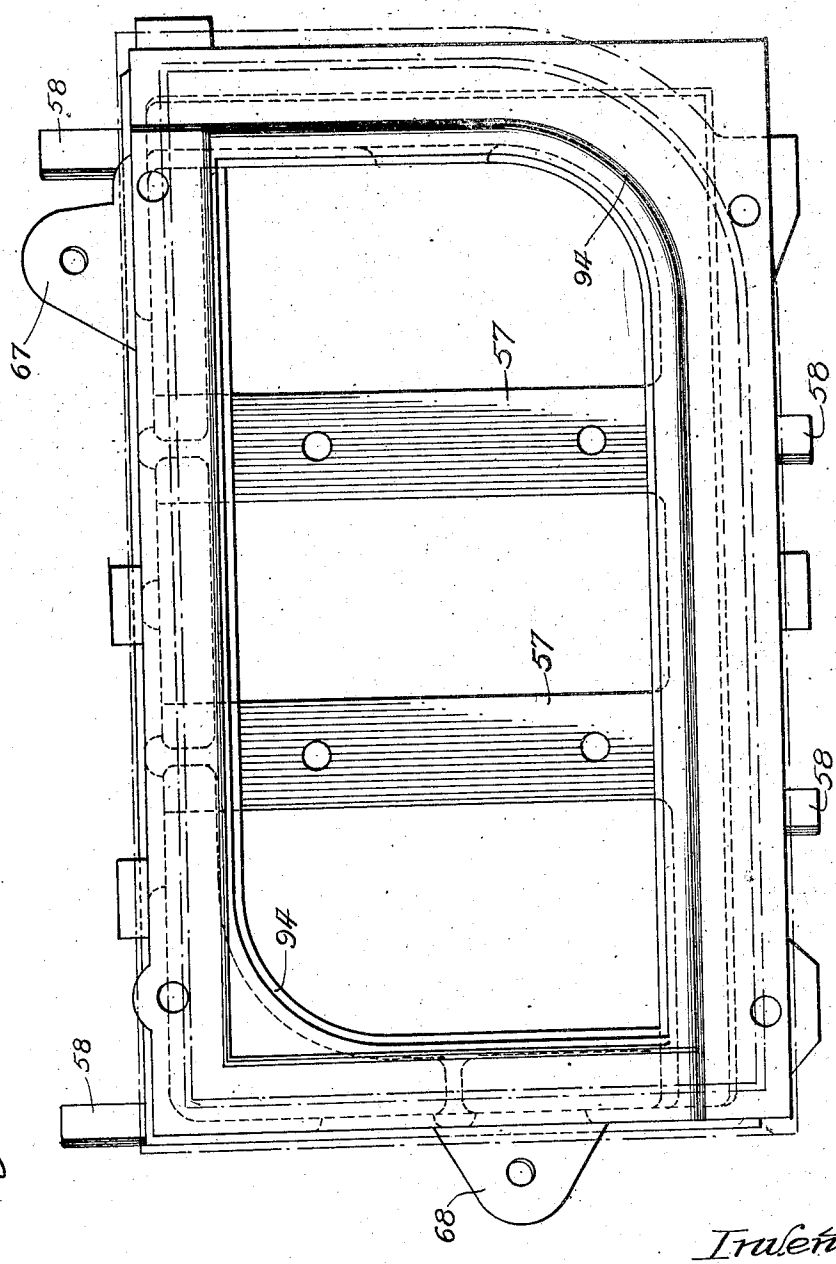


Fig-9

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T. A. HUGHES

PROCESS AND APPARATUS FOR FORMING SAND MOLDS

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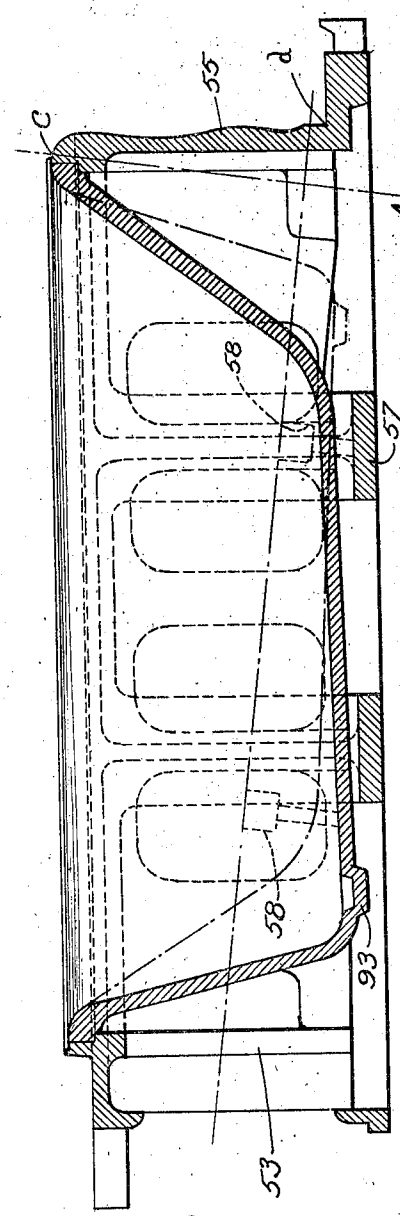


Fig-10

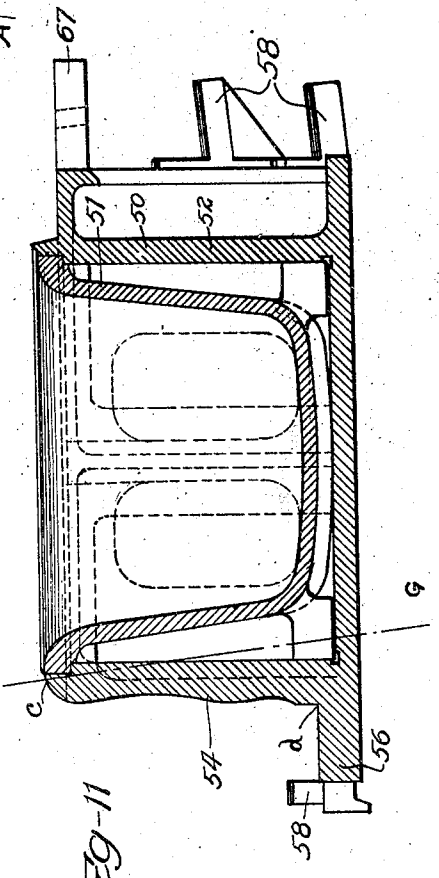


Fig-11

Inventor:-
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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

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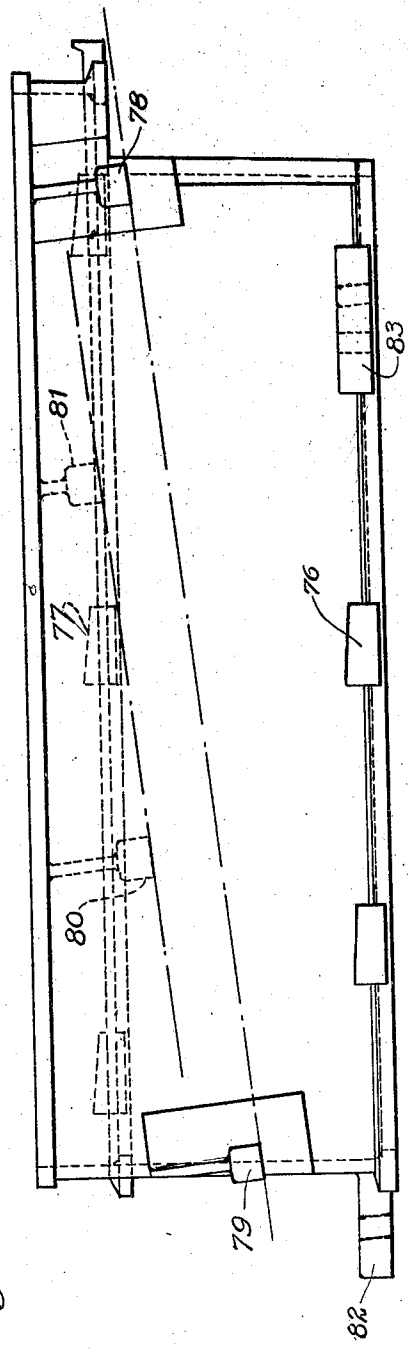


Fig-12

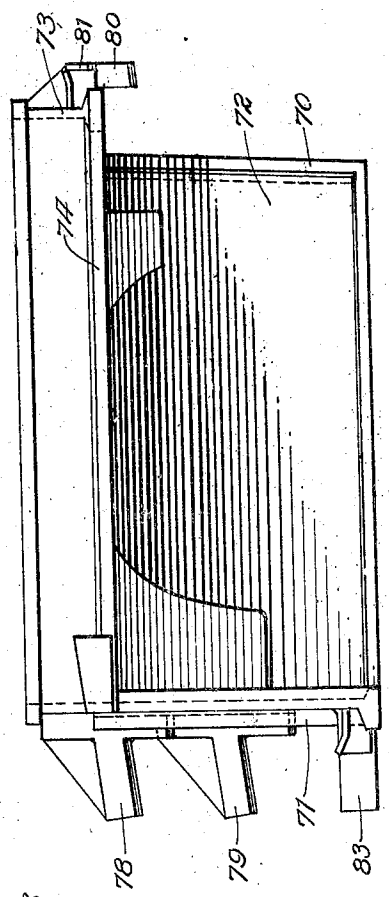


Fig-13

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Aug. 10, 1926. 1,595,784

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PROCESS AND APPARATUS FOR FORMING SAND MOLDS

Filed Sept. 28, 1923 11 Sheets-Sheet 11

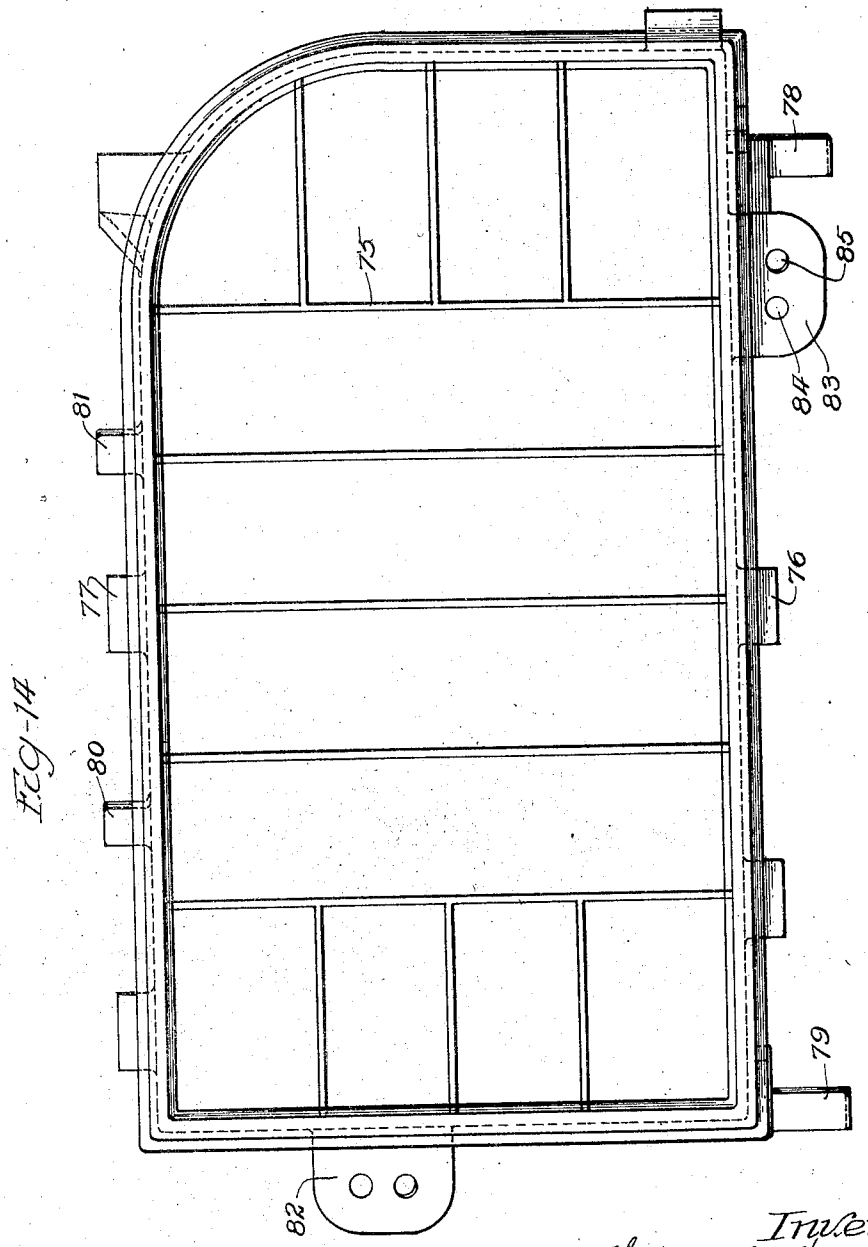


Fig-14

Inventor:-
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Patented Aug. 10, 1926. 1,595,784

UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR FORMING SAND MOLDS.

Application filed September 28, 1923. Serial No. 665,263.

This invention relates to the art of forming and handling sand molds, and has more particular reference to the forming and handling of molds designed for the production of articles, the patterns for which require drawing from the flask parts in an angular direction. An example of such articles and a primary use of the invention exists in the production of bath tubs provided with aprons or skirts at one or more sides having a general vertical position in the finished tub but waved transversely of the height.

A principal object of the invention is the provision of a new process and an apparatus adapted to expeditiously draw the pattern from one or more of the flask parts and to assemble these parts both by vertical action and without the requirement that the flasks present an angular relation to the sand supplying equipment or during the ramming of the sand.

Another important object of the invention is the provision of a new process and apparatus which will accomplish this result with minimum change for the production of articles requiring different angularity of arrangement in draw and assemblage.

Another important object of the invention is the provision of a new process and apparatus which will have general application to the production of articles of the general character described, and which will permit of a wide range of substitution of flasks.

A further object of the invention is the provision of a set of patterns for making apron bath tubs, which will permit of the location of the drain in the bath tub at different ends within the same skirt portion.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings,

Figure 1 is a side elevation of a combined drawing and assembly machine embodying my present invention;

Fig. 2 is an end view thereof showing the drawing of drag pattern;

Fig. 3 is a similar view showing the cope and drag arranged for assemblage;

Fig. 4 is a similar view showing the cope and flask assembly;

Fig. 5 is a top plan view of the machine of Fig. 1;

Fig. 6 is a side elevation of the drag flask;

Fig. 7 is an end view thereof looking from the right in Fig. 6;

Fig. 8 is a bottom plan view of the drag body proper;

Fig. 9 is a top plan view of the drag pattern;

Fig. 10 is a section taken longitudinally through the drag pattern;

Fig. 11 is a section taken transversely thereof;

Fig. 12 is a side elevation of the cope body;

Fig. 13 is an end view thereof looking from the right in Fig. 12;

Fig. 14 is a top plan view of the cope;

Figs. 15, 16 and 17 are schematic views showing forms and arrangements of apron tubs.

While it will be understood that my present invention is adapted for wide application, it is herein described in connection with the manufacture of apron bath tubs. Such a tub consists of the usual tub body and an integral part or apron extending down to the floor, at the side or sides of the tub, which are exposed to view when the tub is installed.

Referring first to Figs. 15, 16 and 17 it will be noted that the tub is positioned either in an alcove (as indicated schematically in Fig. 17) in which event a longitudinal side is exposed, or the tub may be arranged in either a left or right hand corner (as shown in Figs. 15 and 16 respectively). In either of the last eventualities an end as well as a side of the tub is exposed and the skirt extends continuously from one wall engagement at say the point *a* to the point *b*. These aprons while having a general vertical construction are waved across the width to break the flat contour and improve the appearance of the tub. A sample of a wave of this character is indicated in a number of the views, notably Figs. 10 and 11, showing the drag pattern, the face of the apron being of the shape indicated between the points *c* and *d*. These figures are referred to at this point

in the specification merely to indicate the shape of the face of the tub.

It will be noted that since the apron is generally vertical this waving, departing as it does from the vertical, renders drawing of the tub at a normal to its horizontal axis impossible, the drawing occurring along the line parallel to both the lines *cf* and *cg*. In other words where, as in Figs. 10 and 11, the tub to be produced has an apron at an end and side the pattern is drawn along a line inclined in two directions from the vertical plane. In the past, this has been generally accomplished by providing the pattern parts with a base inclined in accordance with the angularity of the line *ca* and *cg* so that the pattern may be drawn vertically. This has required ramming the mold in like position and has rendered also the use of drawing and assembling machines either impractical or difficult of operation because of the lack of a machine or apparatus for readily taking care of the angularity mentioned as it varies in different tubs, both as such angularity is individually determined by the contour and by the requirement that both left and right hand corner and alcove tubs be provided.

My invention contemplates the drawing of the tubs of all of the three arrangements shown in Figs. 15, 16 and 17 without alteration of the machine itself at all and also the drawing of patterns where different angularity is required.

My invention contemplates also the assembling of the cope and drag parts of all of these various forms of tubs, and other articles having like range, without change.

The invention contemplates also a new process of drawing the patterns and assembling the mold parts by vertical action where angular draw and assemblage are required. In accordance with the process two set of supports are provided which are relatively movable with respect to each other, the members of each set being arranged in a horizontal plane. Upon the pattern and flask parts are arranged lugs at such heights with respect to the plane of the top or bottom flask or pattern part as to automatically arrange said flask or pattern part at the desired inclination when brought to rest on the proper set of horizontally arranged supports of the machine. The machine itself will first be described and thereafter the mold parts and other arrangement of lugs, etc.

A fixed support 21 of any suitable character or shape is preferably arranged upon a suitable concrete or other foundation 22. This carries in the present instance a heavy cast base 23 which forms a bearing for the plunger 24 of a fluid pressure cylinder 25 which may be of hydraulic type. At each side of this base are provided supports for two posts 26 and 27 having their tops 28 and 29 arranged in a horizontal plane. The tops of these posts constitute a set of fixed supports for the pattern in drawing the pattern or for the cope in assembling the mold.

A liftable platform 31 is fixed upon the top of the plunger 27 and is adapted to be elevated therewith. Two brackets 32 extend up at each side of this platform and provide supports for rods 33 arranged through angles 34 upon the sides of a frame comprised of channels 35 and H-beams 36. A channel extends along each side of the frame and the two together provide a set of supports arranged in a horizontal plane for the flask part in drawing the pattern and the drag part in assembling the mold. At appropriate locations upon the tops of the channels 35 seat members 37 are provided to receive lugs upon the flask parts as will be presently described.

The flask in the present instance comprises two parts, namely, a cope and a drag. The drag is shown in Figs. 6 to 8. The drag is generally designated by reference character 40 and consists of four vertical walls 41, 42, 43 and 44. The walls 43 and 42 are the end and side walls at the tub apron sides of the drag and are relatively higher than the bodies of the walls 41 and 44. Within these walls are provided webs 45 throughout and extending slightly above the low sides of the flasks. Upon the low longitudinal side of the flask are provided two lugs 46 and 47 arranged relatively close together and relatively near but on opposite sides of a vertical transverse central plane. Upon the opposite longitudinal side two other lugs 48 and 49 are provided, spaced farther apart and arranged near the ends of the flask. These lugs are so arranged that they are in a common plane and when this plane is arranged horizontally the drag part of the flask is given the inclination designed for the draw and the pattern is thus permitted to be lifted vertically out of it and the cope to be assembled vertically therewith.

The pattern is shown in Figs. 10 and 11. This pattern, generally indicated at 50, comprises an outer integral body and an inner removable member 51 for defining the tub shape proper. Two sides of the pattern 52 and 53 are relatively high and are adapted to match with the difference in height between the walls 41 and 42 on the one hand and 44 and 43 on the other. These walls do not enter into the actual configuration of the product. The other two outer walls of the pattern, namely, those indicated by reference characters 54 and 55, which are adapted to form the outer face of the apron, are spaced in from the pattern flange 56 which is adapted to rest upon the tops of the walls 42 and 43. The outer body of the pattern is provided with integral cross members 57 for strengthening the construction and the

parts are fastened together in any suitable fashion.

The pattern has lugs 58 arranged in a plane in parallelism with the plane of the lugs 46, 47, 48 and 49 of the drag and two lugs at one side are arranged closer together than the lugs at the other side. The purpose of this will be later apparent. It may be mentioned, however, that the lugs closer together are arranged when the pattern is in place on the drag at the side of the drag having the lugs spaced farther apart.

Web blocks 61 and 62 are provided on the drag and companion web blocks 63 are provided upon the pattern. These blocks are brought into adjacent position when the pattern is on the drag and a web clamp engages them to hold the parts together. The drag is rammed in inverted position and is then turned over and placed in the machine shown in detail in Figs. 1 to 5. Preparatory to this action, the platform 31 is elevated and the lugs of the drag (46 to 49) as the flask part with its pattern is lowered into position engage in seats 37 arranging the whole structure in desired inclined position. The clamps are now removed and the platform 31 permitted to lower. As this action continues the lugs 58 in the pattern engage on the tops of the posts 28 and 29 and continued lowering of the platform produces vertical separation or draw with the parts automatically arranged in desired angular relation. The lugs on the drag and pattern and seats on the frame are so arranged that the lugs clear the posts in this action and this is the cause for the varied spacing given these parts as already described.

The separating action of the drag is shown in Fig. 2. This separating action is guided by two pins 64 which are tapered and seated at one end in the lugs 65 and 66 (Fig. 8) on the drag and pass through similar lugs 67 and 68 (Fig. 2) in the pattern.

These pins serve also to accurately locate the drag and pattern during the ramming of the sand.

The cope may be similarly separated from its pattern or it may be otherwise separated.

The invention contemplates the assembling of the cope on the drag by the reversal of the action of drawing the drag pattern or for that matter the reversal of the action of drawing the cope pattern if the cope pattern be drawn in this machine. The cope is shown more particularly in Figs. 12 to 14 and it will be noted that the cope, generally designated at 70, comprises a high side and end wall 71 and 72 and a low side and end wall 73 and 74 respectively adapted to mate with the companion walls of the drag. The cope is provided with ribs 75 appropriately arranged and has clamping wedge blocks 76 and 77 arranged to come in proper relation with the companion blocks of the drag. The cope also has four lugs 78, 79, 80 and 81 so located as to arrange the drag at the angularity of the flask when these lugs are lowered onto the tops of the posts of the machine in place of the drag pattern. I prefer to so construct the cope and cope pattern that the pattern may be lifted vertically out of the cope while the cope is in horizontal position. The manner of doing this however is unimportant to the present invention and is disclosed and claimed in my copending application Serial No. 665,264. Two lugs 82 and 83 are provided and are adapted to be brought into contact with the lugs 65 and 66 on the drag. These lugs have each two perforations in the present instance, one 84 and the other 85. The perforation 84 extends at right angles through the lug and is adapted to permit vertical separation of the cope and pattern if this means of drawing be employed in accordance with my copending application and the opening 65 is arranged at the angularity of draw provided by the machine of Figs. 1 to 5, and is to be employed if the cope be separated from its pattern in this or a companion machine or if it be separated by merely tilting the cope upon the floor before or after ramming.

The mold is assembled as indicated in Fig. 3 exactly by reverse operation of drawing the pattern. I prefer, however, to provide longer pins 91 in place of the pins 64 to insure proper centering of the mold parts before appreciable approach. Pins 64 are merely lifted out and pins 91 substituted therefor. After the cope has been thus accurately placed and located upon the tops of the posts the platform 31 is again lifted and the parts thus brought into assembled position, this action and arrangement being indicated in Fig. 3. When the plunger has lifted the lugs of the cope off the tops of the posts, clamps 92 may be secured over companion clamping blocks and the mold thereafter lifted and placed on the floor for pouring.

It may be mentioned that after the pattern part is removed from the flask part in the machine any patching that may be necessary can be readily accomplished without disturbance of the parts and it will be noted that the frame carrying the seat supports 37 being suspended by the rods 33 is shiftable laterally to facilitate the operation in the assemblage of the cope and drag.

Referring to Fig. 9, which is for a left hand corner tub, it will be noted that the pattern is so constructed that the internal

part 51 may be turned end for end so as to bring the tub outlet 93 at either the right or left hand end of the tub structure, this being accomplished by providing proper formation 94 at the corner of the apron and the diagonally opposite corner of the tub.

It will be manifest that any desired tilt of a pattern may be obtained by merely arranging the lugs appropriately upon the pattern and flask parts and that in the same machine and without any adjustment of it right hand, left hand and alcove apron tubs may be provided.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The process of forming molds for the molding of articles requiring an angular draw of the pattern, comprising, ramming a flask while in a horizontal position, tilting the flask to an angular position, and removing the pattern along a straight line draw.

2. The process of forming molds for the molding of articles requiring an angular draw of the drag pattern and an angular assembly of the cope, comprising, molding the drag flask and pattern in a horizontal plane, tilting the drag flask, withdrawing the pattern, and assembling the cope while the drag flask is in the tilted position.

3. An apparatus for use in forming sand molds, comprising, means for supporting a pattern, means for supporting a flask part, each said means being arranged in a horizontal plane, mechanism for moving one of said means with respect to the other, and devices on said pattern and said flask arranged in planes out of parallelism with the tops and bottoms of said patterns and said flask for engaging said supporting means.

4. An apparatus for use in forming sand molds, comprising, a set of supports for a pattern, a set of supports for a flask part, each said set of supports being arranged in a horizontal plane, means for moving one set with respect to the other, and mold part and pattern part support engaging members arranged in planes out of parallelism with the tops and bottoms of said parts.

5. In a machine for forming sand molds, the combination of flask parts, each having a set of supporting lugs arranged in an angular plane, and a pattern supporting machine, comprising supporting members arranged in spaced horizontal planes respectively adapted to engage a set of flask part lugs arranged in a single plane whereby to support said flask parts in inclined position for vertical draw.

6. In a machine for forming sand molds, the combination of flask parts, each having a set of supporting lugs arranged in an angular plane, and a pattern supporting machine, comprising supporting members arranged in spaced horizontal planes respectively adapted to engage a set of flask part lugs arranged in a single plane whereby to support said flask parts in inclined position for vertical assemblage.

7. In a machine for use in forming sand molds, the combination of supporting surfaces arranged in spaced horizontal position, a cope member having supporting lugs arranged in a single plane angularly disposed across said cope, a drag having a similar set of lugs arranged substantially in a plane with the lugs of the cope, the lugs of the said cope and drag being adapted respectively to engage the horizontal supports in the parallel planes aforesaid, and means moving one of said supports toward the other said support for vertical assemblage.

8. In a machine for use in forming sand molds, the combination of supporting surfaces arranged in spaced horizontal position, a cope member having supporting lugs arranged in a single plane angularly disposed across said cope, a drag having a similar set of lugs arranged substantially in a plane with the lugs of the cope, the lugs of the said cope and draw being adapted respectively to engage the horizontal supports in the parallel planes aforesaid, means moving a said support toward the other said support for vertical assemblage, and centering pins carried by one flask part and entering into the other for centering said flask as they are assembled.

9. A machine for use in forming sand molds, comprising, two sets of supports, each formed to arrange a flask part in inclined position for vertical assemblage, one of said supports being adjustable relative to the other for accurate centering.

10. A machine for use in forming sand molds, comprising, two sets of supports, each adapted to arrange a flask part in inclined position for vertical assemblage, one of said supports being automatically movable laterally of the other upon approach of the flask parts for accurate assemblage.

11. A molding machine, comprising a set of fixed supports arranged in a horizontal plane, and a set of vertically movable supports arranged in a second horizontal plane, and means on the flask parts adapted to be disposed respectively in horizontal planes of said supports for arranging flask parts mutually in angular position to permit vertical assemblage.

12. A machine for use in forming molds, comprising, posts arranged with their tops in a horizontal plane, lugs on a flask part disposed in a single plane and adapted to engage the tops of said posts to arrange the flask part in angular relation, a vertically movable frame having lug engaging surfaces arranged in a horizontal plane, and a second flask part adapted to be supported on said frame and having lugs for engaging the same arranged to dispose the flask part at the inclination of the first mentioned flask part for vertical assemblage.

13. A machine for use in forming molds, comprising, posts arranged with their tops in a horizontal plane, lugs on a flask part disposed in a single plane and adapted to engage the tops of said posts to arrange the flask part in angular relation, a vertically movable frame having lug engaging surfaces arranged in a horizontal plane, and a second flask part adapted to be supported on said frame and having lugs for engaging the same arranged to dispose the flask part at the inclination of the first mentioned flask part for vertical assemblage, said last mentioned frame being shiftable laterally in assembling action.

14. A machine for use in forming molds, comprising, posts arranged with their tops in a horizontal plane, lugs on a flask part disposed in a single plane and adapted to engage the tops of said posts to arrange the flask part in angular relation, a vertically movable frame having lug engaging surfaces arranged in a horizontal plane, and a second flask part adapted to be supported on said frame and having lugs for engaging the same arranged to dispose the flask part at the inclination of the first mentioned flask part for vertical assemblage, and a fluid pressure lift for elevating said frame in vertical assemblage.

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