April 23, 1929. F. J. HULL 1,710,168

SAND BLAST ABRASIVE RECLAIMING AND MIXING

Filed April 1, 1926 5 Sheets-Sheet 1

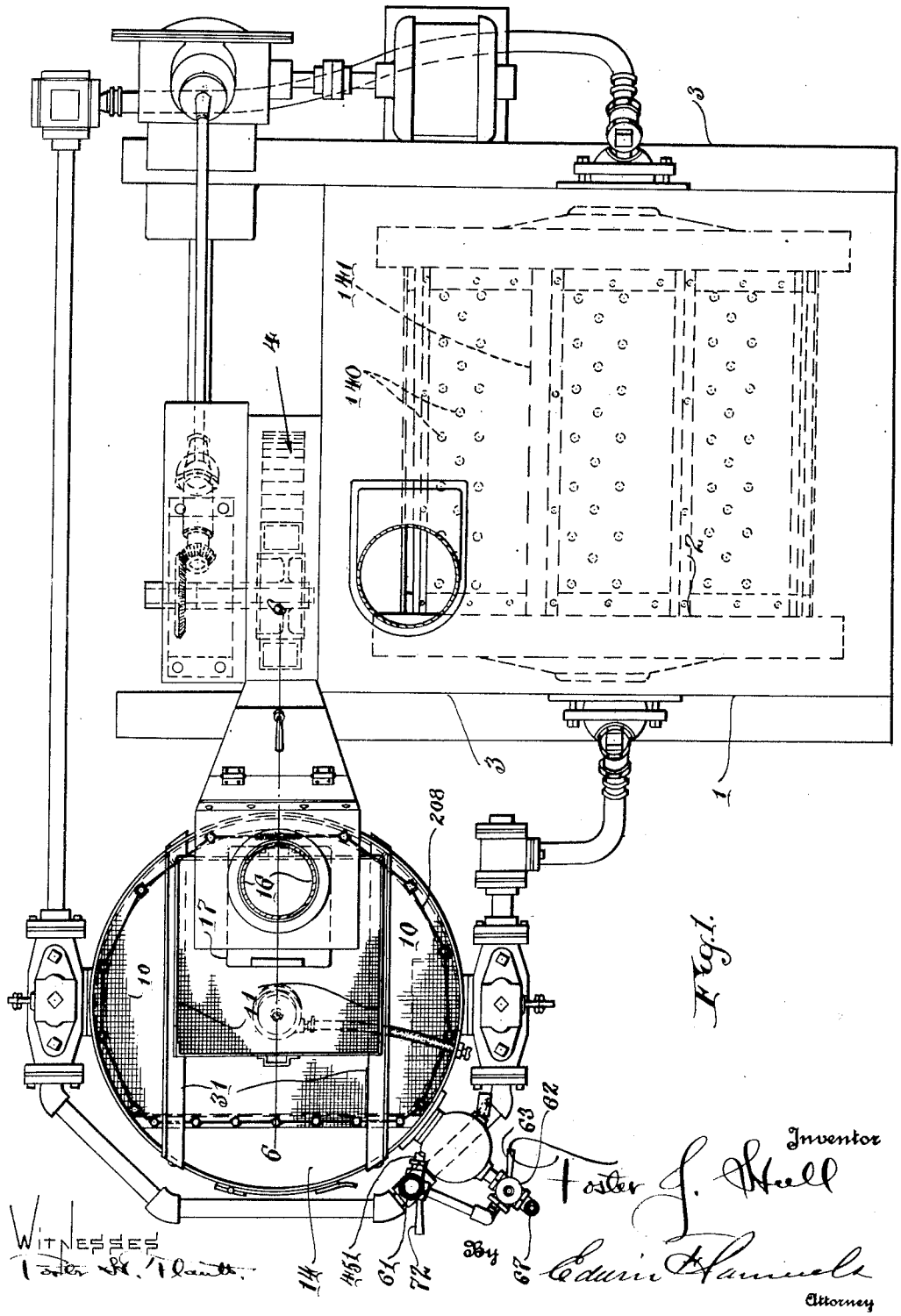


Fig. 1.

Witnesses

Inventor
Foster J. Hull

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April 23, 1929. F. J. HULL 1,710,168

SAND BLAST ABRASIVE RECLAIMING AND MIXING

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Fig. 7.

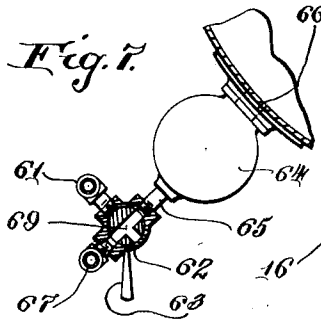


Fig. 2.

Witnesses:

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April 23, 1929. F. J. HULL 1,710,168

SAND BLAST ABRASIVE RECLAIMING AND MIXING

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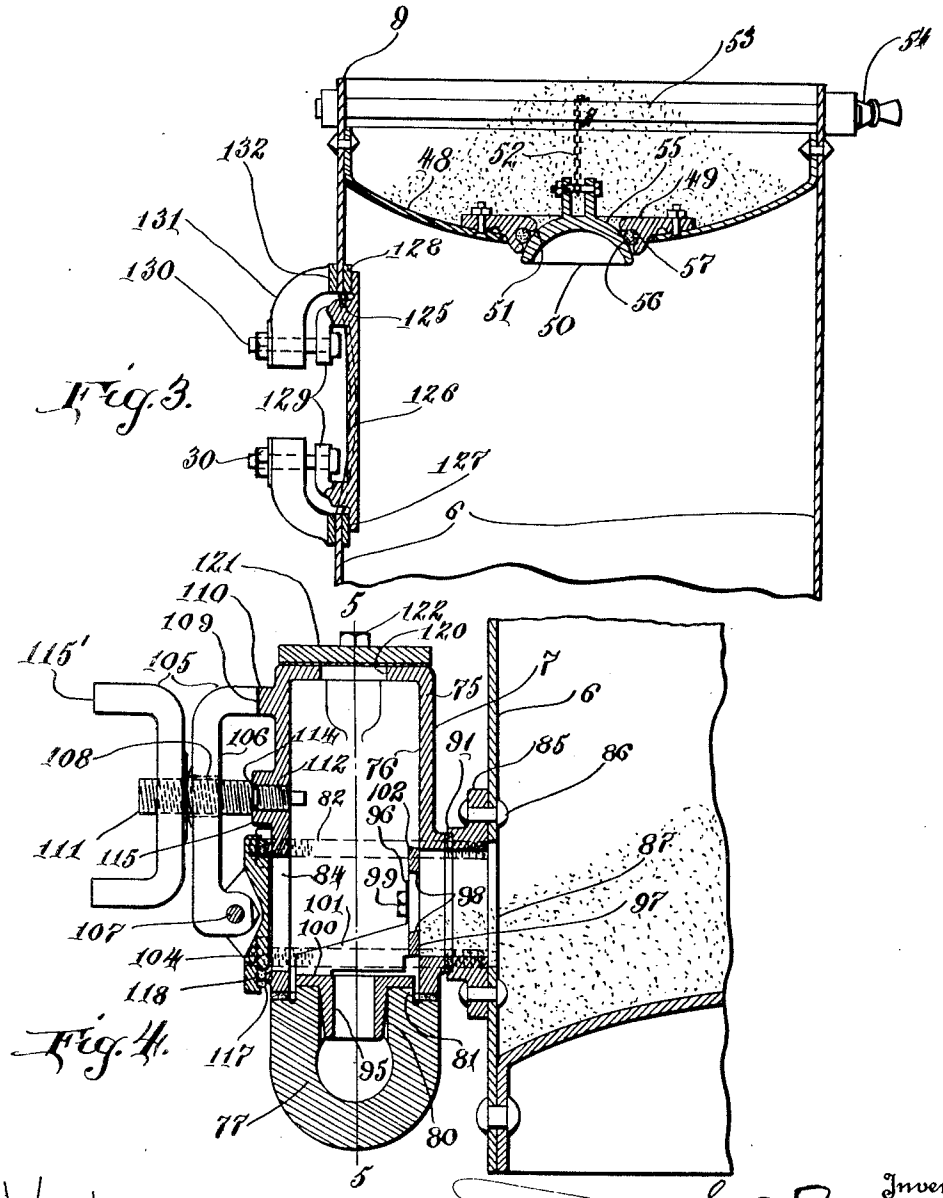


Fig. 3.

Fig. 4.

Witnesses.

Inventor

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April 23, 1929. F. J. HULL 1,710,168

SAND BLAST ABRASIVE RECLAIMING AND MIXING

Filed April 1, 1926 5 Sheets-Sheet 4

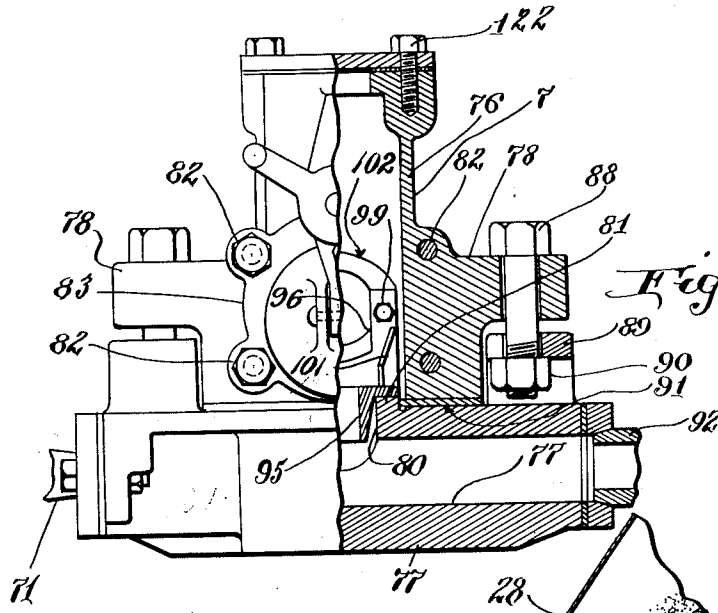


Fig. 5.

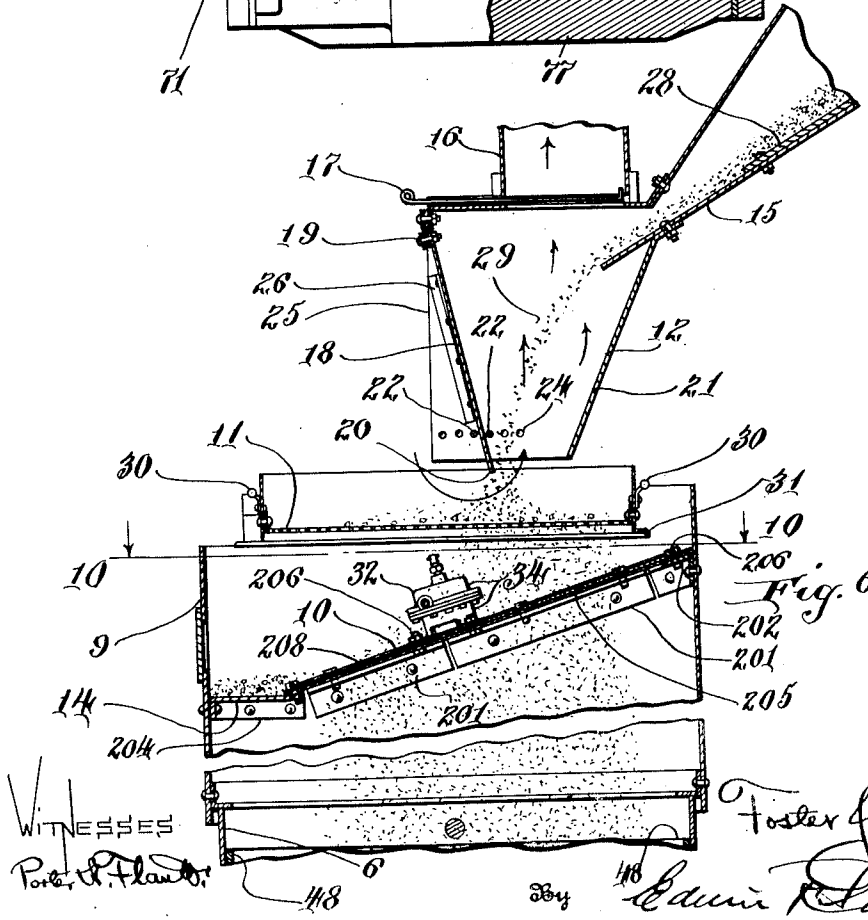


Fig. 6.

Witnesses

Inventor

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April 23, 1929. F. J. HULL 1,710,168

SAND BLAST ABRASIVE RECLAIMING AND MIXING

Filed April 1, 1926 5 Sheets-Sheet 5

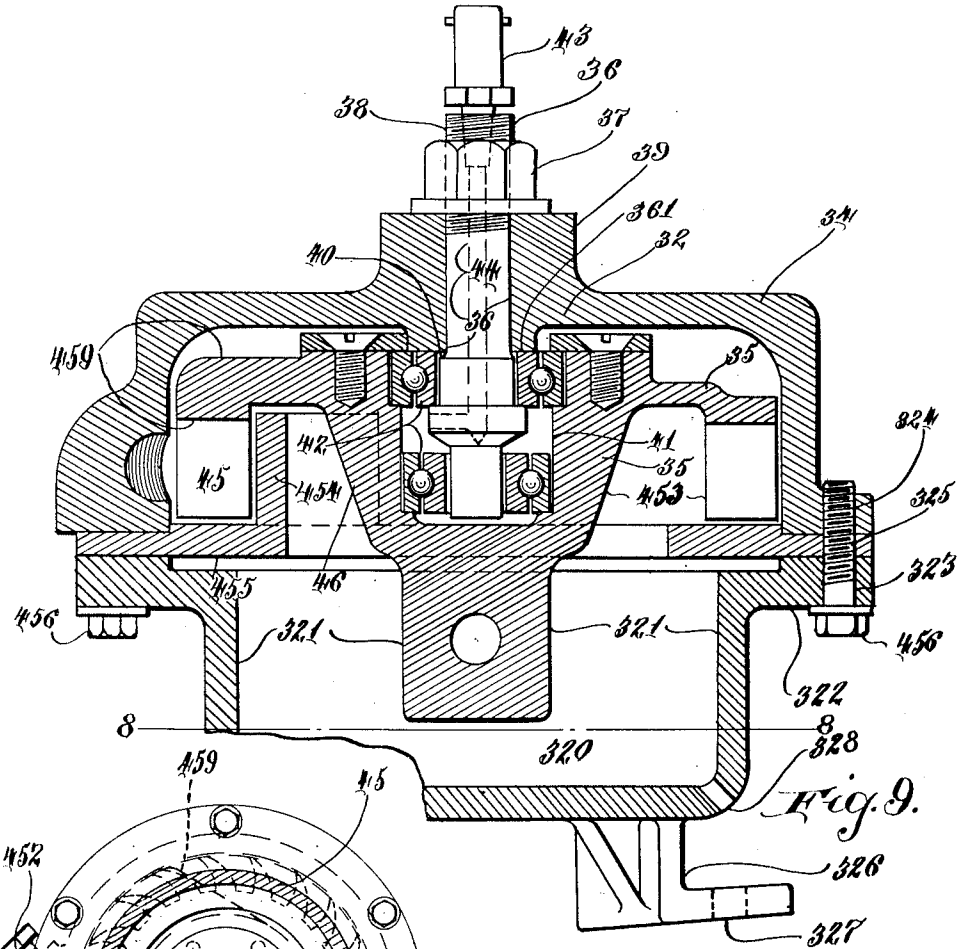


Fig. 9.

Fig. 8.

Witnesses

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Patented Apr. 23, 1929. 1,710,168

UNITED STATES PATENT OFFICE.

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SAND-BLAST ABRASIVE RECLAIMING AND MIXING.

Application filed April 1, 1926. Serial No. 98,977.

In the operation of the sand blast barrel machine the sand blast or abrasive stream consisting of a jet of air and particles of abrasive, either sand or steel or other convenient abrasive propelled by the air, enters the rotating barrel at the center of the axial ends, the barrel being a little less than half full of castings or other articles to be treated or cleaned by means of the abrasive. The abrasive particles are projected against the surface of the load and the slow rotation of the barrel serves to shift the load and the individual castings or other articles and to turn them so that the castings and their various surfaces are exposed in turn to the abrasive stream.

The used abrasive is dropped from the barrel and removed by a conveyor or elevator and discharged by means of a gravity chute, or other suitable means, reclaimed and reintroduced by way of the blast.

The present invention relates to the apparatus for cleaning the abrasive, which has been used in the sand blast barrel as above described or in any other sand blasting operation. The function of the machine is to separate from the abrasive the fine particles or dust, which, on account of their small mass do not take on the momentum necessary to effective blasting and serve to cushion and reduce the impact of the abrasive particles thereby interfering with the abrasive action. The apparatus also separates the dirt and large particles, as nails and pieces of slag, burned molding and core sand, refuse and the like which are discharged with the abrasive and which would interfere with the action of the apparatus, clogging the feed openings, thimbles, nozzle and hose.

The application also relates to the means for retaining the cleaned abrasive and feeding it to the tank and also to the means for feeding the abrasive to the air blast or mixing it therewith before it is led to the nozzle, and to other details of the air blast control and tank, including means whereby the abrasive stream is determined and controlled by means of the air valves and to the convenient arrangement and interchangeability of certain parts subject to excessive wear.

In the accompanying drawing I have illustrated diagrammatically a sand blast apparatus equipped with a tank and other appliances embodying the features of my invention, and I have also illustrated in detail the various features and details of this apparatus.

In the drawing:

Figure 1 is a plan of the sand blast barrel machine and tank with connections adapted for operation in accordance with the invention.

Figure 2 is an elevation of the tank and connections, also showing the adjacent portion of the sand blast barrel machine.

Figure 3 is a section on the line 3—3 of Figure 2, showing the upper portion of the tank, filling valve and actuating means and manhole.

Figure 4 is a section on the line 4—4 of Figure 2 showing the sand blast tank fragmentarily and a mixing chamber and sand line.

Figure 5 is a view of the mixing chamber, etc., looking from the left in Figure 4, the right hand side of Figure 5 being broken away to show a section on the line 5—5 of Figure 4.

Figure 6 is a section on the line 6—6 of Figure 1 showing the abrasive separator and cleaner.

Figure 7 is a sectional plan on line 7—7 of Figure 2.

Figure 8 is a section through the vibrator turbine on line 8—8 of Figure 9; and

Figure 9 is a section on the line 9—9 of Figure 8.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the apparatus as shown comprises a sand blast barrel machine 1 having a rotary barrel 2, casing 3, elevator 4 and nozzle 5 for directing the blast into the barrel. The invention relates particularly to sand blast tank 6, having mixing chambers 7 and storage bin 9 over the tank, and to the air pressure means for propelling and controlling the abrasive stream. In the form of the invention shown the storage bin encloses a safety screen 10 and is provided with a pan screen or equivalent device

11 above the safety screen. Over the screen is the separator 12, to which the abrasive and other materials discharged from the barrel and raised by the elevator are delivered by elevator spout 15.

Having more particular reference to the details of the apparatus, the ventilating air, i. e., air from the outside, is drawn through the separator 12 by means of a blower 13 or any suitable draft apparatus, which in the form of the apparatus illustrated creates an upward draft in and through the pipe 16 leading upward from the top of the separator 12. The draft through the pipe 16 may be regulated by a damper 17, and the draft through the separator, which is shown as a funnel shaped member with the reduced end turned downward, is primarily regulated and controlled by a flap or valve 18 in the nature of a side wall member pivoted or hinged at the top 19 so that the bottom edge 20 swings laterally toward and from the opposite side wall 21 of the separator, the valve or swinging member 18 being opposite the spout 15. In the form of the invention shown the flap or valve 18 is supported in adjusted position by means of pins 22 seated in two holes of a series of holes 24 arranged in a horizontal line and formed in the side wall 25 of the separator at the bottom, the pins 22 being placed one on each side of the swinging member 18 for this purpose.

The valve 18 is preferably provided at each side with rubber flaps 26, which bear against the adjacent sides 25 of the separator casing improving the draft by cutting down the leakage of air into the slight vacuum maintained in the separator during operation. The chute or spout 15 is also preferably provided with a wear plate 28, which is secured to the floor of the chute at the point where the material is delivered thereto from the elevator reducing the wear on the spout or chute floor at this point due to the impact of the abrasive materials and dust.

The angle of the chute is preferably so determined as to cause the discharged material to cross the separator casing in a thin flat stream as it falls, the stream of abrasive and other materials being indicated at 29 in Figure 6, so that the air draft passes upward through a curtain of falling abrasive, dirt and dust, the dust, on account of the fine particles of which it is composed being much more easily supported by air friction, is borne upward by the air draft, the course of the heavier abrasive particles and also the heavier particles of dirt not being perceptibly affected.

The draft is regulated by means of the damper 17 and the flap or valve 18 to give the most effective cleaning which can be accomplished under the conditions presented as to draft creating means, power available, etc. The good abrasive and the coarse refuse drop to the screen 11, which in the form shown is a removable pan screen preferably having handles 30 at each side. This screen is removed by the operator at suitable intervals when little or no material is coming through, the débris being dumped in a convenient receptacle. The pan screen prevents undue accumulation of débris, the bulk of which is removed in this way, but it is a comparatively coarse screen which drops the abrasive without retaining any portion of it. The pan screen is supported on a suitable frame 31 at the top of the bin 9. The pan screen normally retains all material that could clog the nozzles.

Below the pan screen the entire cross section of the bin 9 is closed by an inclined screen 10 and its waste receptacle 14. This screen catches any large particles which may overflow or otherwise pass the pan screen and prevents clogging of the nozzle. This is known as the safety screen. To facilitate the passage of the abrasive through the screen, the latter is vibrated by suitable means, the vibrator indicated by reference character 32, being a turbine actuated by a stream of air from the air pressure line, though any fluid stream may be used for this purpose. The details of the vibrator are illustrated in Figures 8 and 9 and it is shown in its relation to the bin, etc., in Figure 6.

In the form of the invention shown the vibrator turbine consists of a casing 34 secured to the screen and containing wheel 35 mounted to rotate about a central stud 36 held by a nut 37 engaging the thread 38 on the stud and turned up against the boss 39 at the center of the casing in which the stud is seated, the stud having a shoulder 40 which bears at the inside of the casing against inside boss 361. Beyond the shoulder 40 the stud projects into the bearing cavity 41 in the hub 46 of wheel 35 where it is, in the form of the invention shown, provided with two sets of ball bearings 42 by which the wheel is mounted on the stud, the bearings being spaced apart, and lubricated by way of the stud which, as shown, is provided with a well known type of commercial fitting 43 and grease passage 44 leading therefrom to the interior of the bearing.

The wheel is provided with buckets or more properly, impact vanes 45, against which a jet of compressed air led from pipe 61 by way of pipe 451 to the casing is projected through the intake passage or nozzle 452. The buckets or vanes discharge inwardly toward the center of the turbine into the circular exhaust passage 453 and the vanes immediately adjacent to the intake where the impact is received are encased or enclosed as to the discharge ends by segmental wall 454 extending from the intake forward in the direction of rotation through an arc of about 60 degrees and the vanes are curved backwardly to al-

ways present a surface at right angles to the jet. The exact extent of this wall is immaterial, the object being to hold the pressure of the jet on the vanes for a sufficient period to impart the velocity of the jet to the wheel or as much thereof as can be utilized. The segmental wall 454 is carried by and, as shown, formed integrally with plate ring 455.

The casing 32 of the turbine is, in the form of the invention shown, provided with a base 320 which closes the central cavity 453 from below, the base having for this purpose a central chamber 321, which with the cavity 453 forms the exhaust passage. It also has a peripheral flange 322 pierced by holes 323 which register with the holes 324 in the casing flange and 325 in the plate 455, the three members, i. e., the casing, the plate and the base being fastened together by bolts 456. The exhaust air or other fluid is released from the casing by a small opening 328. In the form of the invention shown the vibrator stands upright and, as shown in Figure 9, on top of the screen at or near the center, the base being for this purpose provided with downwardly projecting feet 326, having bolt holes 327 through which are passed any suitable bolts to fasten the vibrator to the screen. By enclosing the turbine as described it is completely protected from the dust and grit in the bin which would have a very harmful effect.

The vibratory effect is obtained or enhanced in the form of vibrator shown by the eccentric weighting of the wheel whereby the center of gravity of the wheel is displaced from the axis, the eccentric weighting in the form shown consists in the increased thickness of the wheel on one side at 459, the weighted portion, as shown, extending along the periphery above the brackets and inwardly to the hub 46 as indicated by dotted lines in Figure 8, however, the vibratory effect may be obtained in any suitable and convenient manner by any type of eccentrically weighted rotary member or structure.

The screen 10 is mounted on angles 201 secured to the inside of the bin walls and having flanges 202 projecting inwardly. These angles, as shown, are made in separate segments for convenience of manufacture and to avoid undue rigidity. In order to cause the abrasive and other materials to move downwardly and clear the screen the latter is inclined to the horizontal at an angle of 15 or 20 degrees, or any preferred angle, and is provided at the bottom with a flat receptacle 14 to catch the coarser materials which are separated by the screen. This receptacle is shown in the form of a flat plate having depending flange 204 at its edge, which is secured to the bin wall. The screen 10, as already outlined, is a safety screen intended to eliminate any chance that the coarse material may pass the screens and enter and clog the nozzles. It is, therefore, so constructed and arranged that with the receptacle 14 it closes the entire cross section of the bin so that it sifts all the abrasive which passes the pan screen and catches any coarser particles which may in any way be dropped from the pan screen or which may pass on account of the pan screen being left out or held out when the machine is operated.

In order that the safety screen may withstand the vibratory action referred to without unduly shortening its life, it is flexibly mounted and the flexible mounting in the form described consists of a felt padding strip 205 between the flange 202 of the angle irons and the screen, the latter being held by bolts 206 passing through the edges of the screen and seated in the flange 202, the bolts being left comparatively loose and locked to prevent turning, the locking being accomplished by means of a wire 208 threaded through suitable apertures in the bolt heads. The wire as shown, may pass around the entire circumference of the bin and be joined at the ends. The edge of the screen adjacent receptacle 14 is secured to the latter in the same manner as to the angle irons.

The vibratory action produced is noiseless and very efficient in operation, giving an effect very much like the rotary rocking of a plate settling down on a flat surface after being spun.

From the safety screen 10 the cleaned abrasive drops on the floor 48 of the bin 9, which, as shown, is to the best advantage centrally depressed or concave as seen from above and provided at the center with an opening surrounded by a valve seat 49. Filling valve 50 cooperates with and closes the opening 51 in the valve seat. The depression of the bin floor serves to lead the abrasive which is dropped from the screen 10 to the floor 48 toward the center of the bin where it is discharged through and by way of the filler valve opening 51 into the tank 6 known as the sand blast tank.

The filling valve 50, in the preferred form, opens downwardly and is suspended by means of a chain 52 from the valve shaft 53 which, as shown, is mounted to rotate or rock, rolling the chain about the shaft and unrolling it to raise and lower the valve. The shaft is supported in suitable openings or bearings in the walls of the bin 9 across which, as shown, it extends diametrically. A handle or operating lever 54 is secured to the shaft 53 at one end on the outside of the bin and projects outward radially from the shaft. The valve opens by gravity, being opened or closed by a single movement of the hand lever in the corresponding directions. As shown, the valve 50 is of the mushroom type, being in the form of a semi-spherical bowl, the hollow of the bowl being turned downwardly and the outer curved surface 55 serving to engage the valve seat which, as shown, is packed or padded by

means of a rubber ring 56 seated in a groove 57 in the seat. The mushroom formation of the valve causes it to present when closed a greater surface downwardly toward the tank than it presents upwardly toward the bin, so that the pressure in the tank holds it in tightly closed position, and further the spherical contacting or seating surface of the valve dispenses with the necessity for accurate guiding of the valve to its seat, as the valve effects a tight closure whether its axis be alined with the axis of the opening or the valve be tipped or cocked in either direction. The valve is but slightly opened to release the abrasive which flows downward by gravity from the bin to the tank to be mixed or combined with the abrasive stream as hereinafter described.

To permit the filling valve to open by gravity the air pressure must, of course, be first released from the tank 6 and the air pressure which holds the valve 50 closed prevents opening of the valve when the tank contains air under pressure, which would result in blowing the abrasive from the valve opening 51. This release of pressure is accomplished almost automatically by the normal operation of the three way valve 62, to be described.

The sand blast tank 6 in the normal operation of the machine contains the immediate supply of abrasive being fed to the sand blast nozzles and during operation is filled with air under pressure to equalize the pressure in the hose and mixing chamber.

Air under pressure is supplied from any convenient source by way of air pipe 61, which is connected to a three way valve 62 controlled by hand lever 63, the three way valve being so arranged that in one position it admits air from the pipe 61 to the tank by way of the moisture and oil separator 64, the lead from the valve casing to the separator being indicated by reference character 65 and the connection from the separator to the tank by reference character 66. In the other position of the valve, in which the parts are shown in Figure 7, the air is released from the tank by way of the exhaust pipe 67. The compressed air pipe 61 is also led downwardly past three way valve 62 to the mixing chambers 7, one at each side of the machine, the compressed air pipe 61 terminating in a T 68 at the bottom from which the mixing chamber pipes 71 lead in both directions about the base of the tank to the said mixing chambers 7.

The flow of compressed air to the mixing chambers and hence the abrasive stream is controlled by the down pipe valve 72, which control of the abrasive stream by the air is regarded as an important improvement.

In operation before starting the blast the filling valve lever 54, as seen in Figure 3, is swung in left handed rotation toward the observer to admit abrasive to the tank and then reversed to the position shown to close the valve 50. The compressed air valve 72 in the down pipe is then opened to lead air to the sand line and the three way valve is next opened to allow the air to enter the tank from the compressed air pipe 61. To stop blasting the three way valve lever 63 is first thrown way over to exhaust position, connecting the tank to the exhaust pipe and the valve 72 is closed. When all the air has been exhausted from the tank any operation which requires opening of the tank or the barrel, or the barrel casing, as filling or emptying the barrel, admitting abrasive to the tank or repairing the tank, may be performed.

The abrasive for use during each period of operation of the machine, having been admitted by way of the filling valve 50, is contained in the storage tank, filling the bottom portion thereof, and the abrasive stream of air and abrasive particles is formed in and by means of mixing chambers 7. Each chamber comprises the main chamber 76 and the air and sand passage or sand line 77. The main chamber of each mixer, in the form of the invention shown, is an inverted T shaped casting which is provided with a central passage or chamber 76, which in the form shown is in upright position, and ears 78, one at each side by which the sand line 77 is secured to the main chamber. The sand line is in the form of a short tubular member having a lateral opening 80 intermediate of its length, the opening 80 being turned upward and registering with the lower end of the passage or chamber 76. The opening 80 is surrounded by a raised portion or boss 81 which projects into the passage or chamber 76. The mixing chamber 7 is secured to the side of the tank by four bolts 82, see Figure 5, which extend through a boss 83 on the outside of the mixing chamber surrounding the choke relief opening 84, to be described, the bolts being seated at their opposite ends in a collar 85, which is secured to the tank 6 by means of rivets 86. The collar 85 surrounds the sand feed opening 87 near the bottom of the tank, there being one such opening and one such mixing chamber on each side of the tank.

The air and sand passage or sand line member 77 is secured to the main chamber 76 by means of bolts 88 extending downwardly through the ears 78 of the T casting forming the chamber and also through ears 89 on the air and sand passage casting 77, the nuts 90 being affixed to the bolts 88 below the ears 89 whereby the sand passage casting 77 is drawn up against the bottom of the chamber. In order to provide and maintain an air tight connection, packing 91 may be introduced between the castings and also between the mixing chamber casting 76 and the collar or nipple 85 on the tank surrounding sand feed opening 87. The compressed air pipe 61—71 is connected

to the sand passage member 77 at one end, i. e., at the left in Figure 5, and the hose 92 is connected to said member at the other end, i. e., at the right in Figure 5, and the member 77, on account of the abrasive action of the stream of sand and air, being subject to comparative rapid wear and deterioration, is thus made capable of quick and convenient removal and replacement by merely disconnecting the air pipe 71 and the hose 92 and the bolts 88 whereby the sand line or air and sand passage is dropped and may be replaced.

An important feature of the invention resides in the means for regulating the supply of abrasive to correspond to the flow of air.

This is accomplished by means of the removable and interchangeable thimbles or bushings 95 by which the size of the opening 80 from the chamber 76 into the sand passage 77, the said opening or passage 80 being known as the sand supply passage or opening, may be varied to suit the conditions, the object being to vary and regulate the supply of abrasive to correspond to and be directly proportionate to the flow of air, which is determined by the compressed air supply available for the operation of the machine. The size of nozzle may, and for the best operation of the machine should be correspondingly varied. The hole in the reducer thimble should ordinarily be twice the diameter of the nozzle opening.

To this end a set of thimbles or bushings 95, each having a different size of opening, may be supplied for each mixing chamber, the bushings being all of an equal outside dimension so as to fit the opening 80. In the preferred form each bushing or thimble 95 is provided with a flange 100 at the top and is held in position by an L shaped frame or bracket 96 which fits in the chamber 76 as illustrated in Figures 4 and 5, the upright portion of the L resting against the upright side of the chamber toward the tank, said upright portion 97 in the form of the invention shown covering and projecting on each side of the passage 87 which leads from the tank to the chamber and having therein an opening 98 of a size equal to or corresponding to the opening in the bushing. The upright 97 of the L shaped bracket 96 is secured to the wall of the chamber by means of cap screws or bolts 99 and is, in the form of the invention shown, provided at the sides with base arms or feet 101, which, as shown, project forwardly over and in contact with the flange 100 of the thimble 95. The L shaped bracket 96 may be separate from the apertured plate 102 which covers the opening 87, and the arms 101 of the bracket may be of thin plate spring material so that they can be flexed laterally to release the thimble.

To provide for access to the chamber to renew, change and replace the thimbles and to clear the passages 87 and 95 in case they become choked, a choke relief opening 84 is provided directly opposite the abrasive feed opening 87 and hence opposite the bushing and bracket 95, 96. This choke relief opening 84 is normally closed by choke relief valve 104, which in the form shown is controlled by means of a spider clamp 105, the same consisting of a U shaped arm 106 pivotally connected at one end to the center of the valve at 107, having a central opening 108 and bearing at the other end at 109 on the mixing chamber wall which, in the form shown, is provided with a projection 110 to receive and support the arm. A screw threaded pin 111 is seated in the wall of the chamber as shown, having a threaded portion 112 engaged in a suitable threaded hole in the chamber and a shoulder 114 which engages a boss 115 on the wall of the chamber formed about said hole. The threaded pin 111 projects outwardly through the central opening 108 in the U shaped arm 106, which is preferably not threaded, and is engaged outside the U by a nut shown in the form of a wing 115' which when screwed up against the outside of the U shaped arm locks the valve 104 against the seat 117 which surrounds the opening 84 on the outside, the valve being as shown provided with suitable packing 118 which cooperates with the valve seat. The mixing chamber 76 is, as shown, also provided with a top opening 120 by which a suitable pin or other tool may be inserted to clear the sand drop opening 95 in case it becomes clogged. This opening is closed by a cap 121 which may be secured in any suitable manner, as by means of cap screws or bolts 122.

The sand blast tank is also shown as provided with a man hole or hand hole opening 125 to give access to the inside of the tank in inspecting or repairing the tank. On account of the area of this opening and cover, which latter when the tank is filled with air under pressure, must resist a very considerable thrust the manhole cover 126 is placed inside the tank so that the pressure forces it outwardly against the edges of the opening on which it bears as shown at 127, the contacting surfaces being preferably packed in any suitable maner as by means of packing ring 128. The manhole cover, as shown, is provided with ears 129 which are slotted to receive bolts 130 which extend outwardly therefrom and pass through bracket arms 131 projecting from the manhole bracket ring 132, which ring rests on the periphery of the opening on the outside.

In the operation of the machine the abrasive particles are, as described, projected against the surface of the load in the barrel, the slow rotation of the barrel serving to turn the individual castings so that their various surfaces are exposed to the abrasive

stream which is directed into the barrel at the centers of the axial ends. The abrasive is, during the operation of the machine, dropped from the barrel through the perforations 140 which are covered by shields 141 so that the flight of the particles is arrested permitting them to be dropped by gravity. The abrasive with the dirt from the castings, dust due to the operation, and other débris accumulates in the bottom of the machine whence it is removed by the elevator or conveyor 4 and discharged by way of the spout 15 into the separator 12, the incline of the spout being preferably such as to impart a certain horizontal momentum to the particles forming a thin wide stream or curtain 29 of the particles extending across the separator on a downward but rather flat curve.

An upward draft is provided by suitable means as a blower creating a suction by way of the pipe 16 leading from the top of the separator. The draft of air passes through the curtain of solid particles as illustrated by the arrows in Figure 6. The suction of the blower being for convenience treated as constant, the intensity of the draft is regulated by means of the flap 18 which determines the cross section of the separator and hence the velocity acquired by any given quantity of air drawn through the separator by the blower. The draft carries away the fine particles of dust which, on account of their size, cannot be made to have an effective abrasive action when carried by the blast and which on the contrary serve to cushion the abrasive particles and, therefore, interfere with the operation of sand blasting.

The pan screen 11 sifts the abrasive, passing the particles of normal and effective size and catches the large particles which might choke the mixing chamber passages, the air line, the hose or the nozzles. These particles are conveniently dumped from time to time by the operator, who removes and dumps the pan when the machine is stopped. The passage of the coarse particles which would choke the passages and which may in any way escape the pan, is arrested by the safety screen 10 which closes the entire cross section of the bin 9.

The safety screen is secured in position as described and is not intended to be removed other than for repairs or replacement. This screen is held and supported by separate segments of an angle iron, as illustrated, and is flexibly mounted so that it may to advantage be vibrated to facilitate the passage of abrasive. This may be accomplished by any suitable type of vibrator. In the form shown the vibrator is an air turbine 32 eccentrically weighted to produce the vibratory action. This is quieter, cheaper and more easily maintained than the reciprocating type.

In the form and arrangement of the invention as shown the bin 9 rests on top of the tank 6, being removable and held only by gravity. The floor 48 of the bin, which is more particularly the top of the tank 6, is centrally depressed as shown in Figure 3 to lead the screened abrasive toward the filling valve 50. The filling valve, as described, preferably has a spherical surface to facilitate closing and to prevent cocking. It opens downward by gravity permitting the abrasive to flow downward into the bottom of the tank, the valve being controlled by a handle 54 which raises it to closed position or lowers it, the valve being held in closed position by the air pressure in the tank.

Air under pressure is supplied by way of pipe 61 and is led by suitable connections directly to the sand lines of the mixing chambers 75 on each side of the machine whereby the abrasive is dropped into the stream of air as already described. The air passage to the sand lines is controlled by a valve 72. The pressure in the tank is equalized with the pressure in the sand lines and air passage and hose by means of air led from the pipe 61 to the tank by way of three way valve 62 and air dryer or moisture trap 64, which prevents the precipitation of moisture in the air tank and, therefore eliminates the difficulty due to damp abrasive, which would tend to clog the nozzles, cause loss of time and annoyance, considerable difficulty having been hitherto-fore experienced from damp abrasive due to moisture in the compressed air precipitated in the tank.

Three way valve 62 not only controls the admission of air from the compressed air line to the tank, but the release of pressure from the tank. The valve, as disclosed most clearly in Figure 7 serves in one position by means of the three way passages 69, to connect the pressure line 61 to and with the trap or moisture and oil separator, which is in turn connected at 66 directly to the tank. This equalizes the pressure in the tank with the pressure in the sand line, permitting the abrasive accumulated in the bottom of the tank to flow by gravity through the abrasive feed opening 87—98, and the thimble or abrasive flow control opening 95. In the other position the compressed air connection to the tank is cut off and the tank is connected for release of the air pressure in the tank by way of exhaust passage 67.

While the abrasive is fed by gravity to the sand line it is apparent that the flow of abrasive and the abrasive stream will stop when the air blast is cut off at the valve 72 and in ordinary operation may be started, stopped and controlled by the operation of the air valve 72.

The nipples 95 are chosen to correspond to the air pressure and supply available, as the rate of feed of the abrasive is determined in this way. The nipple may be changed as described after removing cover or valve 104.

The sand line which is also subject to comparatively rapid wear is also conveniently removed and replaced by removing the nuts 90 and dropping the sand line from the mixing chamber, likewise disconnecting the air passage at 71 at one end and the hose 92 at the other end. In case of choking of the nipple the cap 121 can be removed and the nipple cleaned by means of a suitable pin or tool and the sand openings 98—87 can be as conveniently cleaned by removing the choke relief valve 104, it being of course understood that when the mixing chamber or the tank is to be opened for any purpose the pressure is first released by turning the three way valve 62 to cut off the air pressure and connect the tank with the exhaust.

I have thus described specifically and in detail a single embodiment of my invention in order that the nature and operation of the same may be clearly understood, however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim and desire to secure by Letters Patent is:

1. The combination with a sand blast apparatus of a separator chamber having opposed openings and means for creating a draft of air through said openings, means for removing used abrasive from the machine and passing it through the chamber causing it to contact the air draft, the chamber having a flap swinging transversely to the air draft and means for securing said flap in a number of positions of adjustment providing for the regulation of the cross section of the chamber to determine the intensity of the air draft with a given supply of air.

2. The combination with a sand blast machine of a separator chamber, means for passing the used abrasive through the chamber, means for passing an air draft through the chamber and through the moving abrasive, an enclosure to receive the abrasive from the separator, a removable pan screen in the path of the abrasive, and a safety screen beneath the pan screen, the safety screen being secured to the walls of the enclosure closing the horizontal cross section of the enclosure.

3. The combination with a sand blast machine of a separator, means for projecting the used abrasive into the separator, means for passing an air draft through the separator and through the moving abrasive, a bin to receive reclaimed abrasive and a safety screen in the path of the abrasive, the safety screen being secured to the bin closing the horizontal cross section of the bin, and being inclined and having a receptacle for refuse at the bottom of the incline.

4. The combination with a sand blast apparatus of means for reclaiming the used abrasive comprising a screen and means for vibrating the same consisting of a fluid turbine, the turbine being mounted on the screen structure whereby the vibrations of the turbine are communicated directly to the screen.

5. The combination with a sand blast apparatus of a tank, a mixer having a sand chamber connected to the bottom of the tank at the side, a sand blast line below the chamber and a passage leading downward from the sand chamber to the sand blast line intermediately of the latter, a supply of air under pressure and means connecting same to one end of the sand line, a sand blast nozzle and means connecting the same to the other end of the sand line, the mixing chamber having an opening at the top in alignment with the downward passage and means for closing the same whereby the downward passage may be cleared without disconnecting the mixer from the tank.

6. The combination with a sand blast apparatus of a tank, a mixer having a sand chamber connected to the bottom of the tank, a sand blast line below the chamber and a passage leading from the chamber to the sand blast line, a supply of air under pressure and means connecting same to one end of the sand line, a sand blast nozzle and means connecting the same to the other end of the sand line, a nipple removably affixed to the downward passage for controlling the supply of abrasive and providing for variation of the size of the opening by substituting other nipples, the sand chamber having an opening to give access to the nipple immediately adjacent the nipple and means for closing the same whereby the nipple may be changed without disconnecting the mixer from the tank.

7. The combination with a sand blast appartus of a tank, a mixer having a sand chamber connected to the tank, a sand blast line and a passage leading downward from the chamber to the sand blast line intermediately of the latter, a nipple in said downward passage, the sand chamber having an opening immediately adjacent the nipple and means for closing the same, said opening being in alignment with the connection to the tank, the closing means for the latter opening consisting of a cover, a U shaped member pivotally connected at one end to the cover, and bearing at the other end on the chamber, a screw seated in the chamber and passed through the central portion of the U and a nut outside the U engaging the screw.

8. The combination in a sand blast machine of means for cleaning the abrasive, comprising a separator chamber, means for projecting the abrasive across the chamber, means supplying an air draft intersecting the path of the abrasive, a removable pan screen in the path of the abrasive at the bottom of the separator, an enclosure leading the abrasive downwardly from the pan screen and a safety screen secured to the walls of the enclosure closing the entire cross section of the same

and intersecting the path of all particles passing downward through and around the pan screen.

9. The combination in a sand blast apparatus of means for reclaiming the used abrasive comprising a screen and means for vibrating the same, consisting of a rotary member eccentrically weighted and supported on the screen structure and means for rotating said member.

Signed by me at Hagerstown, Maryland, this 29th day of March, 1926.

FOSTER J. HULL.