

May 17, 1932.

R. RUEMELIN

1,858,561

SAND BLAST MACHINE

Filed July 26, 1926

3 Sheets-Sheet 1

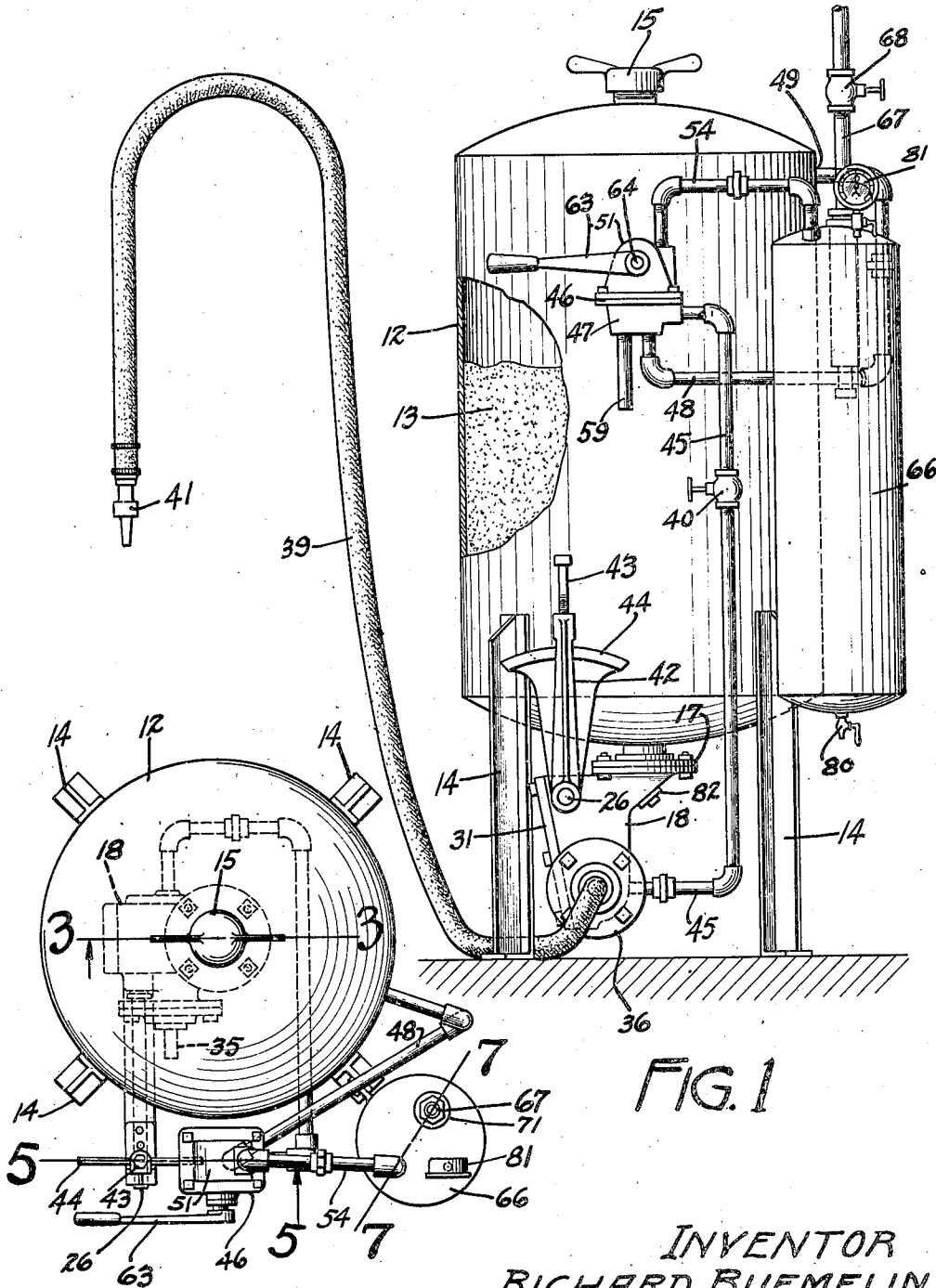


FIG. 1

FIG. 2

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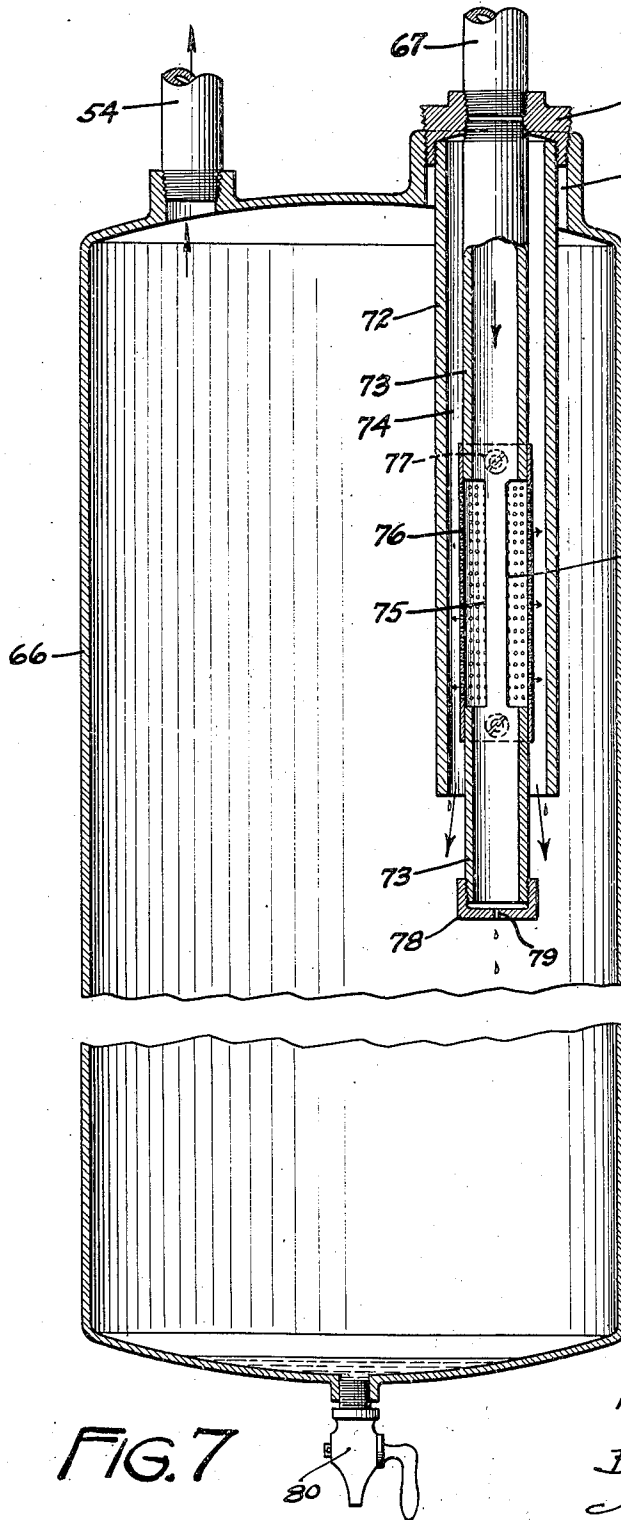
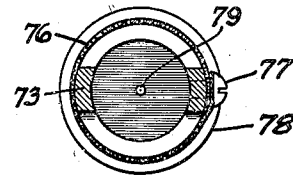
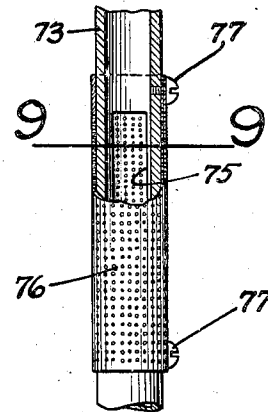
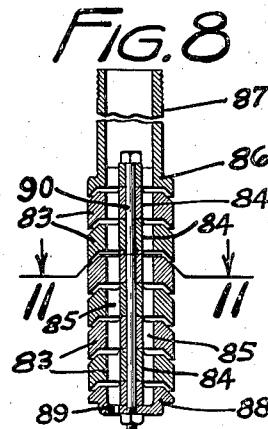
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3 Sheets-Sheet 3



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SAND BLAST MACHINE

Application filed July 26, 1926. Serial No. 124,979.

This invention relates to new and useful improvements in sand blast machines, and an object of the invention is to provide such a machine of high power, yet flexible and simple in operation, thereby adapting it for practically all kinds of sand blasting, ranging from light frosting to deep lettering in such material, as granite, utilized for monuments, corner-stones, and the like.

10 A further object of the invention is to provide a sand blast machine having a sand control valve comprising a readily replaceable rubber valve and seat, thereby eliminating unnecessary wear and repairs, as rubber offers a greater resistance to the abrasive action of flowing sand than other materials.

A further object is to provide a sand blast machine, comprising a sand valve and an air valve, and means provided within the sand valve whereby, when said valve has once been adjusted for the proper mixture of sand and air for a given work, the entire control of the machine will be accomplished by the manipulation of the air valve only, thereby greatly increasing production.

A further object is to provide such an apparatus having means for automatically cutting off the supply of sand from the tank, when the air valve is shut off, thereby positively preventing an excess quantity of sand from entering the hose, which usually results in the obstruction of the passage there-through.

Other objects of the invention are to provide a sand blast machine having; a sand box or chamber in which is mounted a removable bushing which may be quickly and cheaply replaced when necessary; a three-way air control valve having a flat seat adapted to withstand long service without leakage; a direct flow of sand and air, thereby reducing friction and wear, and also making available the full force of the blast; a clean-out plug of ample size accessibly located in the bottom of the tank, thereby permitting the latter to be quickly emptied of sand; a removable clean-out cover mounted upon the sand valve whereby access may readily be had to the interior thereof for cleaning and other purposes; a large drier having means therein for

removing all moisture from the air with its attendant troubles; and also to provide such a machine of simple and inexpensive construction, combining durability, simplicity and accessibility, and economical and efficient in performance.

Other objects of the invention will appear from the following description and the accompanying drawings, and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the accompanying drawings,

Figure 1 is an elevational view showing the general construction of the improved machine;

Figure 2 is a plan view of Figure 1;

Figure 3 is an enlarged detail sectional view on the lines 3—3 of Figures 2 and 4, showing the position of the sand in the sand valve, when the apparatus is inoperative;

Figure 4 is a detail sectional view on the line 4—4 of Figure 3, showing the removable bushing in the sand box or chamber;

Figure 5 is a detail sectional view on the line 5—5 of Figure 2, showing the air control valve in operative position;

Figure 6 is a similar view showing the air valve in inoperative position;

Figure 7 is a detail sectional view on the line 7—7 of Figure 2, showing the interior of the drier;

Figure 8 is a detail view, partially in section, of a portion of the air filtering tube within the drier;

Figure 9 is a cross-sectional view on the line 9—9 of Figure 8;

Figure 10 illustrates a modified form of air-filtering tube; and

Figure 11 is a cross-sectional view on the line 11—11 of Figure 10.

The novel sand blast machine featured in this invention comprises a tank 12 adapted to contain sand 13, such as is usually employed in connection with machines of this kind.

The tank 12 is supported upon legs 14 secured thereto by such means as welding. A filler opening and cap 15 is provided in the upper portion of the tank for the introduction of the sand.

5 A sand outlet 16 is provided in the bottom of the tank 12 and is surrounded by a flange 17 to which is secured an air and sand mixing device comprising a casing 18 secured there-
10 to by bolts 19. A passage 21 is provided in the upper portion of the casing 18 and terminates with an annular extension 22, having a flexible sleeve 23 mounted exteriorly thereof to provide an annular valve seat. A valve
15 24, also of flexible material, is secured to a member 25 fixedly mounted upon a shaft 26, rotatably mounted in bearings provided in the upper portion of the casing 18 as particularly shown in Figure 4. The valve seat
20 or sleeve 23 and the valve 24 are preferably of rubber, which has been found, in actual practice, to offer a greater resistance, than other materials, to the abrasive action of the sand in passing through the valve during the
25 operation of the apparatus.

A partition 27 is provided in the casing 18 immediately below the sand valve to form an air and sand mixing chamber 28 in the lower portion of the casing 18, as shown in Figures 3 and 4. An orifice 29 establishes communication between the valve chamber and the mixing chamber 28. One side of the casing 18 has a cover 31 removably secured there-
30 to whereby access may be had to the interior of the valve chamber and mixing chamber for cleaning and other purposes.

The mixing chamber 28 is provided with a flanged extension 32 having a bushing 33 removably mounted therein as shown in Figure 4. This bushing is provided with a tapered bore 34 which functions to guide the mixture of sand and air from the chamber 28 into a nipple 35 secured to the flanged extension 32 by means of a ring 36 and bolts 37.
40 This bushing also protects the casing against wear. The nipple 35 is preferably provided with an enlarged head 38 having a threaded engagement with the ring 36. The usual operating hose 39 has one end secured to the
45 nipple 35 and the usual nozzle 41 mounted in the opposite end thereof. This nozzle, of course, is interchangeable depending upon the type of work being performed.

The sand valve 24 is controlled by means
55 of a lever 42 terminally secured to the shaft 26, and having a lock screw 43 mounted in the upper portion thereof adapted to engage a quadrant 44 to lock the lever in its adjusted positions. By the manipulation of
60 the lever 42, the supply of sand to the mixing chamber 28 may be controlled, and, if desired, the flow of sand from the tank 12 may be completely cut off by moving the valve into closing position.

65 Air is supplied to the mixing chamber 28

through a pipe 45 having its upper end connected to an air control valve 46 shown in Figures 1, 5 and 6. A valve 40, of ordinary construction, is interposed in the pipe 45 whereby communication may be cut off be-
70 tween the mixing chamber and air control valve.

The air valve is shown in detail in Figures 5 and 6. It will be noted by reference to these figures, that the air pipe 45 is connected to the
75 base 47 of the valve 46. A pipe 48 also has one end connected to the base 47 of the air valve, and has its other end connected to the upper portion of the sand tank 12, as indicated at 49 in Figure 1. The upper portion
80 51 of the air valve is secured to the base 47 by means of bolts 52, and provides an air chamber 53 having an air supply pipe 54 leading therefrom to an air drier which will subsequently be described. A slide 55 is
85 mounted within the air chamber 53 and functions to open and close the ports 56, 57 and 58, communicating respectively with the pipes 45, 48 and 59, the latter being the exhaust of the valve, as shown in Figure 5. A
90 passage 61 is provided in the slide 55 adapted to be moved into registration with the port 57, when the valve is in operative position. When thus positioned, it will be noted that the exhaust port 58 will be closed. A recess
95 62 is also provided in the slide 55 adapted to bridge the ports 57 and 58 when the slide is positioned as shown in Figure 6. When thus positioned, the supply of air from the chamber 53 will be cut off from the pipes 45 and 48,
100 and the air confined within the pipe 48, and therefore the tank 12, will be exhausted to the atmosphere, as indicated by the arrows in Figure 6. The slide valve 55 is retained upon its seat upon the upper face of the base
105 47 by the air pressure in the valve chamber 53.

The means provided for actuating the slide valve 55 consists of an operating lever 63 terminally secured to a shaft 64 mounted
110 in bearings provided in the upper portion 51 of the valve as shown in Figures 5 and 6. A depending arm 65 is secured to the shaft 64 and has its lower end engaging the slide valve 55, whereby actuation of the arm 65
115 will cause the slide valve 55 to be reciprocated upon its seat as shown in Figures 5 and 6.

A feature of this invention resides in the novel means provided for thoroughly drying the air and removing all moisture therefrom
120 before being delivered to the sand and air mixing chamber 28. Such means preferably consists in the provision of an air drying tank 66 having a connection with the air valve 46 by means of the pipe 54, connected to the
125 upper wall thereof as shown in Figure 7. The drier tank 66 has a connection with a source of air supply through a pipe 67 having a shut-off valve 68 interposed therein, as shown in Figure 1. A flanged opening 69
130

is provided in the upper wall of the tank 66, and has a threaded plug 71 mounted therein in which one end of the air supply pipe 67 is secured as shown. A cylindrical member 72 is secured to the plug 71 and depends into the drier tank 66 to approximately one-half the length of the tank. A nipple 73 of substantially the same diameter as the supply pipe 67, is also secured to the plug 71 preferably in axial alignment with the pipe 67 and cylindrical member 72, thus providing an annular space 74 between the nipple 73 and the wall of the member 72. Portions of the nipple 73 are cut away intermediate its ends, and within the cylindrical member 72, as indicated at 75—75. A perforated plate or sleeve 76 is mounted upon the exterior of the nipple 73 to cover the cutaway portions 75 as particularly shown in Figures 8 and 9. This perforated plate or sleeve 76 may be secured to the nipple by screws 77. A cap 78 is provided upon the lower end of the nipple 73 to restrict the passage of air therethrough. A small duct 79, however, is provided therein to permit water, tending to accumulate therein from condensation, to be precipitated into the bottom of the drier tank as shown in Figure 7. A pressure gauge 81 is preferably mounted in the upper wall of the drier tank to indicate the pressure therein.

In the operation of this novel sand blasting machine, the air control lever 63 may be moved from the position shown in Figure 6 to that shown in Figure 5, wherein it will be noted that the supply of air from the pipe 54 will flow through the chamber 53 and into the pipes 45 and 48. Circulation through the pipe 48, however, will be substantially interrupted as soon as the pressure in the upper portion of the sand tank 12 reaches the pressure in the air chamber 53. Air circulation through the pipe 45 however, will continue as long as the slide 55 of the air valve is in the position shown in Figure 5, thereby delivering air under pressure to the sand and air mixing chamber 28 with the resultant blowing of the sand therefrom into the hose 39, and through the discharge nozzle 41. During the initial operation of the apparatus, the sand control valve 24 will be regulated by means of the lever 42 until the proper mixture of sand and air is obtained, after which the lever 42 may be locked in such position by means of the lock screw 43, and thereafter the entire operation of the machine will be controlled by manipulation of the air control lever 63.

When the apparatus is inactive, as shown in Figure 3, the sand will pile up in the mixing chamber 28 in the form of a cone, thereby interrupting the flow of sand from the tank 12 without closing the valve 24, and also preventing the sand from entering the nipple 35, and therefore the hose 39, with its attendant troubles, such as obstructing the passage

therethrough. As soon as the air control valve is initially moved into operative position, the flow of air from the pipe 45 into the mixing chamber 28 will be comparatively slow as a result of the accumulation of sand in the hose 39, caused by the mixture of sand and air remaining therein when the supply of air to the mixing chamber 28 was cut off. Upon the initial starting of the apparatus, however, the pressure built up in the hose 39 will cause the sand accumulated therein to be blown therefrom, after which the velocity of the air from the pipe 45 through the chamber 28 will increase to the extent that the column of air passing through the chamber 28, will remove the upper portion of the sand cone disposed therein, after which a constant mixture of sand and air will be delivered to the hose 39, depending upon the position of the sand valve 24. Therefore, when the apparatus is inactive a quantity of sand will remain in the bottom of the mixing chamber 28 as indicated by the dotted lines in Figure 4. The shape of the mixing chamber 28 is such as to provide ample passage for the air around the sand cone disposed therein upon initial starting of the apparatus, as clearly shown in Figure 3.

The function of the drying tank 66 is to thoroughly dry the air and remove all moisture therefrom before being delivered to the mixing chamber 28, as hereinbefore stated. The air delivered to the drier tank 66 from the pipe 67 is discharged into the nipple 73 under pressure from a compressor or other suitable source of air supply under pressure. From the nipple 73 it is discharged through the small orifices in the perforated plate 76, and into the annular space 74 between the nipple and the cylindrical member 72. As it is discharged from the nipple, it impinges against the wall of the member 72 and expands and cools, and any moisture contained therein will be precipitated to the bottom of the tank, as clearly shown in Figure 7. Any moisture accumulating in the lower end of the nipple 73 will be discharged through the orifice 79 into the bottom of the tank as also shown in this figure. From the tank 66, the air is delivered through the pipe 54 to the air chamber 53 provided in the air control valve, shown in Figures 5 and 6. Thus all air delivered to the air valve 46 will be thoroughly dried before entering the chamber 53. A drain cock 80 is provided in the lower wall of the drier tank 66 whereby the water accumulating therein may be drained therefrom.

A clean-out plug 82 is preferably provided in the casing 18 of the sand valve 24 as shown in Figure 3. By the removal of this plug, sand accumulating in the discharge passage 16 of the tank, may readily be dislodged therefrom by the insertion of a rod or suitable instrument through the filler opening

provided at the upper end of the sand tank.

The general construction and arrangement of the parts of this novel sand blasting machine is such that it will readily lend itself for use for practically all kinds of sand blasting. It is operable by means of a single control lever, and by means of the sand valve 24, the flow of sand from the tank 12 to the mixing chamber 28 may readily be controlled to obtain the proper mixture of sand and air for various kinds of work. After the sand valve has been adjusted to produce the proper mixture for a given work, the lever 42 of the sand valve may be locked in such adjusted position by means of the lock screw 43, after which it will only be necessary to operate the air control valve lever 63. The construction of the air valve is such that the mixture of sand and air, discharged from the nozzle 41 of the hose 39, may be used for work ranging from light frosting to deep lettering.

In Figures 10 and 11, there is shown a drier tank nipple of modified construction. This nipple is composed of a series of circular members 83, each having a central hub 84 supported by arms 85 as shown in Figure 11. The upper section 86 has a cylindrical extension 87 terminally threaded whereby it may be secured to the plug 71 in a manner similar to the nipple 73. The lower terminal section 88 of the device functions as a cap and has a small orifice 89 therein through which water accumulating therein may be precipitated into the lower portion of the tank in a manner similar to that shown and described with reference to Figure 7. The hubs 84 of the members 83 and sections 86 and 88 are apertured to receive a tie rod 90 whereby the sections may be securely tied together as shown in Figure 10. The hubs 84 of the various members are of such lengths as to slightly space the members apart, thereby providing annular gaps therebetween through which the air under pressure is discharged therefrom into the relatively larger cylindrical member 72.

The opening 29 is only completely filled with sand at the time that the valve 24 is fully opened, and this service is only required for a mild cutting action, as for tracing or frosting on glass. For hard cutting action, the valve 24 is only partly opened so that only a small amount of sand is draining through the opening 29. During the blasting operation, the sand is practically removed from the chamber, as fast as delivered. No pile of any substantial size is therefore being formed at this time. When air supply to the mixing chamber is shut off, the sand continues to pass through the valve 24 and opening 29 thus forming a frusto-conical pile in chamber 28 as shown in Figure 3. When the air is again turned on the hose 35 may be obstructed, and it is therefore necessary to remove that obstruction before the proper

sand blast operation can be effected. In order to remove the obstruction in the hose 35, the air pressure can be built up (in the chamber around the sand pile) to discharge all of the accumulated sand in the hose before more sand from the pile enters the hose. When the obstruction is removed, the air has a free flow under full velocity across the pile, and by a whisking action; beginning substantially at the top of the pile, gradually removes the sand as fast as delivered. Therefore, the sand cone is only fully formed when air blast is shut off in pipe 45.

It is necessary, in order to obtain full pressure of the compressed air in or across the mixing chamber, that the pipe 45 be of ample size to avoid frictional losses of the air. It will be noted that the top of the opening of pipe 45 is approximately at the level of the bottom edge of the opening 29. It is important that the air does not strike the extension through which the opening 29 passes, because the velocity of the air would be considerably reduced. Moreover, the cross-sectional area of the pipe 45 is considerably less than the corresponding area of the sand pile, the apex of which pile is opposed to it.

The valve is never shut when machine operation is discontinued. The result is that after the machine stops operating the cone of sand is formed.

In the event that the hose 35 is unobstructed by sand, then the air flows directly from pipe 45 to the hose 35 and first whisks away the sand which had been formed in a cone at the last stopping of the machine. It is very important in order to prevent the loss of available force in the air that the air has a direct flow from the pipe 45 to the hose 35. It is also important that the air meet with no obstruction when starting. It is for this reason that the pipe 45 is positioned near the top of the sand cone. It would be objectionable to position the pipe 45 at the bottom of the sand cone on account of the greater resistance in forcing the air through the thick body of sand. Therefore, experience has taught that if after the formation of a cone, the air is turned on and is directed to the middle or to the bottom of the pile, there is more tendency for the hose 35 to plug. Therefore, herein the air is caused to act directly principally at the top portion of the cone, instead of at some lower level. By application of the air near the apex of the cone, the pile is gradually reduced beginning at its point of smallest thickness downwardly until eventually the sand is nearly cleared out. Really, then, the reason for applying the air near the top of the cone, relates only to the condition where we have had a normal shutdown and where we are starting again. It gives the quickest get-away to the nozzle.

The cross-sectional area of the nozzle is

less than that of the pipes 35—39. It is for this reason that it is very important not to deliver sand in excess at the beginning when the cone is broken due to the initial introduction of air, because the air is at that time carrying away part of the sand of the cone, and part of the sand is being delivered through opening 29, and thus there is a small surcharge delivery of sand. However, as the operation proceeds the cone of sand is gradually removed.

In initially removing the sand by directing the blast at the bottom of the pile, it takes more time to remove the surplus, while when the blast is directed at the top of the cone, the action at the nozzle is quicker because of the smaller quantity being taken off of the accumulated pile. There is a time period between the starting of the apparatus, and normal running. By normal running is meant the highest efficiency of blast. There is a sacrifice in blast while the surplus sand is being removed, and this sacrifice is less as a matter of fact when the air is applied at substantially the thinnest portion of the pile. In all other types of machines known to me, it is necessary to shut off the supply of sand before turning on the air in order to clean out the mixing chamber 28.

I claim as my invention:

1. A sand tank, a valve casing attached to the tank and having an upper valve chamber and a lower mixing chamber, and passages respectively establishing communication between the tank and valve chamber, and valve and mixing chambers, a pipe line communicating across the mixing chamber beneath the latter passage at a level intermediate the top and bottom of the chamber, a valve in the upper chamber adapted to close the first mentioned passage, both chambers being open at one side, and a plate removably closing the chambers and allowing simultaneous access to both, when removed.

2. A sand tank having a valve casing having an upper valve chamber, and a lower mixing chamber, passages respectively establishing communication between the tank and valve chamber and valve and mixing chamber, a valve in the upper chamber adapted to close the first mentioned passage, both chambers being open at one side, and a plate removably closing the chambers and allowing simultaneous access to both, when removed.

3. A sand tank having a circular outlet opening at its bottom, a valve chamber into which said opening delivers, a tubular valve seat of rubber in said valve chamber forming an extension of said opening, a swinging semi-spherical rubber valve having its spherical side cooperative with said tubular seat to control sand flow, a mixing chamber directly below the valve chamber, said chamber having a nozzle passage leading horizontally therefrom, and having a compressed air pas-

sage horizontally leading into said chamber, and aligned with said nozzle passage, a vertical opening below the valve establishing communication between the valve chamber and the mixing chamber to form a sand cone in the mixing chamber in line with the passages, the size of the mixing chamber being such that air currents may pass either through the cone or on each side of it during movement towards the nozzle passage.

In witness whereof, I have hereunto set my hand this 19th day of July 1926.

RICHARD RUEMELIN.