

March 3, 1936.

J. E. KENNEDY ET AL

2,032,367

PNEUMATIC TRANSPORT SYSTEM

Filed May 27, 1932

3 Sheets-Sheet 1

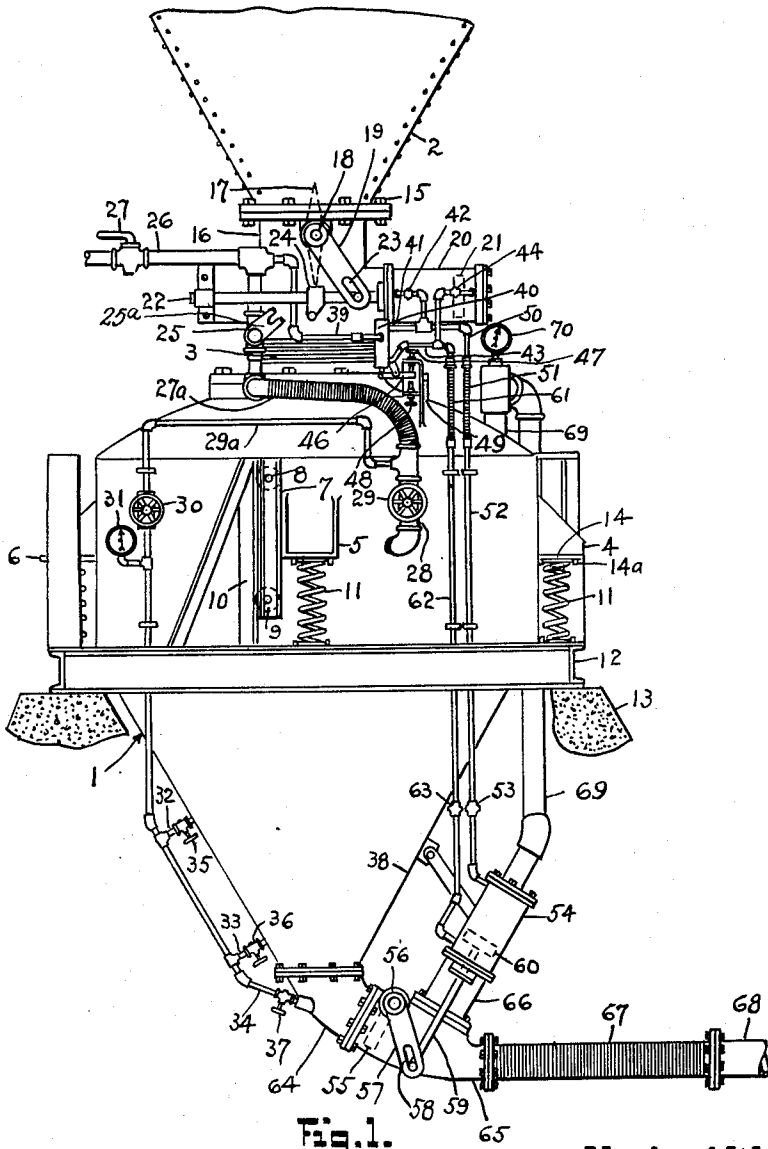


Fig. 1.

Herbert W. Johnson
Joseph E. Kennedy
INVENTORS.

BY
Charles A. Clark, Jr.
ATTORNEY.

March 3, 1936.

J. E. KENNEDY ET AL

2,032,367

PNEUMATIC TRANSPORT SYSTEM

Filed May 27, 1932

3 Sheets-Sheet 2

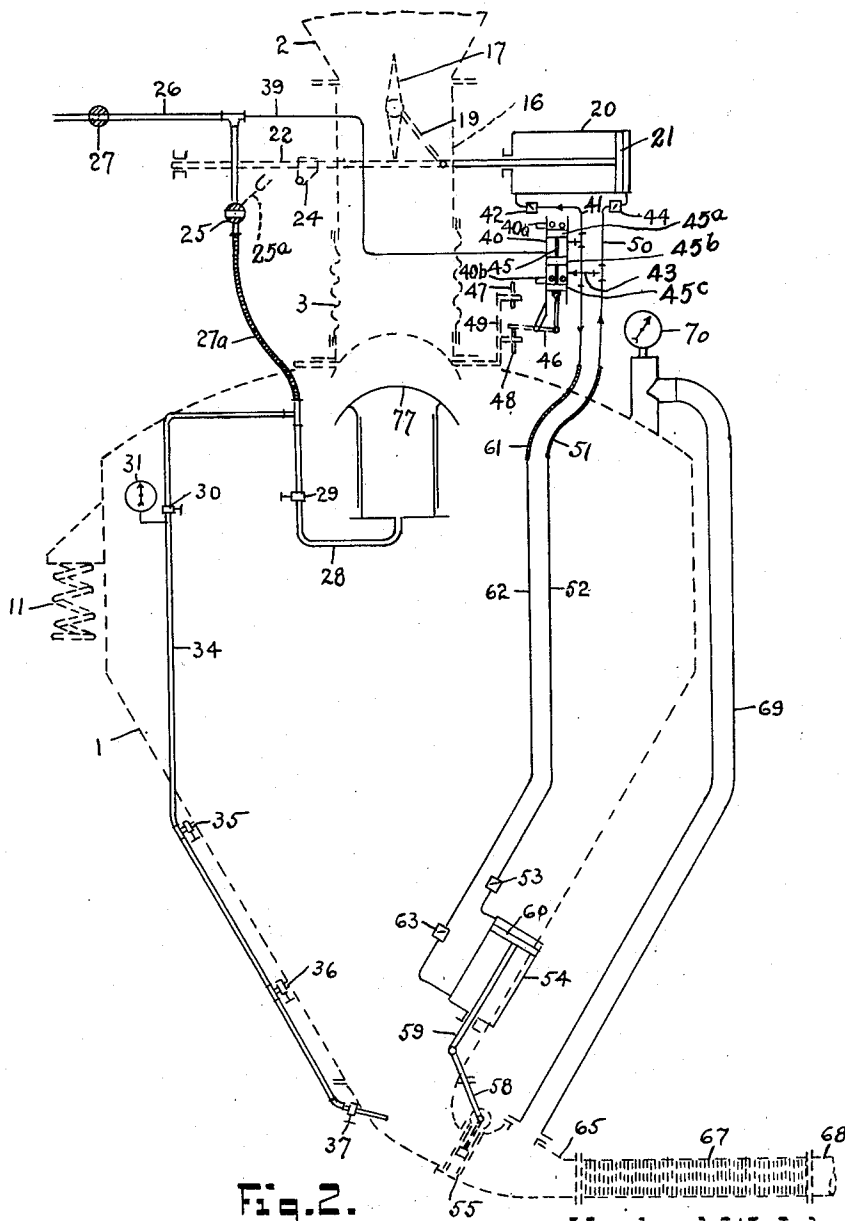


Fig. 2.

Herbert W. Johnson
Joseph E. Kennedy
INVENTORS

BY *Charles A. Clark M.E.*
ATTORNEY.

March 3, 1936.

J. E. KENNEDY ET AL
PNEUMATIC TRANSPORT SYSTEM

2,032,367

Filed May 27, 1932

3 Sheets-Sheet 3

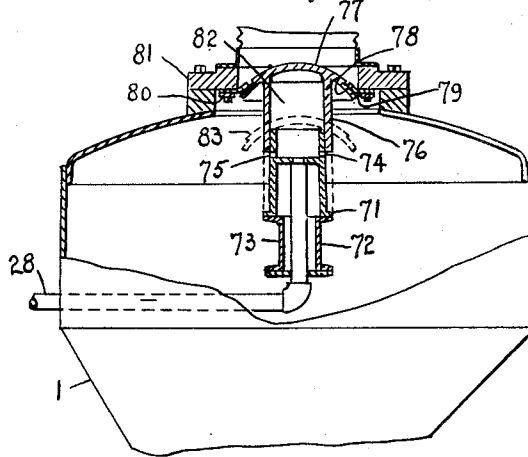


Fig. 3.

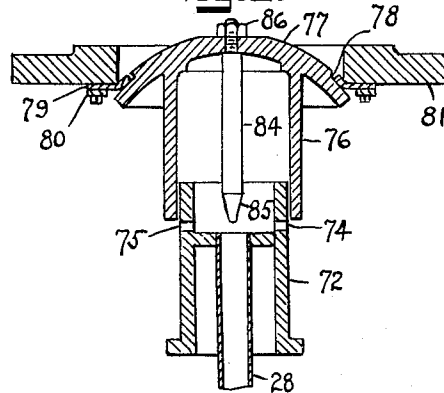


Fig. 4.

Herbert W. Johnson
Joseph E. Kennedy
INVENTORS.

BY *Charles A. Clark, m.e.*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,032,367

PNEUMATIC TRANSPORT SYSTEM

Joseph E. Kennedy, New York, and Herbert W. Johnson, Bronxville, N. Y., assignor, by direct and mesne assignments, to Nellie Kennedy, New York, N. Y.

Application May 27, 1932, Serial No. 613,904

15 Claims. (Cl. 302—53)

This invention relates to means and a system for delivering material from a source of supply and transporting the same to a place remote from the source of supply for use or storage, and while the invention is adapted particularly for the handling of pulverized material, such as coal, cement, and the like, it is also adapted for the handling of liquid or semi-liquid materials, such as slimes or slurries, as well as granular materials, such as rye, wheat, oats, corn, flaxseed, and the like.

The invention relates particularly to a system and apparatus utilizing a container having a hopper or funnel shaped bottom to receive the material to be transported having a material inlet in the top and an outlet in the apex of the hopper bottom having a conduit connected thereto through which to convey the material for use or storage at a remote point, fluid pressure being entered into the container to effect an emulsifying or aerating of the material and to exert an extruding force on the material in the container. Heretofore, in order to effect the conveying of the material through the conveying conduit, additional fluid pressure to constitute the vehicle for transporting the material through the conveying conduit is entered into the conveying conduit, and it is an object of the invention to provide the container with valve controlled connections with a source of fluid pressure arranged to enter fluid pressure into the container to effect an emulsifying or aerating of the material in the bottom portion of the container and to the top of the container to exert an extruding force on the material, and the fluid pressure entered into the container to constitute the sole vehicle for discharging the material from the container and transporting it through the conveying conduit.

In apparatus of an automatic system of this character, either a single manually or mechanically operated closure means has heretofore been provided to control the filling of material into the container and to close the material inlet during the discharge of the material from the container, or a single closure means actuated to inlet closing position by fluid pressure entering the container has been utilized. However, in practice in the use of such closure means due to the material adhering to the closure means as material is filled into the container, it has been impossible to effect an intimate closing and pressure sealing of the material inlet with the result that there is a considerable loss of pressure, and it is a further object of the invention to over-

come this disadvantage by providing means to control and shut off the flow of material from the material inlet to the container and provide additional closure means actuated to inlet closing position by the material extruding fluid pressure entering the container and the pressure of the fluid in the container during the discharge of the material exerting a closing force upon said closure means to pressure seal the material inlet.

Another object of the invention is to provide improved means for closing and pressure sealing the material inlet normally assuming an inlet opening position by gravity and adapted to be actuated to and retained in inlet closing and sealing position by the pressure of fluid in the container, and the providing of said closure means with a globular face and a member of flexible material disposed about and extending inward from the wall about the material inlet for said globular face to seat against, and said flexible means arranged to prevent material passing through the material inlet coming in contact with the under face thereof engaged by the globular face of the closure means and adapted to co-operate with said globular face to wipe material therefrom and assure an intimate contact and fluid tight seal between the globular face and member of flexible material.

A further object of the invention is to provide in apparatus and a system for transporting material of this character means which is automatically set in operation when a predetermined quantity of material is filled into the container to render fluid operated means active to actuate the closure means for controlling the filling of material into the container to shut off the flow of material and to connect the container with a source of fluid under pressure to effect a discharge of the material from the container and after the material has been discharged from the container said fluid pressure operated means rendered active to shut off the fluid pressure from the container and actuate the means to control the filling of material into the container to permit of the filling of material to the container, and the provision of outlet means to exhaust the fluid pressure from the container displaced by the material filled therein and close said outlet means during the operation of the connection of the fluid pressure with the container.

Another object of the invention is to provide the container from which the material is delivered with resilient supporting means and the provision of fluid pressure operated means to actuate the means to control the filling of mate-

rial and admission fluid pressure into the container, said resilient supporting means being calibrated to urge the container upward to a predetermined position with no load in the container and in the movement of the container to such position actuate means to connect the fluid pressure operated means with a source of fluid pressure to effect the shutting off of the source of fluid pressure from the container and actuate the means to permit the filling of material into the container, and when descending movement to a predetermined point is imparted to the container by the filling of a predetermined quantity of material into the container actuate said means to connect the fluid pressure operated means with the source of fluid pressure and actuate the means to connect the source of fluid pressure with the container and shut off the flow of material into the container.

In the drawings accompanying and forming a part of this application, Figure 1 is an elevational view of the apparatus showing an embodiment of means for carrying out the invention.

Figure 2 is a diagrammatic view to illustrate the method of operation.

Figure 3 is a view of a portion of the container of the apparatus, partly in section, to show the arrangement of mounting the closure means to pressure seal the material inlet to the container and the connection of the extruding fluid pressure with the container to actuate said closure means to and retain it in inlet closing and sealing position; and

Figure 4 is a sectional view showing a modification of the closure means shown in Figure 3.

In carrying out the invention, there is provided a container 1 having a hopper or funnel shaped bottom with an outlet through the apex thereof and having a material inlet opening in the top adapted for the connection of flexible means 3 to connect the inlet opening with a source of supply, such as a storage bin 2, by connecting the flexible means to a sleeve 16 fixed to the outlet of the bin by bolts, as at 15, the flow of the material to the inlet opening being controlled by a valve or gate 17 mounted upon a shaft 18 and whereby the gate is pivotally supported within the sleeve 16, the shaft having a lever or crank arm 19 fixed to an end thereof exterior of the sleeve to actuate the valve to permit filling of material into the container from the bin and to shut off the flow of material from the bin.

The material is discharged from the container and conveyed to a remote point for use or storage by a fluid, such as air or other fluid under pressure, for which purpose the container has valve controlled connections with a source of such fluid (not shown) by a pipe 28 leading into the top of the container connected with a supply pipe 26 leading from the source of fluid pressure having a shut off valve 27 interposed therein, and the pipe 28 also having a control valve 29 interposed therein, the fluid under pressure entering the container through the pipe 28 exerting an extruding force upon the material therein. A branch pipe 29a leading from the pipe 28 has valve controlled outlets 35, 36 opening through the hopper bottom into the container at a point within the container outlet, and a further valve controlled outlet 37 also opening through the hopper bottom adjacent the container outlet and arranged to direct the flow of fluid therefrom toward the container outlet, the fluid entering the container through the outlets 35, 36 effecting an emulsifying or aerating of the material at

the bottom portion of the container and the outlet 37 serving to eject or effect a discharge of the aerated or fluffed material from the container outlet into a transporting conduit 68 connected by a flexible section 67 and a casing 65 with the container outlet.

To pressure seal the material inlet to the container as the fluid pressure is entered into the container and during the discharge of the material from the container, closure means is provided for said inlet opening, in the present instance arranged within the container to open into and close outward from the container and normally assuming an inlet opening position by gravity. This closure means is in the nature of a fluid pressure actuated piston mechanism and comprises a tubular member or sleeve 76 arranged at one end with a head having an arcuate face and shown as of globular form, as at 77, the sleeve 76 extending from the rear of said head. The piston is supported and guided to have axial movement toward and away from the inlet opening by a casing 71, said casing being arranged within and opening to the piston sleeve and supported co-axially of the container inlet by channel members 72, 73 extending transversely of and attached to the container, as shown in Figure 3.

The inlet opening is provided with means for the globular face of the closure to seat against and co-operate therewith to pressure seal the inlet, and comprising an annular member 79 of flexible material secured by a clamping ring 80 to the under surface of an annular member 81 to which the flexible connection means 3 for the bin 2 is connected. The seating member 79 is of a diameter less than the diameter of the opening through the annular member 81 so that the seat member extends inward from the wall of the inlet opening. As the globular face of the closure member is moved to inlet closing position, an annular recessed and machined portion 78 at the margin of the globular face will engage with the under surface of the portion of the seating member extending inward from the opening wall with which face the material as it is filled into the container through the inlet opening will not come in contact, and as the globular face engages therewith any material which may have adhered to the globular face will be wiped therefrom and there will be an intimate contact between the globular face and its seating member and thus assuring a pressure tight seal.

The admission of fluid pressure to the top of the container is through the casing 71 for which purpose the pipe 28 is connected with a perforation centrally in a partition extending transversely of the casing intermediate the ends thereof, the fluid pressure entering into a chamber 82 formed by the piston sleeve 76 and the casing 71, and from such chamber into the container 1 through ports 74, 75 in the casing wall, which ports in the normal inlet opening position of the closure means are covered by the piston sleeve 76, as shown in dotted lines 83 in Figure 3, and as the fluid pressure enters into the chamber formed by the piston sleeve 76 and casing, it will initially move the closure to inlet closing position, as shown in full lines in said Figure 3, thereby uncovering the casing ports and permit of the passage of the fluid into the top of the container, the fluid pressure at all times exerting a closing and sealing force upon the closure member.

The container is supported by a frame 12 upon a suitable foundation 13, and to adapt the appa-

ratus as an automatic system to fill and discharge successive predetermined quantities of material from the container, the container has a resilient support upon the frame 12 to permit of upward and downward movement of the container, said means comprising springs 11 equidistantly disposed about the container and seated upon the frame, the container being supported upon the springs by brackets 4, 5 and 6 integral with or secured to and extending laterally from the container, the springs being retained in position relative to said brackets by washers 14 and stops 14a. To provide antifriction guiding means for the container in its movement, there is mounted upon each of the container supporting brackets a carrier 7 on which there is rotatably mounted in vertical spaced relation rollers 8, 9 which engage and travel relative to vertical guides 10 fixed upon the supporting structure, said guiding means co-operating with the supporting springs to maintain the container in vertical position.

The springs 11 are calibrated to move the container with no load therein upward to a predetermined position and by such movement render means active to shut off the container from the source of fluid pressure and in successive sequence therewith actuate the gate 17 to fill material into the container, and at a point in the downward movement of the container effected by filling a predetermined quantity of material into the container render said means active to actuate the gate 17 to shut off the flow of material to the container and in successive sequence therewith connect the container with the source of fluid pressure to discharge the material from the container. For this purpose, fluid pressure operated means is provided, comprising a cylinder 20 mounted on the sleeve 16 and a piston 21 reciprocatory therein. A rod 22 connected to the piston and extended from the cylinder has a pin and slot connection 23 with the gate actuating lever 19, and has a trigger 24 fixed thereon consisting of a block and a finger extending laterally therefrom adapted to engage a bifurcation in the end of an arm 25a fixed to a valve 25 interposed in the connection of the pipe 28 with the supply pipe 26 to actuate said valve to connect and shut off the pipe 28 from pipe 26. The opposite ends of the cylinder 20 are connected with a source of fluid pressure by pipe 41 leading to one end of the cylinder from adjacent one end of a pilot cylinder 40 and a pipe 43 leading to the opposite end of the cylinder from adjacent the end of the pilot cylinder opposite to that to which the pipe 41 is connected, said pipes 41, 43 having control valves 42, 44 interposed therein. The pilot cylinder intermediate the ends is connected by pipe 39 with the fluid pressure supply pipe 26. To control the connection of the opposite ends of the cylinder 20 with the source of fluid pressure through the pilot cylinder 40, reciprocatory piston mechanism is arranged in the pilot cylinder, comprising three piston heads 45a, 45b and 45c fixed in equidistantly spaced relation on a rod 45, one end of which rod is extended from the end of the pilot cylinder, and the pistons are adapted to be actuated to connect either end of cylinder 20 through the pilot cylinder 40 with the source of fluid pressure, or open the same to the atmosphere through exhaust ports 40a, 40b in the pilot cylinder. In the position of the piston 21, shown diagrammatically in Figure 2, with the valve 17 in material inlet opening position and the fluid pressure shut off from the container by valve 25, the

one end of cylinder 20 is connected through pipe 41 with the source of fluid pressure through the space between piston heads 45a, 45b, while the opposite end of cylinder 20 is open to the atmosphere through pipe 43 and the exhaust ports 40b in pilot cylinder 40 opening to the space between piston heads 45b, 45c. To connect cylinder 20 with pipe 43 and the actuating medium to actuating medium to actuate the piston 21 to move the gate 17 to closing position and the valve 25 to open position, the pilot pistons are adjusted to connect pipe 39 and pipe 43 with the space between piston heads 45b, 45c and slutting off pipe 39 from the space between piston heads 45a, 45b and opening said space to the ports 40a.

The pilot piston mechanism is actuated to the position shown in Figure 2 when the container is empty and moved to a predetermined upward position by springs 11 causing an abutment 48, adjustably mounted in a bracket 49 fixed on the container, to engage one arm of a pivoted lever 46, the other lever arm being connected with the piston rod 45. When a predetermined quantity of material is filled into the container and downward movement is imparted thereto against the tension of springs 11, an abutment 47 adjustably carried by the bracket 49 in opposed relation to the abutment 48 is caused to engage the lever 46 and adjust the pilot cylinder piston mechanism to open the pipe 39 and pipe 43 to the space between the pistons 45b, 45c and opening the space between pistons 45a, 45b to the pipe 41 and exhaust ports 40a, thus connecting the cylinder 20 with its actuating medium to move the piston to the end opposite to that shown in Figure 2 and actuating gate 17 to closed position and the valve 25 to open position and connecting the container with the source of fluid pressure.

The container outlet is provided with a control valve 55 and means are also provided to actuate said valve to outlet closing position when the gate 17 is in open position and pressure fluid control valve 25 is in closed position to shut off fluid pressure from the container, as shown in Figure 2, and to open position when gate 17 is actuated to closed position and pressure control valve 25 is actuated to open position. This means is herein shown as comprising fluid pressure operated means, for which purpose there is provided a second cylinder 54 with a piston 60 reciprocatory therein and a rod 59 connected thereto extended from the cylinder and having a pin and slot connection 58 with the valve actuating lever 57. One end of the cylinder is connected by a pipe 52 through a flexible pipe section 51 with pipe 50 and thereby through pipe 43 with the pilot cylinder 40. The opposite end of cylinder 54 is connected by a pipe 62 through a flexible pipe section 61 with pipe 41 and thereby with the pilot cylinder. The pipe sections 52, 62 may have control valves 53, 63 interposed therein.

To exhaust the fluid pressure retained in the container when the pressure fluid control valve 25 is closed and during the filling of material into the container, a valve controlled exhaust outlet leads from the top of the container having a pipe 69 connected thereto and may have a pressure gauge 70 interposed in the connection. In an automatic system the pipe 69 is connected with the conveying conduit 62, and for this purpose said pipe is connected with the casing 65 at the outer side of the outlet valve 55, said casing being in the nature of a valve casing. The valve 55 is adapted to control the connection of pipe 69 with casing 65 by arranging a valve seat in

the valve casing at the connection of pipe 69 therewith against which valve 55 seats when moved to container outlet opening position, and thus shutting off the connection of pipe 69 with pipe 68 during the discharge of material from the container. The successive quantity of material delivered from the container may be varied by adjusting the abutments 47, 48 and thus regulating the time the material inlet control gate and fluid pressure inlet control valve, as well as the material outlet control valve, are actuated.

In Figure 4 there is shown a modified arrangement of the closure means to pressure seal the material inlet opening, the structure being the same as that shown in Figure 3 except that a plunger 84 having a tapered end 85 is secured axially of the sleeve 76 by extending the reduced threaded end through the globular wall and secured by nut 86, the plunger is of less diameter than and engages in the fluid pressure inlet pipe which is extended into and connected to the casing 72, whereby the fluid pressure will act initially on said plunger as a piston to move the closure means to material inlet closing position, and as the plunger is of less diameter than the fluid pressure in the pipe a portion of the fluid will pass between the plunger and pipe so that the full force of the pressure thereof will not act as a moving force on the closure and thus reducing the velocity at which the closure is moved to the inlet opening. The plunger is of a length so that it will be clear of the fluid pressure inlet pipe when the closure means is in inlet closing and sealing position and thus the full force of the pressure will serve to hold the closure to the seat 79.

The apparatus is in the nature of a weighing mechanism, since loads of a predetermined quantity and weight are filled into and discharged from the container in successive sequence, and a register may be provided actuated from the movement of the container by the filling of each load into the container to register the number of loads filled into and discharged from the container, and as the successive loads are of predetermined weight, the total weight transported in a given period of time may be determined by multiplying the number of the loads by the weight thereof.

We claim:

1. In material transporting means, a container for the material having a material inlet and outlet, an outlet for the exhaust of fluid pressure from the container and a connection with a source of fluid pressure to discharge material from the container, valves to control the material inlet, the fluid pressure connection and the exhaust outlet, resilient supporting means for the container normally urging the container upward to predetermined position in the no-load condition of the container and adapted to have predetermined descending movement against said resilient supporting means by the filling of a quantity of material of predetermined weight into the container, and fluid pressure operated means having operative connections with said valves and controlled by the movement of the container to normal no-load position to actuate the valves to open the material inlet and exhaust outlet and close the connection of the container with the source of fluid pressure and fill material into the container, and by the movement of the container to loaded position actuate the valves to close the material inlet and exhaust

outlet and open the connection of the container with the source of and enter fluid pressure into the container to discharge the material from the container.

2. In material transporting means, a container having a material inlet and outlet and a pressure inlet, valve mechanisms to control said material inlet and pressure inlet, fluid pressure operated means having an operative connection with and adapted to actuate said valve mechanisms, resilient supporting means for the container adapted to urge the container to and support it in predetermined position in the no-load condition of the container and adapted to have descending movement against the action of its resilient supporting means proportional with the quantity of material filled therein, and means to render the fluid pressure operated means operative to actuate the valve mechanisms to open the material inlet and close the fluid pressure inlet to the container by the positioning of the container by its resilient means in the no-load condition of the container, and render said fluid pressure operated means operative to actuate the valve mechanisms to close the material inlet to the container and open the fluid pressure inlet to the container to loosen and extrude material thereby from the container at a predetermined point in the descending movement of the container effected by the filling of a predetermined quantity of material into the container.

3. In material transporting means as claimed in claim 2, anti-friction guiding means for the container co-operating with the resilient container supporting means to guide the container in its movement.

4. In a material transport system, a container for the material to be transported having a material inlet and outlet and valve controlled connections with a source of fluid pressure to loosen the material in and extrude material from the container through the outlet, an annular member of yielding material disposed about the material inlet within the container to constitute a valve seat, and a valve for the material inlet normally assuming an inlet opening position and adapted to be moved to and seated against the valve seat and pressure seal the material inlet by the force of the material extruding fluid pressure, said valve having a face to seat against the valve seat and a sleeve extended rearwardly of the valve face, a casing opening to and upon which the valve sleeve is slidably mounted and the connection with the source for the material extruding fluid pressure leading to said casing, said casing having ports opening to the container adapted to be closed by the valve sleeve with the valve in inlet opening position and to open said ports to the container when the valve is seated against the valve seat to admit the material extruding fluid pressure through the ports to the container.

5. A material transporting system as claimed in claim 4, wherein the extruding fluid pressure is entered into the container through a pipe extended into the container and connected with the casing upon which the valve sleeve is slidably mounted, and a plunger carried by the valve axially within the sleeve thereof to have movement into and out of the fluid inlet pipe connected with the casing and of a diameter less than the diameter of said pipe to control the connection of and open said pipe to the casing.

6. In a material transport system, a resilient-

ly supported container normally urged to predetermined position in the no-load condition of the container and adapted to have descending movement proportional with the quantity of material filled therein, said container having a material inlet and outlet and valve controlled connections with a source of fluid pressure to loosen the material in and extrude the material from the container, a valve for the material inlet normally assuming an inlet opening position and moved to inlet closing position by the entrance of the material extruding fluid pressure into the container, and fluid pressure operated means to actuate the fluid pressure inlet control valve to opening and closing positions comprising a cylinder having connections at opposite ends with a source of fluid pressure, a piston reciprocatory therein having an operative connection with said valve, and valve mechanism interposed in the connections of the cylinder with the source of fluid pressure operative by the movement of the container to normal no-load position thereof to connect the cylinder at one side of the piston with the source of fluid pressure to move the piston to actuate the pressure inlet control valve to closing position, and to connect the cylinder at the opposite side of the piston with the source of fluid pressure to move the piston to actuate the fluid pressure inlet control valve to open position at a predetermine point in the descending movement of the container effected by filling material therein to admit the material aerating and extruding fluid pressure to the container.

7. In a material transport system as claimed in claim 6, a valve to control the filling of material into the container having an operative connection with and actuated by the piston of the fluid pressure operated valve actuating means to shut off the flow of material to the container when the fluid pressure inlet control valve is actuated to open position to connect said fluid pressure with the container and actuate said valve to open position to fill material into the container when the fluid pressure inlet control valve is actuated to closed position.

8. In a material transport system as claimed in claim 6, a valve for the outlet of the container, and fluid pressure operated means to actuate said valve to outlet closing position when the fluid pressure inlet control valve is actuated to closed position, and to actuate said outlet valve to outlet opening position when the fluid pressure inlet control valve is actuated to open position.

9. In a material transport system as claimed in claim 6, a valve for the outlet of the container, and fluid pressure operated means for actuating said valve comprising a second cylinder connected at the opposite ends with the source of fluid operating pressure for the first cylinder, a piston in said second cylinder having an operative connection with the outlet valve, and the valve mechanism for controlling the connection of the first cylinder with its source of fluid pressure operative to connect said source of fluid pressure with the second cylinder at one side of the piston to actuate the valve to close position when the fluid pressure inlet control valve is actuated to closed position and connect the fluid pressure with said second cylinder at the opposite side of the piston to actuate the outlet valve to open position when the fluid pressure inlet control valve is actuated to open position.

10. In a material transport system as claimed in claim 6, a valve for the outlet of the container,

and fluid pressure operated means for actuating said valve comprising a second cylinder connected at the opposite ends with the source of fluid operating pressure for the first cylinder, a piston in said second cylinder having an operative connection with the outlet valve, and the valve mechanism for controlling the connection of the first cylinder with its source of fluid pressure operative to connect said source of fluid pressure with the second cylinder at one side of the piston to actuate the outlet valve to closed position when the fluid pressure inlet control valve is actuated to closed position and connect said fluid pressure with said cylinder at the opposite side of the piston to actuate the outlet valve to open position when the fluid pressure control valve is actuated to open position, an outlet from the container to exhaust the fluid pressure therefrom displaced by the material filled into the container, and said valve for the material outlet being operative to shut off said exhaust outlet from the container when said valve is moved to outlet opening position and open said exhaust outlet when the valve is moved to outlet closing position.

11. In material transporting means, a container for the material having a material inlet and outlet and a connection with a source of fluid pressure to exert an extruding force on the material in the container, loosen the material in the lower portion of the container and discharge the material through the container outlet, and said fluid pressure entered into the container serving as the conveying vehicle for the material discharged from the container, valve mechanisms to control said material inlet and fluid pressure connections, resilient supporting means for the container normally urging the container to predetermined position and adapted to have predetermined descending movement against said resilient supporting means by the filling of a quantity of material of predetermined weight into the container, fluid pressure operated means having an operative connection with the valve mechanisms for material inlet and fluid pressure connections controlled by the movement of the container to normal on load and loaded positions to alternately control the filling of material into the container and the aerating and extruding of the material therefrom.

12. In material transporting means as claimed in claim 11, adjustable means controlled by the movement of the container to regulate the operation of the fluid pressure operated valve actuating means and thereby regulate the quantity of material successively filled into and extruded from the container.

13. In material transporting means, a container having a material inlet in the top and a material outlet, a valve seat of flexible material disposed about the inlet within the container, a casing in the container axially of the inlet having ports opening to the container, a valve for the inlet carried by said casing to have movement toward and away from the inlet and control the opening of the casing ports to the container, said valve normally assuming a position away from the inlet to shut off the ports from the container and having an arcuate face to seat against the valve seat and effect a wiping of material from and an intimate contact between the arcuate face of the valve and seat to pressure seal the container from the inlet, and a pipe adapted for connection with a source of fluid pressure and connected with the casing to deliver fluid pres-

sure into the container, the fluid pressure being operative to actuate the valve to open the casing ports to the container and move the valve to the inlet and retain it in inlet closing position.

- 5 14. In material transporting means, a container having an inlet and an outlet for the material and valve controlled inlet means for fluid under pressure, means for controlling the inlet to fill
10 the inlet, a valve casing connected to the outlet adapted for connection of a conveying conduit thereto, a conduit connecting the top of a container with the valve casing for exhausting fluid pressure from the container, and a valve in said
15 valve casing operative to control the container outlet and the connection of said conduit with the valve casing.

- 15 15. In means for delivering and transporting material by a fluid under pressure, a container for the material having a material inlet in the
20 top and an outlet, a pipe extended into the container adapted to be connected with a source of and enter fluid under pressure on the top of the material in the container, an annular member of
25 yielding material disposed about the material inlet within the container to constitute a valve seat, a valve having a face to seat against the

valve seat and a sleeve extended below the valve face, a casing opening to and upon which the valve sleeve is mounted and forming therewith a chamber, and said valve adapted to have movement on the casing toward and away from the valve seat and normally assuming a position away
5 from the inlet, a pipe extended into the container adapted for connection with a source of and to enter fluid under pressure into the container and connected with the chamber formed by the casing
10 and valve sleeve and the pressure entering said chamber actuating the valve to and hold the same against the valve seat to close and pressure seal the container inlet, and said casing having ports
15 opening to the container adapted to be closed by the valve sleeve with the valve in inlet opening position and open said ports to the container when the valve is seated against the valve seat
20 to admit the fluid under pressure through the ports to the container, and means carried by the valve to control the connection of the fluid pressure pipe with said chamber to effect a slow movement of the valve to the valve seat by the initial flow of the fluid pressure from the pipe.

JOSEPH E. KENNEDY.
HERBERT W. JOHNSON.