June 12, 1928. 1,673,276

N. W. WARMAN

SAND THROWING MACHINE FOR FOUNDRIES

Filed Oct. 30. 1926 2 Sheets-Sheet 1

Fig. 1

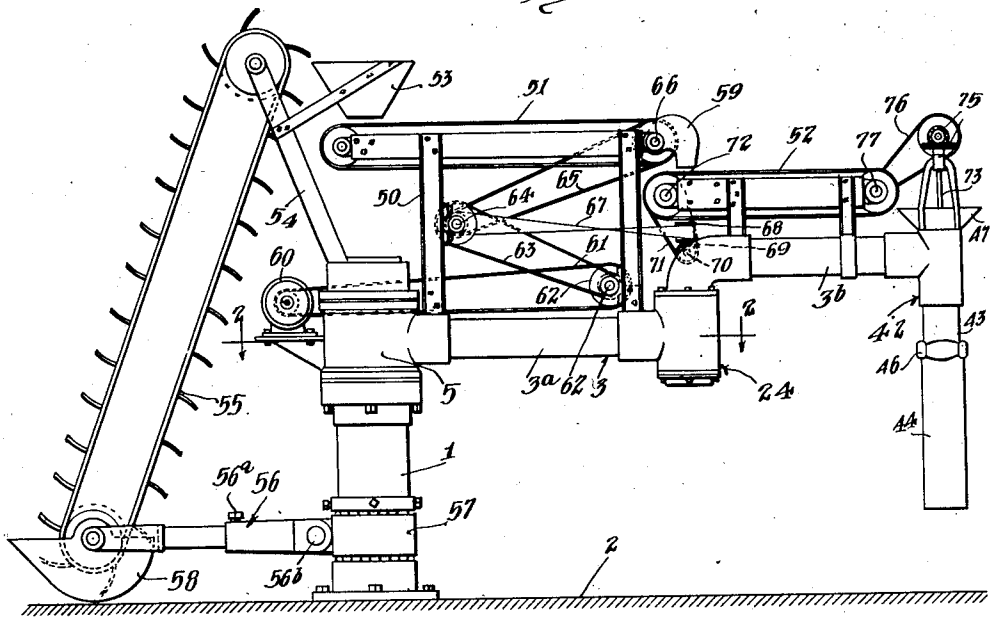
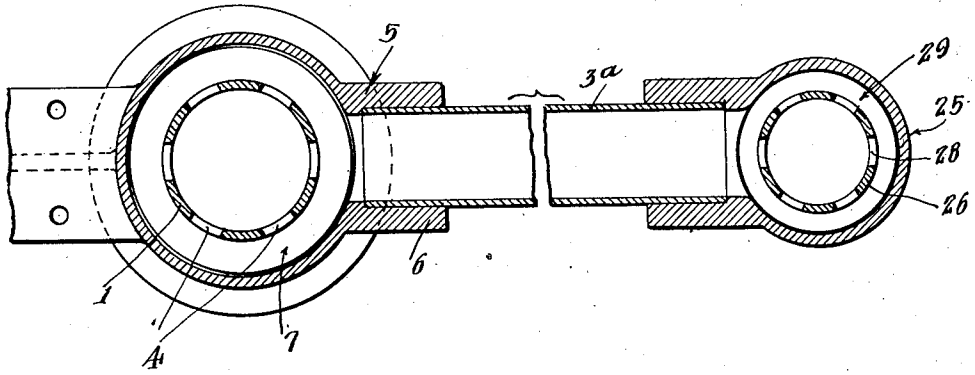


Fig. 2



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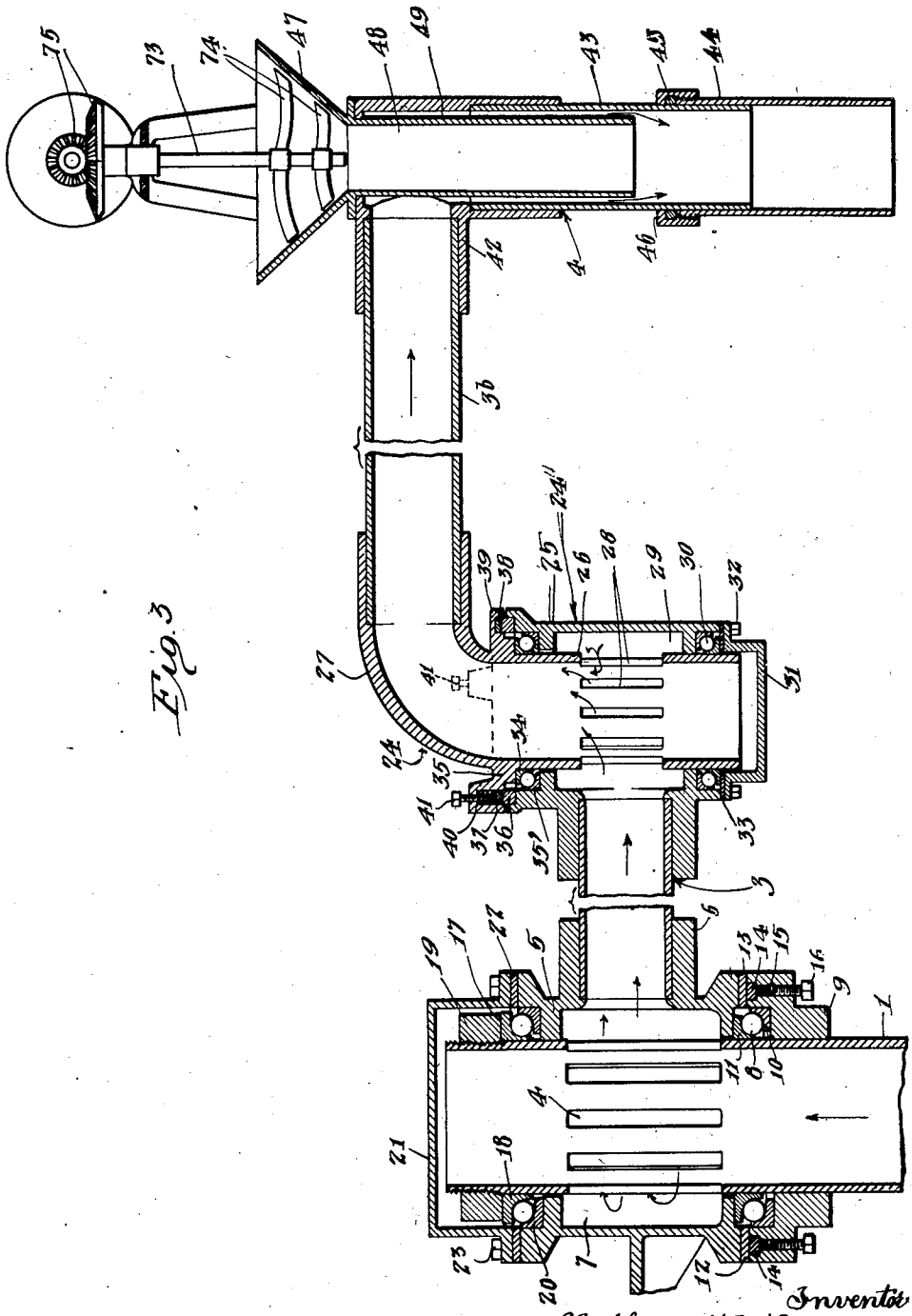


Fig. 3

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Patented June 12, 1928. 1,673,276

UNITED STATES PATENT OFFICE.

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SAND-THROWING MACHINE FOR FOUNDRIES.

Application filed October 30, 1926. Serial No. 145,302.

This invention relates to a machine to be used in a foundry to facilitate the filling of molds with sand. Machines for this purpose are popularly known as sand flingers or sand throwing machines. In their operation, they project the sand with considerable force into the mold so that it will pack itself around the pattern. Heretofore mechanical means have been employed for giving the sand the necessary velocity at the point where it is projected into the mold. These means, however, have not been entirely satisfactory.

The general object of this invention is to produce a pneumatic machine for this purpose, which is so constructed as to enable an air blast or compressed air to be used for throwing the sand into the mold; also to provide a machine for this purpose having improved means for delivering the sand to the sand nozzle.

In the present embodiment of the invention, the construction includes an arm mounted to rotate about a vertical axis and having a joint at an intermediate point on the arm to enable the sand nozzle to be brought into position over any mold on the foundry floor within the radius of the arm.

One of the objects of the invention is to provide an improved construction for the swivel joints or pivot joints of the arm which will enable them to conduct the air blast without great resistance and with a minimum of leakage. Further objects of the invention appear hereinafter.

The invention consists in the novel parts and combinations of parts to be described hereinafter, all of which contribute to produce an efficient sand throwing machine for foundries.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Fig. 1 is a side elevation of a sand throwing machine embodying my invention.

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1 but upon an enlarged scale.

Fig. 3 is a vertical section taken through the upper end of the post and longitudinal of the arm of the machine, and also passing centrally through the sand nozzle.

In practising the invention, I provide a post 1, which may be set upon a foundry floor 2. To this post is secured an arm 3 which carries a sand nozzle 4 at its outer end. The post and arm are so constructed as to enable them to conduct an air blast to the sand nozzle. In order to accomplish this, these parts are preferably made of tubular construction. See Fig. 3.

In order to enable the sand nozzle to be brought into position over any mold within the radius of the arm 3, this arm is preferably constructed of two sections or extensions 3^a and 3^b. The inner section 3^a is connected to the tubular post 1 by a swivel or pivot connection. In order to accomplish this, the upper end of the post is formed with a plurality of air ports 4^a, which may be in the form of longitudinal slots and at these ports an air head 5 is rotatably mounted. This air-head is in the form of an annular casing, having a hub 6 at one side, which is rigidly secured to a tube or pipe which forms the inner section 3^a of the arm of the machine. The wall of the casing of the air-head 5 is removed from the wall of the post so that an annular air duct 7 is formed around the post at the ports 4^a and communicating with the bore of the inner section 3^a of the arm. In order to support the arm 3 on the post and at the same time provide a substantially air tight connection at the lower bearing 8 for the arm, I provide a ring 9 which is shrunk onto the post. The upper portion of this ring is counterbored to receive a ball race 10 so that a ball bearing is formed between it and a similar ball race 11 which is in the form of a ring carried on the under side of the air-head 5. Near the ball races, the lower side of the air-head is formed with an annular seat, and the upper side of the ring 9 is formed with an annular seat 12. Between these seats a gasket 13 is provided. In the seat 12 adjacent this gasket, a steel ring 14 is countersunk. This ring 14 is pressed against the gasket by a plurality of coil springs 15, which are set in the wall of the ring 9 and which may be adjusted as to tension by means of an adjusting bolt 16 corresponding to each spring. There may be as many of these springs 15 as desired. However, this joint will be satisfactory if three of these springs are employed.

At the upper bearing 17 on the post a somewhat similar construction is provided. This construction includes a ball race 18 which is carried by the post and which may be adjusted downward by means of an adjusting ring 19 threaded on the upper end of the post. The upper end of the air head 5 carries a ball race 20 which cooperates with the ball race 18. This bearing is entirely enclosed by means of a cap 21 which is put in place over it and which clamps down upon a gasket 22 seating on the upper side of the air head 5 and clamped upon the same by means of bolts 23 which pass through the flange of the cap.

A somewhat similar construction to this is employed for forming the swivel joint 24 which attaches the inner section 3^a of the arm 3 to its outer section 3^b. This construction is illustrated in Fig. 3 and includes an air-head 25 in the form of a cylindrical casing, the wall of which is removed from a tubular shank 26, which forms part of an elbow 27. This shank extends downward into the air-head 25 so that the joint provides a vertical axis of rotation for the elbow 27 and the arm section 3^b which is secured in the elbow. Ports 28 in the form of slots are formed in the shank 26 which permits the air to pass from the annular space 29 in the air-head 25 into the interior of the elbow.

At the lower end of the tubular shank 26, a lower bearing 30 is provided and the construction at this point for making the bearing air tight is substantially the same as used at the upper end of the post. In other words, the bearing is covered by means of a cap 31 which is attached to the lower end of the air-head 25 by bolts 32, a gasket 33 being clamped by the bolts between the flange of the cap and the under side of the air-head.

At the upper end of this joint a ball bearing is provided and for this purpose, I provide a ball race 34 seating under a collar 35 formed on the tubular shank 26 near its junction with the elbow 27. This ball race 34 cooperates with a similar ball race 35′; carried by the upper end of the air-head 25. On the upper end of the air-head, a packing ring or gasket 36 is provided of soft material, such as rubber, and on the upper face of this packing ring a steel ring 37 lies, said ring 37 being received in a groove 38 on the under side of an enlarged collar 39 formed on the elbow 27. This ring 37 is pressed down onto the packing ring by a plurality of springs such as the spring 40 and these springs are simply coiled springs received in spring chambers formed in the collar 39 and adjustable.

The sand nozzle 4 comprises an elbow 42 which is attached to the outer end of the arm or tube 3^b, and from this elbow 42, the tubular body 43 of the sand nozzle extends downward. This nozzle 43 has an extension tube 44 which telescopes with it on its outer side and the upper end of the extension 44 is provided with a packing ring 45 and a packing collar or nut 46 which is threaded on the upper end of the extension 44; by screwing up on this nut, the soft packing ring 45 can be compressed so that the extension 44 will be supported on the body 43 of the nozzle. This extension 44 may be moved up or down so as to deliver the sand at any level desired over the pattern lying in the mold.

The sand is delivered to the sand nozzle through a hopper 47 which is of funnel shape; that is to say, it has a tubular lower end 48 which passes down through the elbow 42 and which is spaced away from the wall of the elbow so that an annular air space 49 is formed through which the air blast flows as it comes from the section 3^b of the arm. In other words, as the sand passes down through the tubular part 48, the air blast passes down around the current of sand as illustrated by the arrows in Fig. 3. In this way the sand can be projected with considerable force down into the mold. In accomplishing this, the action of the nozzle is assisted by the action of gravity on the sand and also by the partial vacuum or ejector effect which is developed by the downward flowing air blast as it passes the lower end of the tube 48.

Any suitable means may be provided for passing sand to the hopper 47 but this means is preferably supported on the arm 3. In order to accomplish this, I provide a frame 50 supported on the inner section 3^a of the arm and this frame supports a conveying means in the form of a horizontal belt 51. A similar belt 52 is supported on the outer section 3^b. The delivery of sand to the belt 51 occurs on the axis of the post 1. In this way, the sand will be properly delivered to the belt no matter in what direction the arm 3^a extends. A similar organization of parts is used at the point where the sand is delivered onto the belt 52. In other words, the sand is delivered onto that belt on the axis of the swivel joint 24. In order to accomplish this, I extend the inner end of each of these belts past the axis of the joint about which their supporting arm swings. In the case of the belt 51, I provide a hopper 53 to receive sand and this hopper is supported on a frame 54 extending up from the upper end of the post. This hopper may be supplied with sand by means of an endless elevator 55, the lower end of which may be carried on an arm 56 having a roller bearing 57 at the lower end of the post. The lower end of this elevator carries a receiver 58 into which sand may be shoveled by the molders. The hopper 53 is located directly

on the center axis of the post so that sand is delivered onto the belt 51. This sand is carried out to the end of the belt and is dumped onto the belt 52 which projects under the end of the belt 51. At this point a guard 59 of sheet metal may be provided which acts as a rudimentary chute to guide the sand down onto the belt 52. The belt 52 delivers the sand into the hopper 47. In order to drive the belts, I provide an electric motor 60 which may be supported on the air-head 5 opposite the arm 3. This position for the motor assists in counterbalancing the weight of the arm. This motor drives a belt 61 which drives pulleys 62, one of which drives another belt 63 to drive a countershaft 64. This countershaft has pulleys which drive an upper belt 51. The countershaft 64 drives a twisted belt 67 which actuates a pulley 68 rotating on a vertical axis, and the shaft of which, through bevel gears 69, actuates a horizontal shaft 70. This horizontal shaft drives a belt 71 which extends up and drives a shaft 72 at one end of the belt 52, and carrying a pulley for it.

If desired, a stirring device or agitator may be provided for assisting in feeding the sand through the hopper 47, and for this purpose, I provide a vertical shaft 73 carrying a cross-arm 74 and this shaft may be driven through bevel gears 75 actuated by a belt 76 driven by a pulley on the shaft 77 which is at the outer end of the belt 52.

I prefer to construct the arm 56 so that it is extensible. For this purpose it is made of two telescoping parts with a set screw 56^a for securing them. The inner end of the arm is connected to the swivel collar 57 by means of a pivot joint 56^b.

In using the device, the molds which are to receive the sand would be grouped around the post 1 within reach of the sand nozzle 4.

The sand nozzle would then be brought into position over the mold. In doing this the arm 3 is flexed, if necessary, at the swivel joint 24.

When the sand nozzle 4 is in proper position, the motor 60 is started and the air blast is turned on and passes through the tubular post 1. The air blast at the nozzle cooperates with the descending current of sand so as to project the sand with considerable violence down into the mold. In this way the sand is packed so closely as to render tamping or ramming of the mold practically unnecessary.

By having the sand delivered on the axis of the joints of the arms, it will be seen that the sand is always delivered on the center line or center axis of the belt to which it is delivered.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of my invention, nor in my claims, to the particular embodiment set forth.

What I claim is:

1. In a sand flinging machine for placing sand in molds, the combination of a post having means for conducting an air blast, an arm pivotally mounted on the post having means for conducting the air blast from the post, a tubular nozzle attached to the end of the arm and extending downwardly therefrom, receiving the air blast from the arm, and a tube within the nozzle for feeding sand down through the nozzle so that the sand is surrounded by the air blast.

2. In a sand flinging machine for placing sand in molds, the combination of a post having means for conducting an air blast, an arm pivotally mounted on the post having means for conducting the air blast from the post, a tubular nozzle attached to the end of the arm and extending downwardly therefrom, receiving the air blast from the arm, a sand tube within the nozzle for feeding sand through the nozzle, cooperating with the nozzle to form an annular air passage around the sand tube and a movable extension telescoping with the nozzle for controlling the point of delivery of the sand from the nozzle.

3. In a sand flinging machine, the combination of a tubular post having a plurality of air ports, a tubular arm having an air blast with a bearing on the upper part of said post above the ports and another bearing below the said ports, means for preventing leakage of air at said bearings, a sand nozzle at the outer end of said tubular arm, receiving the air blast from the said ports, and means supported on the arm for delivering sand to the said nozzle.

4. In a sand flinging machine, the combination of a tubular post adapted to conduct an air blast and having a plurality of ports, a tubular arm having an inner section with an air-head rotatably mounted on said post at said ports, a bearing for the air-head on the post above said ports and a bearing for the air-head on the post below said ports, a cap attached to the air-head on its upper side and enclosing the upper bearing, and means for packing the lower bearing to prevent leakage of air, said inner section of said arm having an air-head at its outer end, said arm having an outer section with an elbow at its inner end with a tubular shank extending from said elbow and mounted to rotate in the last named air-head, said tubular shank having air ports therein for conducting an air blast from the inner arm section to the outer arm section, a lower bearing for the tubular shank on the last named air-head below the ports in the shank, an upper bearing for the

tubular shank on the air-head above the ports in the shank, a cap attached to the last named air-head and enclosing the last named lower bearing, means for packing the last named upper bearing to prevent the escape of air, a sand nozzle carried by the outer end of the outer section of said arm and means for delivering sand to the sand nozzle.

5. In a sand flinging machine, the combination of a tubular post adapted to conduct an air-blast, a ring rigidly secured to the post, said post having a plurality of air ports above the ring, a tubular arm for conducting an air-blast, having an air-head rotatably mounted on the post, a bearing between the air-head and the ring for supporting the arm rotatably on the post, a gasket surrounding the bearing and packing the space between the ring and the air-head, an upper bearing for the air-head on the post located above the ports, and means for enclosing the upper bearing to prevent the escape of air.

Signed at Los Angeles, California this 21 day of October, 1926.

NATHAN W. WARMAN.