May 3, 1932. J. F. GOETZ 1,857,084

AIR PRESSURE DISPENSER

Filed May 28, 1928 4 Sheets-Sheet 1

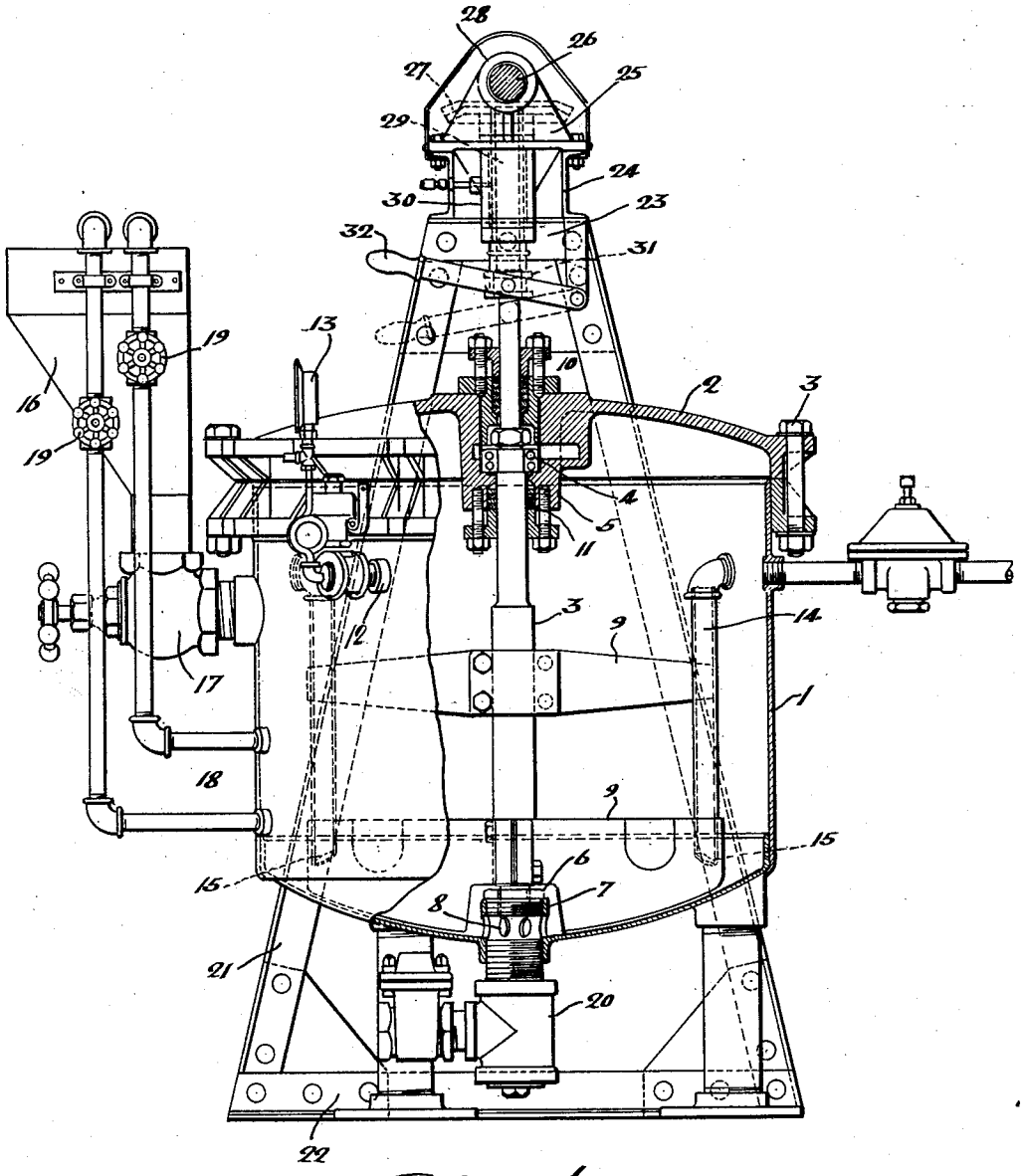

Fig. 1.

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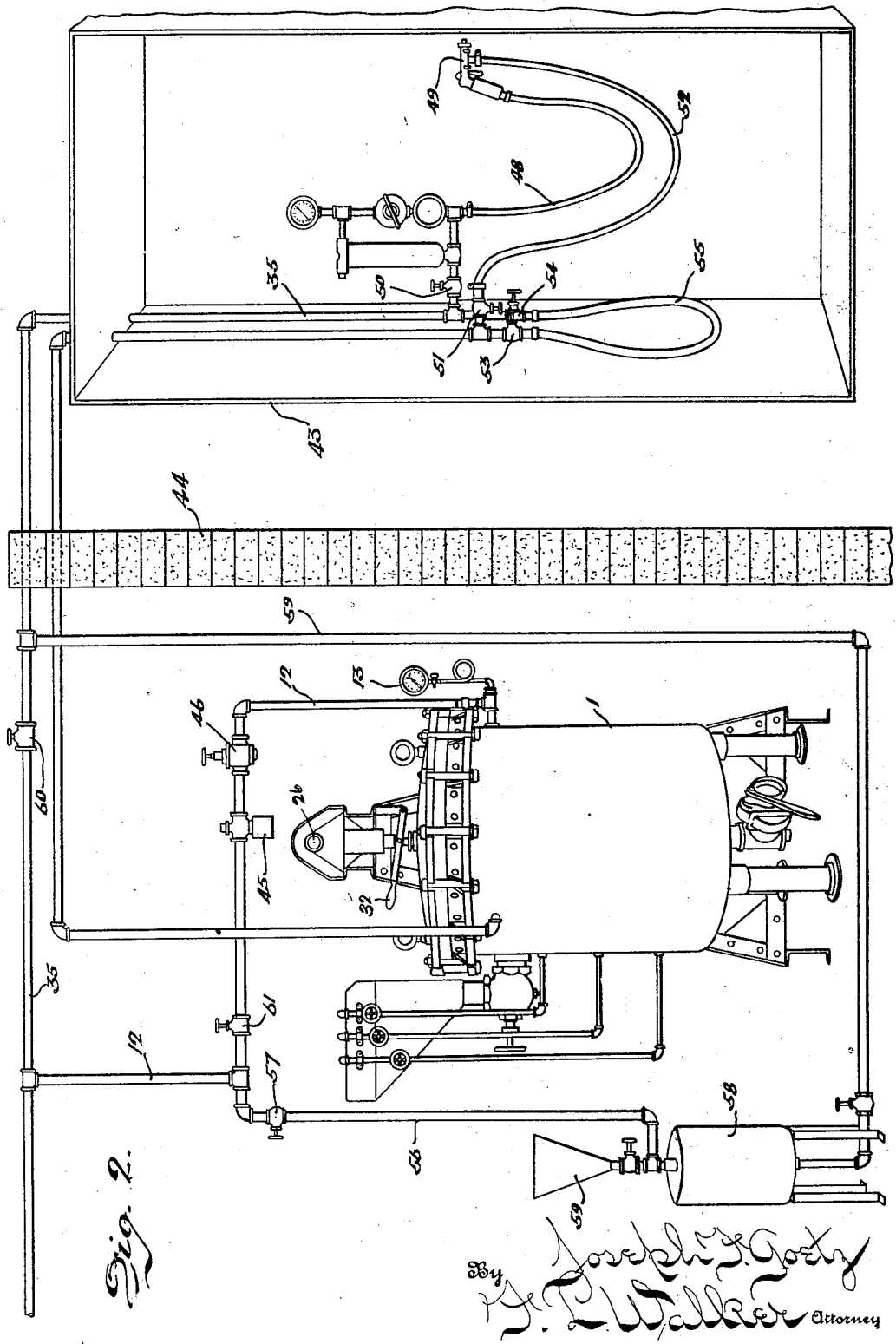

Fig. 2.

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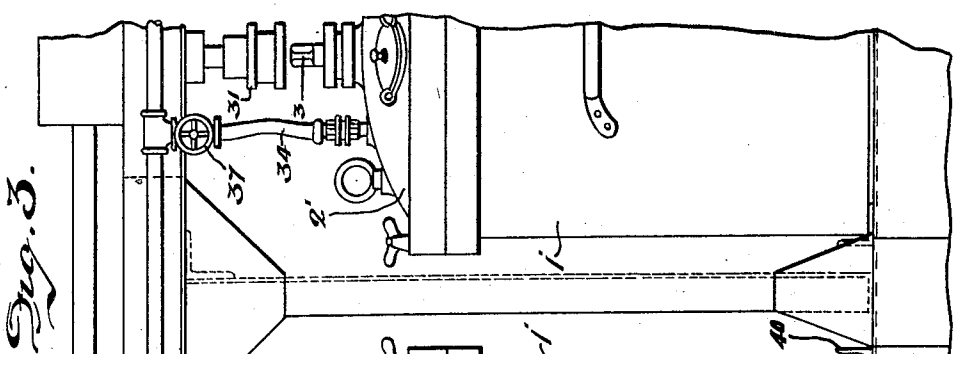

Fig. 3.

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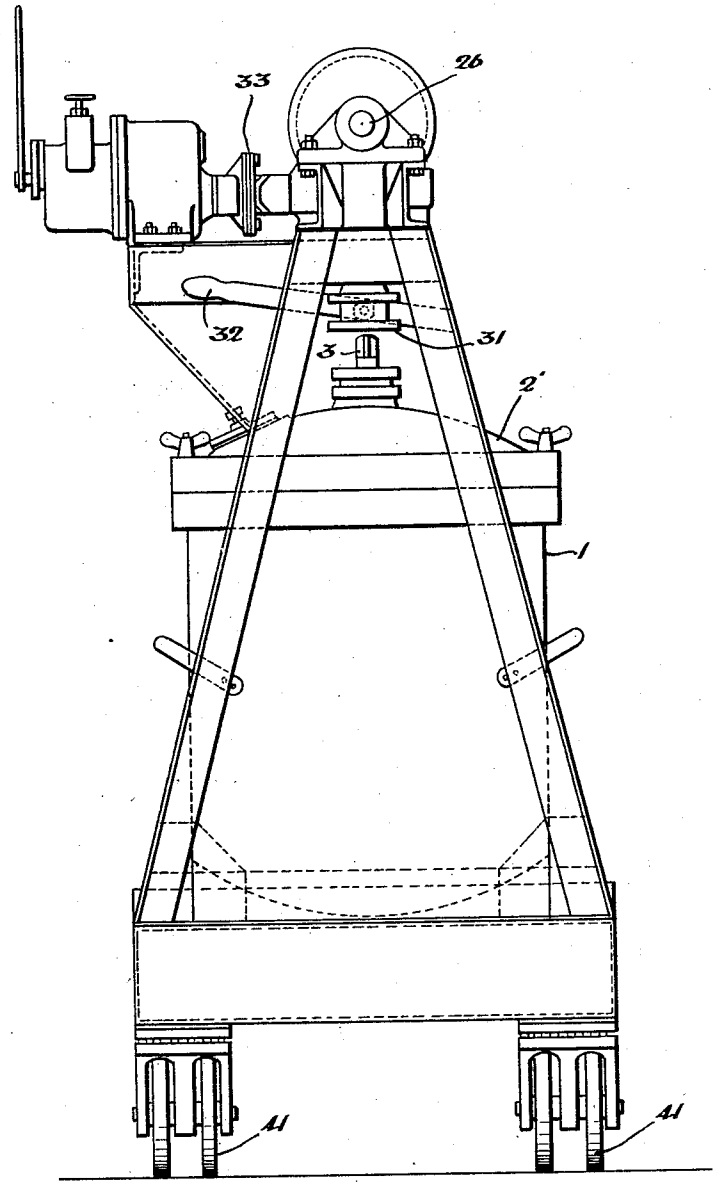

Fig. 4.

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UNITED STATES PATENT OFFICE

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AIR PRESSURE DISPENSER

Application filed May 28, 1928. Serial No. 281,306.

My invention relates to mixing and dispensing apparatus, and more particularly to an apparatus wherein liquids such as paint, lacquer, varnish, disinfectant, insecticide, spray solutions, and the like are maintained in constant state of agitation, while under air pressure by which the agitated and mixed material is simultaneously discharged.

In the present invention there is contemplated a system of liquid agitation and distribution which is particularly applicable to factory use in which the supply reservoirs or tanks having therein mixing apparatus may be distantly located from the point of application of the paint, lacquer, varnish or other liquid, in a fireproof compartment from which the mixed liquid is distributed under pressure to the place of application.

Briefly stated the apparatus includes a mounting frame which may be stationary or portably mounted on rollers, having provision for a series of interchangeable mixing and pressure tanks which are detachably engageable with driving mechanism, air pressure and discharge conduits mounted upon such mounting frame structure. The driving mechanism includes a common drive shaft preferably actuated by a compressed air motor to insure safety against ignition of combustible or explosive vapors. Operatively connected with this main drive shaft at spaced intervals are countershafts having independently operable clutch means carried thereon for detachably engaging the stirring or agitating mechanism of the several pressure mixing tanks positioned upon the structure. These mixing tanks are provided interiorly with rotary agitators and are connected by detachable hose connections with the supply conduit of air under pressure by which the mixed contents of the tanks are discharged through distributing conduits to a sprayer head by which the material is applied. Each pressure tank is provided with a filling hopper connected by a valved inlet with the tank. Inasmuch as a sight or gage glass is impractical for determining the liquid level of paint, lacquer, varnish or the like, a series of test conduits are provided at different levels, all discharging into the filling hopper.

These test conduits are provided with cut-off valves so that by successively opening the valves of different conduits the level of the contents of the tank may be ascertained. Such liquid as may be discharged through the level testing conduits is returned to the tank.

The materials used are ordinarily placed in the tank in a concentrated or thick condition and a suitable quantity of thinning material or solvent is added. The material is thoroughly mixed and kept in a state of agitation by stirring apparatus, causing the heavy ingredients to be held in suspension, and the mixture maintained uniformly.

In the distribution system a chamber is provided into which a quantity of thinning material, solvent or a cleanser liquid may be introduced and by manipulation of properly placed valves in the system, air may be admitted to such chamber to force the thinning material or cleansing liquid through the distribution system and back to the pressure mixer tank. Thus the lines are cleaned and deposits of material removed and the solvent or thinning material subsequently utilized in the mixture of additional material.

The object of the invention is to simplify the structure, as well as the means and mode of operation of mixing and distributing liquids whereby such mechanism will not only be cheapened in construction, but will be more efficient in use, positive in operation, uniform in action, substantially automatic in the intermixture and agitation of materials, of increased safety and unlikely to get out of repair.

A further object of the invention is to provide a system and actuating apparatus wherein pressure tanks equipped with mixing or agitating apparatus may be interchangeably substituted at will.

A further object of the invention is to provide improved driving means applicable to a series of pressure mixing tanks enabling the operation of each tank to be initiated and discontinued independently of the operation of other tanks.

A further object of the invention is to provide an improved form of pressure mixing apparatus including a pressure tank and agi-

tating mechanism mounted therein with improved means for ascertaining the liquid level of the contents of the tank.

A further object of the invention is to provide a pressure distribution system of the character mentioned, having means for cleansing the conduits of the system and returning the solvent or cleansing liquid to the pressure tank.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the accompanying drawings, wherein is shown the preferred, but obviously not necessarily, the only form of embodiment of the invention, Fig. 1 is a vertical sectional view of a mixing tank having agitating means therein and a driving mechanism detachably engageable with the agitating mechanism of the tank embodying the present invention. Fig. 2 is a general view somewhat diagrammatic illustrating the system in which the pressure mixing tank illustrated in Fig. 1 is employed. Fig. 3 is a side elevation of a battery of mixing tanks mounted in a supporting structure, having common driving means for the several tanks and a common air supply conduit communicating therewith. Fig. 4 is an end elevation of the assembly of pressure mixing tanks and a portable mounting structure therefor.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to Fig. 1 of the drawings, 1 is a tank capable of resisting moderately high pressures having a removable cover section 2 which is secured to the tank 1 in any suitable manner as by means of clamp bolts 3 located at peripherally spaced intervals. Centrally disposed within the tank 1 is a vertical revoluble shaft 3 mounted in ball bearings 4 within an inwardly extending hub 5 of the cover portion 2. At its lower end the shaft 3 is journalled in a bronze bearing collar 6, screw threaded into an upstanding nipple 7 formed integral with the bottom of the tank 1 which nipple 7 also provides a drain outlet, being provided with lateral openings 8 for this purpose. Carried by the revoluble shaft 3 are agitating stirring blades or arms 9 which may be of any suitable shape and any desired number in accordance with the character of material operated upon. In the present instance a scraping blade has been shown mounted upon the shaft 3 contiguous to the bottom of the tank 1 and an additional stirring arm at a higher level. Obviously, these elements may be increased in number and disposed at various levels. Within the hub 5 there are formed packing glands 10 and 11 to prevent the escape of air under pressure from the tank and the escape of vapors. The tank is provided with an air supply conduit leading thereto, through which air is admitted under pressure above the liquid level of the contents of the tank. Under the usual conditions of operation air is supplied to the system under an initial pressure of approximately eighty-five pounds per square inch, which by means of a pressure reducing valve is reduced to approximately thirty to fifty pounds per square inch for admission to the tank 1. The air supply conduit 12 leading to the tank is preferably, though not necessarily, provided with a pressure gage 13 by which the tank pressure may be ascertained and proper adjustment maintained for the required pressure. Air admitted to the tank 1 under pressure displaces the liquid contents of the tank, which are intermixed and maintained in a state of agitation, whereby the heavy particles are maintained in suspension, through outlets or distributing conduits 14 the inner ends 15 of which extend downwardly contiguous to the side walls of the tank 1 and to approximate relation with the bottom of such tank. These distribution conduit extensions 15 are disposed out of the path of rotation of the agitator arms 9. Located at one side of the tank 1 is a filling hopper 16 through which material may be introduced into the tank. This hopper 16 is connected through an inlet valve 17 with the interior of the tank. During normal operation the valve 17 is maintained closed and is opened only when additional material is to be admitted from the hopper 16 to the tank 1. A series of test conduits 18 are provided leading from the tank 1 at different levels. There may be any number of such test conduits, all of which discharge into the filling hopper 16. These conduits 18 are provided with individual cutoff valves 19. By successively opening cutoff valves 19 of different test conduits 18 to ascertain whether a liquid mixture will be discharged or only air from above the liquid level, the level of the contents of the tank may be approximately ascertained. All liquid discharged through these test conduits 18 in ascertaining the level of the contents of the tank is returned from the hopper 16 through the inlet valve 17 to the tank. When it is desired to cleanse the tank the remaining contents, and subsequently the cleansing liquid may be withdrawn through the drain outlets 8 in the nipple 7 which nipple is connected with a valved drain outlet 20. One or more tanks as described may be mounted either permanently or removably in a frame structure carrying the driving mechanism for the agitating apparatus. In the present construction there is shown a frame comprising upwardly inclined struts 21 interconnected at their lower ends by a transverse

angle bar 22 and at their upper end by a transverse bar 23 which in turn supports longitudinally disposed spaced beams 24. Upon these beams 24 are mounted bearing blocks 25 for a longitudinally disposed drive shaft 26. The main drive shaft 26 carries at spaced intervals gear pinions 27, each of which meshes with a beveled gear 28 upon a vertically disposed shaft 29 mounted in suitable bearings 30 supported upon the frame structure. Slidingly adjustable upon the lower end of each dependent stub shaft 29 is a sliding clutch sleeve 31 which may be raised and lowered by means of a shift lever 32. The upper end of the main shaft 3 of the mixing apparatus is provided with a polygonal extremity agreeing with a like opening in the sliding clutch collar 31. The tank 1 is positioned with its mixer shaft 3 in axial alignment with the dependent stub shaft 29 of the driving apparatus. The sliding clutch collar 31 is lowered by the shift lever 32 and operatively connects the driven stub shaft 29 of the driving mechanism with the polygonal extremity of the mixer shaft 3, thereby driving the mixing apparatus.

As before mentioned, the tanks 1 may be either permanently or removably mounted in relation with the driving apparatus frame. In Fig. 3 there is shown a series of removable mixer tanks 1′ provided with mixer apparatus of the character before described. In this case the discharge conduits 14 preferably lead from the cover sections 2′ of the tanks and the air inlet connections 12 of the tanks are connected by detachable couplings 33 with flexible hose conduits 34 communicating with the main air supply line 35. The air is admitted to the supply conduit 35 under high pressure and is reduced at the reducing valve 36 to the normal tank pressure. Each branch conduit 34 is provided with a cutoff valve 37. In lieu of providing each tank with a pressure gage as illustrated in Fig. 1, a gage 38 and relief valve 39 may be connected with the air supply conduits 35, whereby they will be common to all of the mixer tanks of the series. An air motor 39 mounted upon one end of the frame structure is preferably employed to drive the main shaft 26. Inasmuch as paint, lacquers, and varnishes are highly inflammable and frequently give off explosive vapors, such air motor is much preferred to an electric motor for driving the main shaft 26 and thereby the several mixing apparatus. Guide flanges 40 upon the base of the frame structure serve to properly position the several tanks 1′ with the upper ends of their drive shafts 3 in axial alignment with the dependent stub shafts 29. By lowering the sliding clutch sleeve 31 the mixer shaft may be connected with the driving mechanism at will. The assembly of interchangeable tanks 1′ is shown in end elevation in Fig. 4 in which view the supporting structure for the driving mechanism is also shown mounted upon rollers 41, and the entire structure may be rendered portable.

In Fig. 2 the system in which the pressure mixer is employed has been illustrated somewhat diagrammatically. As a protection against fire or explosion the mixer unit has been located in a compartment separated by fire wall 43 from the spray booth 44 in which the paint, lacquers, varnish, or other liquid is applied. In this installation the high pressure air conduit 35 communicates through the branch conduit 12 having therein a strainer and water separator 45 and air reducing valve 46 with the mixer tank 1. Continuing beyond the branch conduit 12 leading to the tank 1 the high pressure air conduit 35 leads to the spray booth 43 where it connects to the branch conduit 47 and hose connection 48 with the jet nozzle of the air brush or sprayer head 49. A valve 50 controls the discharge of air from the supply conduit 35 through the hose connection 48 to the sprayer head 49.

The discharge conduit 14 leads from the tank 1 to the spray booth 43 and communicates through a cutoff valve 51 with the flexible hose conduit 52 leading to the air brush or sprayer head 49. The air admitted through the branch conduit 12 to the tank 1 displaces the liquid within the tank, causing it to be discharged through the conduit 14 to the sprayer head 49 where it is subjected to the air jets under higher pressure from the supply conduit 35 causing the material to be blown in a spray upon the surface to be coated. To provide for cleansing the distribution conduit 14 to prevent accumulation of a deposit of paint, lacquer, varnish or the like, and to remove the contents of the conduit in the event that the material of a different character or different color is to be employed, means is provided for washing out the discharge conduit with a solvent, thinning solution or cleanser. To this end the extremity of the liquid distribution conduit 14 and the high pressure air conduit 35 are interconnected through control valves 53 and 54, and an intermediate flexible hose connection 55. In lieu of this hose connection the pipes may be directly coupled together at their extremities with an interposed cutoff valve. Leading from the branch conduit 12 of the air supply system is a conduit 56 having therein a normally closed valve 57. The conduit 56 leads to a container 58 into which may be introduced through funnel 59 a quantity of liquid solvent, thinner or cleansing solution. This container 58 is connected through the conduit 59 with the high pressure air conduit 35 leading to the spray booth. When it is desired to cleanse the system a cut-off valve 60 in the high pressure air conduit 35 intermediate the branch conduit 12 and the conduit 59 is closed as is also a cutoff valve

61 in the branch conduit 12. At the same time the valve 57 in the conduit 56 is opened. This admits air under pressure from the conduit 35 through the initial portion of the branch conduit 12 and conduit 56 to the container 58 into which has been previously introduced a quantity of solvent, thinner, or cleansing solution. This air pressure admitted to the container 58 forces the solvent or cleanser solution through the conduit 59 back to the air supply conduit 35 beyond the cut-off valve 60. In other words, the closing of the valves 60 and 61 and opening of valves 57 and 62 in the conduits 56 and 59 merely bypasses the high pressure air supply through the receptacle 58 and forcing therefrom through the conduit 59 and continuation of the high pressure air conduit 35 the quantity of solvent or cleansing liquid. Such quantity of this liquid as may be necessary to cleanse the sprayer head 49 may be discharged therefrom, after which the valve 50 is closed. The valves 53 and 54 being opened the solvent or cleansing solution is circulated from the high pressure air conduit 35 through the interconnection 55 to the liquid distribution conduit 14 back to the tank 1. This returns to the tank 1 not only all spray material which may remain in the conduit 14 at the conclusion of the spraying operation, but it also returns to the tank 1 under the influence of the air pressure, the solvent or cleansing solution for cleansing purposes. It will be understood that during this cleansing operation the tank is relieved of internal pressure by opening the filling valve 17. The thinner material or solvent may be utilized during subsequent operation for intermixture with additional supplies of material introduced into the tank 1.

While the pressure mixer apparatus has been described primarily to its application of spraying paints, lacquers, varnishes and the like, such tank may be mounted upon a vehicle for spraying roadways with dust laying solution or for applying marking lines to road surfaces. Likewise it may be utilized for spraying disinfectants and for spraying insecticide solution upon trees and shrubbery. The uses mentioned are merely suggestive of the wide range of applications of the invention in one or another of its several forms of embodiment.

From the above description it will be apparent that there is thus provided a construction of the character described, possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions and arrangement of parts, without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention is described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. The herein described system of mixing and distribution of liquids, including a pressure tank, agitator means therein, driving means for the agitator, a sprayer head for the agitated liquid, a high pressure fluid conduit leading to the sprayer head, a branch conduit from said high pressure conduit leading to the pressure tank, a pressure reducer in said branch conduit, a discharge conduit from the tank leading to the sprayer head, a valved bypass conduit communicating at its ends with the high pressure conduit, a cutoff valve in the high pressure conduit between the connections of said bypass conduit, a receptacle for said bypass conduit for the introduction of a cleansing agent, and a valved bypass connection between the high pressure conduit and the discharge conduit adjacent to the sprayer head, the arrangement being such that normally fluid under pressure is delivered to the sprayer head while a portion of the fluid under reduced pressure is delivered to the tank and induces simultaneous delivery to the sprayer head through the discharge conduit of the liquid contents of the tank, and subsequently upon adjustment of the several valves a quantity of cleansing agent is delivered under fluid pressure from the introduction receptacle through the high pressure conduit to the bypass connection with the discharge conduit and thence in reverse direction through the discharge conduit to the tank.

2. In an apparatus of the character described, a tank, a filling hopper communicating therewith, a series of test conduits leading from the tank at different levels and discharging into said filling hopper, valve means by which the conduits may be successively opened, valved connections between the hopper and tank, and means for inducing a flow of the contents of the tank through such conduits into the hopper.

3. In an apparatus of the character described, a pressure tank, a filling compartment communicating therewith, a test conduit leading from the tank at a given level and discharging into the filling compartment, a valve controlling said conduit, and a conduit for admitting fluid under pressure to said tank to induce a flow through said conduit by which it may be determined whether the liquid level is above or below the level of the conduit connection with the tank, the

discharged liquid being returned to the tank through the filling compartment.

4. In an apparatus of the character described, a pressure tank, a filling compartment therefor, a series of conduits leading from the tank at different levels and discharging into said filling compartment and means for inducing a circuitous flow of liquid from the tank through one or another of said conduits and back to the tank whereby the approximate liquid level of the contents of the tank may be ascertained.

In testimony whereof, I have hereunto set my hand this 17th day of April, A. D. 1928.

JOSEPH F. GOETZ.