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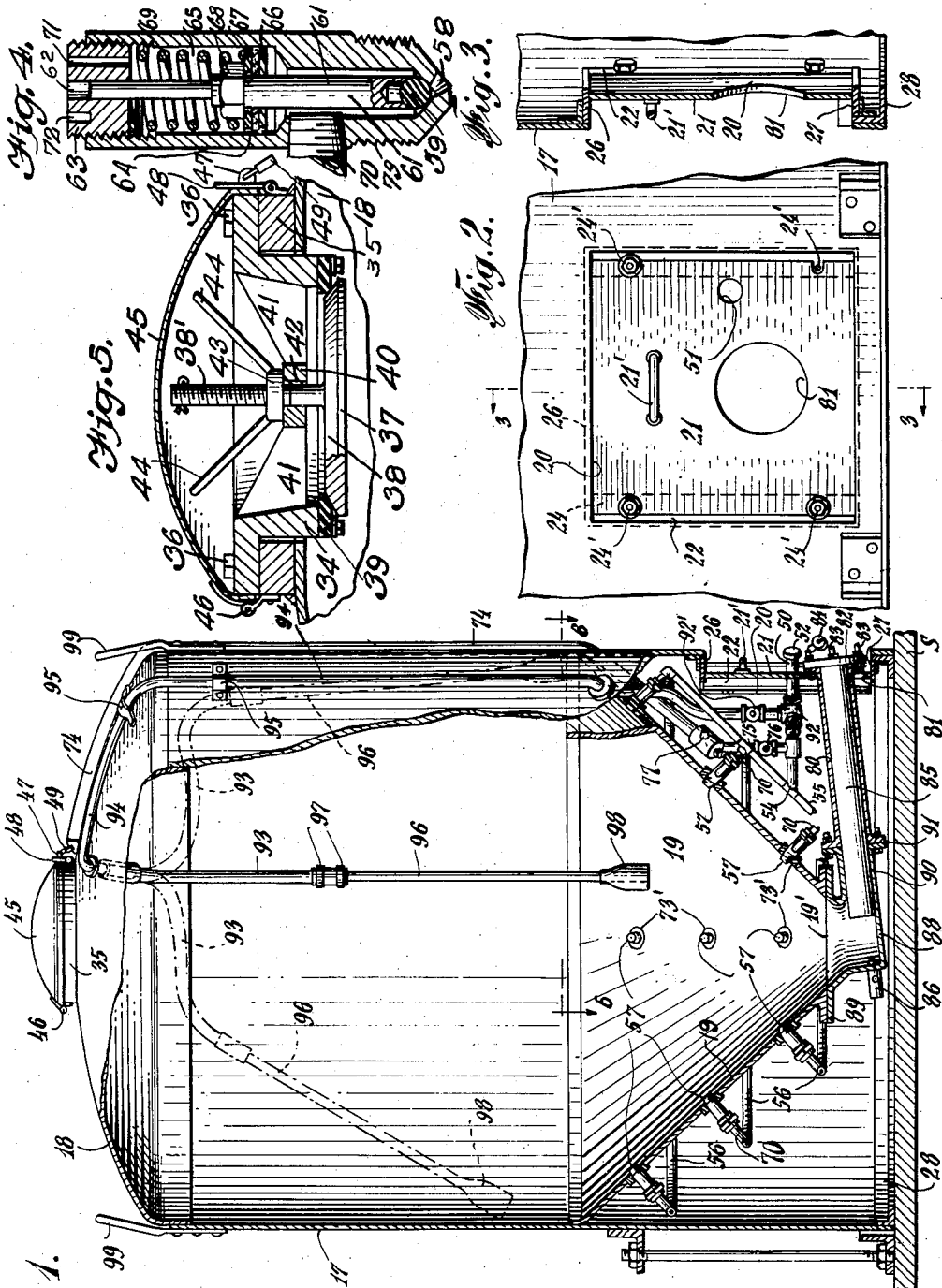
J. E. KENNEDY ET AL

2,115,023

MEANS FOR TRANSPORTING MATERIAL

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2 Sheets-Sheet 1



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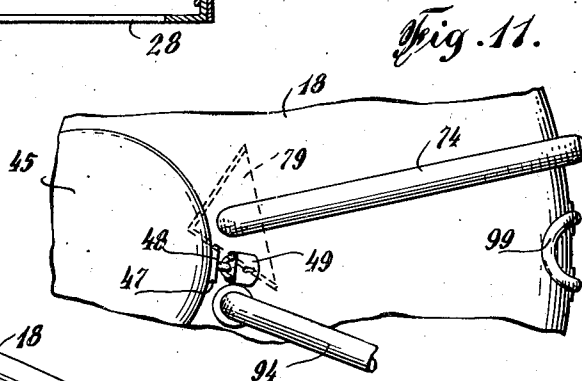
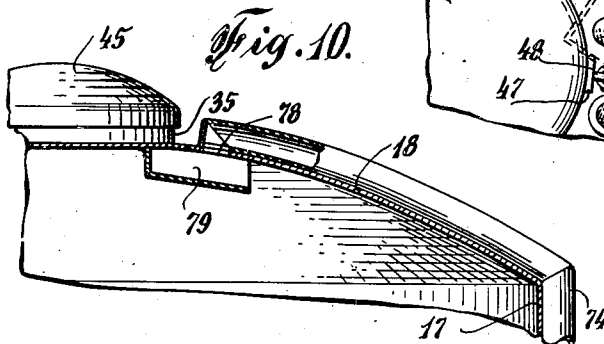
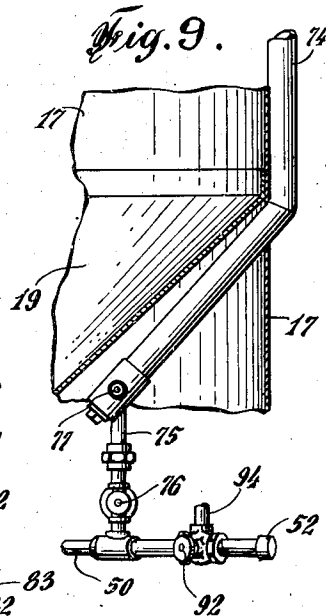
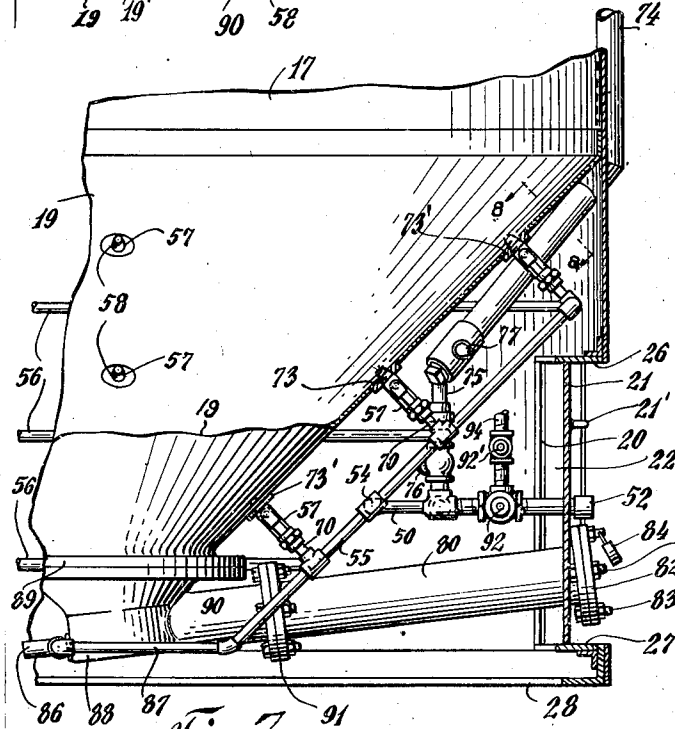
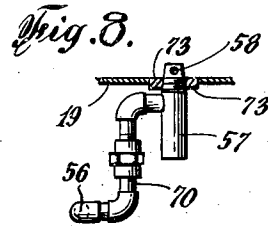
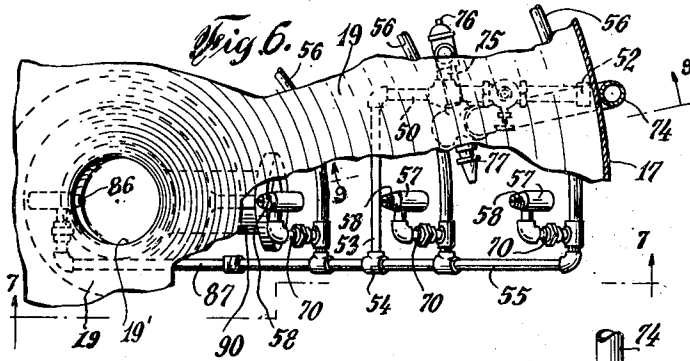
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MEANS FOR TRANSPORTING MATERIAL

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,115,023

MEANS FOR TRANSPORTING MATERIAL

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Application March 18, 1935, Serial No. 11,744

4 Claims. (Cl. 302—53)

This invention relates to apparatus for handling pulverulent material, such as pulverized coal, cement, flour and the like, liquid or semi-liquid materials, such as slimes or slurries and concrete, as well as granular material, such as rye, wheat, oats, corn, flaxseed and the like, and relates particularly to apparatus of this character including a container to contain the material adapted to be mounted upon a transporting vehicle, such as a railway car, motor truck or vessel, to transport the same from a source of supply to a remote place, and means connected to the container adapted for connection with a source of compressed fluid, such as air, and admit the same to the container to empty or discharge the material from the container and serve as the vehicle to convey the discharged material to a place of use or storage.

It is an object of the invention to provide in apparatus of this character including a container having a filler opening and means to seal said opening, improved air supply means adapted for connection with a source of compressed air or other fluid and connected with the bottom and top of the container to effect discharge of all of the material from the container.

In apparatus of this character should the material being handled consist of pulverulent material, such as flour, and particularly cement, the material from the container will enter into the air supply means at the connection thereof with the bottom of the container and effectively choke the same and prevent admitting air pressure into the container through such connection, and it is another object of the invention to provide improved means to connect the air supply means with the bottom of the container, said means including valves normally shutting off said means from the container and operative by the pressure of the air when the air supply means is connected with the source of compressed air to actuate the valves and open communication with the container and maintain the same in said condition during the connection of the air supply means with the source of compressed air.

In handling pulverulent material, particularly cement, in apparatus of this character due to the material absorbing moisture, such as moisture of condensation, the material will tenaciously adhere to the wall of the container and particularly to the bottom and at the juncture of the bottom with the body of the container, and it is another object of the invention to provide in connection with the air supply means communicating with the top and bottom of the container and con-

nected with a source of compressed air, tubular means flexibly suspended within and from the top of the container and connected with the air supply means adapted to be moved or swung about the container by the discharge of the air therefrom and discharge the air to different portions of the container and thereby loosen material adhering to the wall of the container, and the provision of means to control the connection of the air supply means and said flexibly suspended means alternately with the source of compressed air.

Another object of the invention is to provide means to prevent loss of material from and the packing of material in the outlet of the container during the transporting of the container from a source of supply to a remote place of discharge.

Other objects and advantages will hereinafter appear.

In the drawings accompanying and forming a part of this application, Figure 1 is a side elevation of apparatus showing an embodiment of the invention, the container thereof being shown partly in section to show the arrangement of the base portion of the container and mounting thereof on a support as well as the connections of air supply means with the container and the arrangement of the outlet means of the container.

Figure 2 is an elevational view, on an enlarged scale, of the base portion of the container to show the mounting of a releasable closure means for an access opening thereto.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 looking in the direction of the arrows.

Figure 4 is a longitudinal sectional view, on an enlarged scale, of valve controlled nozzles for admitting fluid under pressure to the bottom of the container.

Figure 5 is a sectional view of the top portion of the container to show the arrangement of closure and sealing means for the material filler opening to the container.

Figure 6 is a fragmentary sectional view taken substantially on the line 6—6 of Figure 1 looking in the direction of the arrows to show the arrangement of the valve controlled connections of the air supply means with the bottom of the container.

Figure 7 is a sectional view of the lower portion of the container taken on the line 7—7 of Figure 6 looking in the direction of the arrows.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7 looking in the direction of the

arrows, and showing in detail the mounting of valve controlled nozzles in the container bottom and the connection thereof with a conduit for connection with a source of compressed fluid or air.

Figure 9 is a sectional view taken on the line 8-8 of Figure 6 looking in the direction of the arrows.

Figure 10 is a sectional view of an upper portion of the container and conduit for admitting fluid pressure to the top of the container to show the connection of said conduit with the container.

Figure 11 is a view looking at the top of Figure 10.

In the embodiment illustrated in the drawings for carrying out the invention, there is provided a container comprising a vertically disposed cylindrical body member 17 to constitute the side wall of the container. One end of the container body, to constitute the upper end thereof, is closed by a dome shaped head 18 having an inlet opening through which to fill material into the container, and has a bottom member 19 converging from the side toward the axis of the body member and shown as of conical form with an opening 19' through the apex to constitute the outlet through which the material is discharged from the container. The bottom member is arranged within and secured to the body member intermediate the ends so that the body member or side wall of the container will extend about and beyond the bottom member, as clearly shown in Figure 1, and said extended side wall constituting a base portion adapted for supporting and mounting of the container upon a support, as S, which may constitute a platform truck of a transporting vehicle, such as a railway car or a motor truck and co-operate with such support to provide a housing or chamber about and enclosing the bottom member therein. To gain access to the housing or chamber about the bottom member the extended side wall is provided with an opening 20 closed by a flat closure plate 21 releasably secured by bolts 24' to jamb members 22 fixed to and extending longitudinally of the opposite sides of the opening. Due to the curvature of the wall 17 of the body of the container and the flat arrangement of the closure plate 21 there are spaces above and below the closure plate which are closed by plates 26, 27 secured to and extended inwardly from the wall of the body of the container. To facilitate manipulating the closure plate it is provided with a hand grip 21'. To reinforce and provide the lower end of the body 17 with a supporting base, an annular member 28 of right angle form in cross section is secured at one angle portion to and within the container body with the other angle portion extending inwardly and flush with the end of the container body.

The filler opening of the container (Figure 5) is provided with closure means adapted to be manually actuated to opening and closing positions and actuated independently by pressure within the container to pressure seal said opening, and comprises an annular member 34 engaged in the container opening having a laterally extending annular flange whereby it is supported from the wall about the opening with an interposed annular block 35 welded to the container head, the annular member 34 being secured to said block, as by screws 36. A closure member in the form of a disk 37 of greater diameter than the opening through the member 34 is carried by said member within the container to have

movement toward and away from the opening. To provide a pressure tight closure, the disk has a bevelled portion 38 adapted to seat against a ring 39 of yielding and resilient material, such as rubber, disposed about the inner end of the member 34, the opening through said ring being of a diameter slightly less than the opening through the annular member 34 whereby the inner peripheral portion of said ring will extend into the opening of the annular member 34 and provide a readily yielding seat for the closure. The closure disk is adjustably mounted on and carried by the annular member 34 by a stem 38' secured to and extending axially from the closure disk slidably engaged in an opening in a hub 40 carried axially of the annular member 34 by spider arms 41 extended radially inward from the annular member, and said stem and closure disk being held against rotation by a key in the hub engaging a keyway in the stem, as at 42. To manually adjust the closure disk toward and away from the annular member 34 to close the opening and open the same to the container, a nut 43 is threaded onto the stem at the outer side of the hub 40, said nut being provided with hand grips 44 to facilitate turning the nut onto the stem and drawing the closure disk to the seat 39. The arrangement of drawing the closure member to its seat by the nut as described will permit of movement of the closure member to its seat 39 independent of the actuation of the nut 43 onto or off from the stem 38'.

To protect the closure means from the elements and accumulation of foreign substances thereon exterior of the container, and also to prevent tampering with the contents of the container, a removable housing is provided therefor, shown as comprising a dome-shaped member 45 hingedly connected, as at 46, to the block 35, the housing diametrically opposite to its hinged support being arranged with a laterally extended perforated ear 47 for engagement in an opening in a latch 48 pivotally supported on the block 35, and the ear secured against disengagement from the latch opening by a suitable locking means 49.

The material is emptied or discharged from the outlet 19' of the container by fluid pressure, such as steam or air, preferably compressed air, admitted into the container from a suitable source of supply to loosen and aerate the material at the bottom of the container and to the top of the material in the container to exert an extruding force on the material, and said fluid pressure being adapted to constitute the sole conveying vehicle for the material discharged from the container to a point remote from the container. For this purpose means connected with the container are arranged within the housing or chamber formed by the side wall of the container extended beyond the bottom 19 and adapted for connection exterior of said compartment with the source of fluid under pressure and for the connecting of a conveying conduit to the outlet of the container.

To connect the container with a source of air under pressure a supply pipe or conduit 50 is extended through an opening 51 in the closure plate 21 into the container chamber, the end of said pipe exterior of said chamber being arranged for connection with a conduit leading from the source of air supply or for connection of a closure cap 52. The pipe 50 extends to adjacent the container bottom 19 and is connected within the container chamber to the bottom of the container, for which purpose a laterally extending portion 53 of the pipe 50 is connected by a coupling 54 to a branch

pipe 55 extending parallelly of the exterior of the container bottom, which pipe 55 in turn is connected to a series of pipes 56, shown as three in number, spaced longitudinally of and extending about the container bottom 19. Each pipe 56 is connected to the bottom of the container through a series of nozzles 57, shown as four in number spaced in rows about the bottom 19. The nozzles embody a casing whereby they are mounted in the container bottom with the outlet orifice or orifices of the nozzles 58 opening to the interior of the container for the purpose of admitting air to the container to aerate the material adjacent the bottom of the container. To control the connection of the pipe 50 through the nozzles with the container and shut off the nozzle orifices from the container to prevent material in the container entering the nozzle orifices and pack therein with a consequent choking of the connections of the pipe 50 through the nozzles with the container each nozzle is provided with a valve normally urged to position to close the nozzle orifices and adapted to be actuated to open the nozzle orifices and admit air through the nozzles to the container by the pressure of the air when the nozzles are connected through the pipe 50 with the source of air supply under pressure. The nozzle valve consists of a spherical member 59 of resilient material, such as rubber, to engage a conical wall 60 in which the nozzle orifices are arranged, the valve being carried at the end of a stem or plunger 61 slidably mounted by a portion of reduced diameter at the end opposite the valve member in an opening 62 in a plug 63 threaded into and closing the end of the nozzle casing opposite the orifice. A piston 64 is arranged on the plunger consisting of a disk of flexible material of greater diameter than the diameter of a portion of the nozzle casing of increased diameter 65, the piston being held between a disk 66 of less diameter than the piston fixed on the plunger and a washer 67 clamped to the flexible disk by a nut 68 threaded onto the plunger. The valve carrying plunger is urged by a coiled spring 69 in a direction to engage the valve member with the wall about and close the nozzle orifice. The nozzles are connected to the pipes 56 by angular pipe connection means, as at 70, with a part thereof tapped into the pipes 56 and a part screw threaded into the nozzle casing in communication therewith intermediate the piston 64 and the discharge orifice 58, whereby the compressed air admitted to the nozzle casing will exert a force on the piston to actuate the valve carrying plunger to move the valve 59 away from the nozzle orifice and permit discharge of the compressed air through the nozzle orifice into the container. To permit of escape and of admission of air to the nozzle casing in back of the piston the nozzle plugs 63 are provided with a perforation 71 and said plugs are provided with a recess 72 diametrically opposite the perforation for application of pin wrench to facilitate removing the plugs 63 from and engaging them in the nozzle casing.

Compressed fluid, such as air is admitted to the top of the container 17 above the material therein through the lead-in pipe 50 by a branch pipe or conduit 74 connected at one end to the pipe 50 through a connection 75 having a valve 76 interposed therein to control the flow of the fluid or air into the top of the container and a blow off valve, as illustrated in a conventional manner at 77, operative by the pressure in the container to permit the escape of the fluid or air from the container when it exceeds a predetermined pressure in the

container. The conduit 74 is extended through the wall of the housing about the bottom 19 and in an upward direction parallelly of the exterior of the container 17 and the head 18 with the end opposite to the end connected to the pipe 50 in communication with the top of the container through an opening 78 (Figure 10) in the head 18 to a triangular chamber 79 suspended from the head and arranged to distribute the fluid pressure in a fan shaped course downwardly along the concave contour of the head and distributing the same over the top of the material to exert an extruding force on the material in the container.

The material in the container is discharged therefrom under the extruding fluid pressure admitted by the pipe 74 and the material aerating fluid pressure admitted through the nozzles 57 through a discharge conduit 80 connected in communication with the outlet 19' in the apex of the conical bottom 19 and extended laterally through an opening 81 in the closure plate 21 for the access opening to the container chamber with the end portion thereof extending exteriorly of the closure plate 21 flanged laterally for the connection of a closure member 82 retained in closing position by bolts engaged in aligned openings in the conduit flange and closure member and nuts threaded onto the end of the bolts projecting beyond the closure member, as at 83, during the transporting of the container. To prevent removal of the closure plate 82 and the material from the container, by unauthorized persons, suitable means 84 is provided to lock the closure member in closing position, shown as a key operated lock 84 secured to one of the bolts exteriorly of the nut thereon, as shown in Figures 1 and 7.

To prevent material packing in and clogging the container outlet 19' and discharge conduit 80, particularly when the material in the container consists of flour or cement which may absorb moisture, such as moisture of condensation or otherwise, and a consequent partial setting of the same when it consists of cement, the closure member 82 is provided with a plug 85 to engage in the conduit 80 and being of a length to extend into the outlet 19'. When the container is delivered to the remote place of discharge, the closure member 82 with the plug 85 is removed and a suitable conduit, not shown, through which to convey the material in the container to a place of use or storage, is connected to the flanged end of the conduit 80.

To facilitate the discharge of material through the conduit 80 fluid pressure from the feed pipe 50 is admitted into the container and directed toward the outlet end thereof by a nozzle 86 mounted in the container wall opposite to and with the discharge orifice directed toward the connection of the conduit 80 with the container outlet, the nozzle being connected in communication with a lateral extension 87 of the pipe 55, as shown in Figures 6 and 7.

In the present instance the conduit is connected with the discharge outlet 19' of the container by a connecting member 88 secured to the outlet end of the conical bottom, as by welding, as at 89, and having a tubular portion 90 extending laterally therefrom to which the conduit 80 is connected, as at 91. However, it will be obvious that the conduit 80 may be connected directly to the container in communication with the container outlet.

Due to moisture that will accumulate on the interior surface of the body of the container and the conical bottom, as moisture of condensation,

or moisture absorbed by the material, the material, particularly when it consists of pulverulent material, adheres to the container and particularly to the conical bottom, and while the aerating fluid pressure admitted into the container by the nozzles 57 will loosen and effect discharge of such material when it consists of granular material it is not sufficient to dislodge pulverized material, such as cement or flour, that has absorbed moisture adhering to the conical bottom wall. To overcome this disadvantage and discharge such material adhering to the wall of the conical bottom, means are provided to dislodge said material from the container wall comprising a flexible tube 93 (Figure 1) connected to a conduit 94 extended through the container head 18 into the container, the conduit being supported on the exterior of the container by brackets 95 and the opposite end portion extended through the wall of the housing surrounding the conical bottom and connected to the pipe 50 through a valve 92. The valve 92 is a two way type of valve operative to shut off the pipe 50 from the pipe line 55 and conduit 74 while the conduit 94 is connected to the pipe 50 and source of fluid and maintain the pipe line 55 and conduit 74 open to pipe 50 and source of fluid when the pipe 94 is shut off from the pipe 50 and source of fluid pressure. The free end of the flexible tube is engaged over an end of a rigid tube 96 and secured thereto by clamping members 97 to suspend the rigid tube from the flexible tube. The rigid tube 96 is of a length to extend into the conical bottom 19, as shown in Figure 1. When the fluid pressure is shut off from the conduit 74 and nozzles 57 and fluid pressure is being supplied to the conduit 94, the fluid pressure passing through and from the tubes 93 and 96 will cause a flexing of the tube 93 and effect a swinging of the rigid tube 96 about the container, as shown in dotted lines in Figure 1, and direct the stream of fluid pressure discharged from the rigid tube about the side of the container. To prevent noise and damage to the container by the striking of the rigid tube against the same, the free end portion of said tube is encased with a tubular piece of resilient material, such as rubber, as shown at 98 in Figure 1. Any material adhering to the wall of the container will be dislodged by the stream of fluid pressure discharged from and directed by the rigid tube against said material and by the vibration set up in the wall of the container by the contact between the rubber encased end of said tube and the wall of the container. The fluid pressure delivered to the conduit 94 may be varied depending on the character of material adhering to the container wall by a valve 92' interposed in the conduit 94. The material dislodged from the wall of the container will accumulate in the discharge conduit connecting member 88 and is discharged therefrom through the conduit 80 by actuating the valve 92 to shut off the pipe 94 from the fluid pressure supply and connect the fluid pressure supply to the pipe line 55 and conduit 74.

To discharge the material from the container the cap 52 is removed from the pipe 50 and said pipe is connected to a source of air supply under pressure. The closure member 82 with the plug 85 is removed and a discharge conduit leading to a place of discharge connected with the conduit 80. The valve 92 is actuated to connect the nozzles 57 and the pipe 74 connected with the source of air supply to admit such air through the nozzles and pipe 74 into the container and

thereby effecting discharge of material from the container through the conduit 80. The pressure of the air admitted to the top of the material in the container will urge the closure disk 37 into pressure tight sealing engagement with the sealing gasket 39 and thus prevent escape of pressure through the material inlet. After the material is discharged from the container with the exception of the material that may have adhered to the wall thereof, the valve 92 is actuated to shut off the nozzles 57 and pipe 74 from and to connect the flexibly mounted pipe 96 to the source of air pressure and admit such air through the pipe 96 into the container and thereby dislodge the material adhering to the container wall as hereinbefore set forth, said dislodged material collecting at the container outlet 19' and is discharged from the container by actuating the valve 92 to shut off the pipe 96 from the source of air pressure and connecting such air to the nozzles 57 and the pipe 74.

Having thus described our invention, we claim:

1. In means for handling pulverulent, granular or like materials, a pressure container for the material having a material inlet in the top and the bottom wall converging toward the axis of the container with an outlet through the apex thereof, means to seal the material inlet, a supply conduit adapted for connection with a source of fluid under pressure connected to and in communication with the bottom and top of the container, a tubular member connected with the supply conduit flexibly suspended in the container and of a length to terminate within the converging bottom to admit fluid pressure into the container adjacent the bottom and operative to loosen material adhering to the wall of the container, and valve mechanism to control the connection of the supply conduit with the bottom and top of the container and selectively operative to shut off the flexibly supported member from the supply conduit and open the supply conduit to the bottom and top of the container to effect an aerating of the material and exert an extruding force on the material and discharge of the material from the container outlet, and shut off the connection of the supply conduit with the bottom and top of the container and connect the flexibly supported member with the supply conduit to effect a loosening of the material adhering to the wall of the container.

2. In means for handling pulverulent, granular or like materials, a pressure container for the material including a vertically disposed cylindrical body having a material inlet in the top and a hopper bottom member having an outlet through the apex for the material from the container, means to seal the material inlet opening, a supply conduit adapted for connection with a source of fluid under pressure, branch conduits connected to said supply conduit, two of said branch conduits leading to and communicating with the top of the container and another of said branch conduits connected to and communicating with the bottom of the container to admit fluid under pressure into the container to aerate and exert an extruding force on and discharge the material from the outlet, and a tubular member connected with one of the branch conduits leading to and communicating with the top of the container and flexibly suspended in the container to extend into the hopper bottom to direct the fluid pressure to the bottom wall and operative by the delivery of the fluid pressure there-

through to loosen material adhering to the container wall.

5 3. In means to handle pulverulent, granular or like materials as claimed in claim 2, valve mechanism to control the connection of the supply conduit with the branch conduits selectively operative to connect the supply conduit with one of the branch conduits communicating with the top of the container and the branch conduit connected to and communicating with the bottom of the container and shut off the supply conduit from the branch conduit connected with the flexibly supported member to admit fluid pressure into the container to effect aerating and discharge of the material from the container outlet, and connect the supply conduit with the branch conduit connected with the flexibly suspended member and shut off the supply conduit from the other branch conduits to effect a loosening of material adhering to the wall of the container.

20 4. In means for handling pulverulent, granular or like materials, a pressure container for the

material having a material inlet and an outlet, means to seal the material inlet, a supply conduit adapted for connection with a source of air under pressure connected in communication with and admitting said air to the top and bottom of the container to discharge the material from the container, a tubular member flexibly suspended in the container and extending to adjacent the bottom and connected with the supply conduit and adapted by the discharge of the air therefrom to be swung about the container and loosen material adhering to the wall of the container, and valve mechanism to alternately shut off the supply conduit from the flexibly suspended member and connect the supply conduit in communication with the top and bottom of the container, and connect the flexibly suspended member to the supply conduit and shut off communication between said supply conduit and the top and bottom of the container.

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