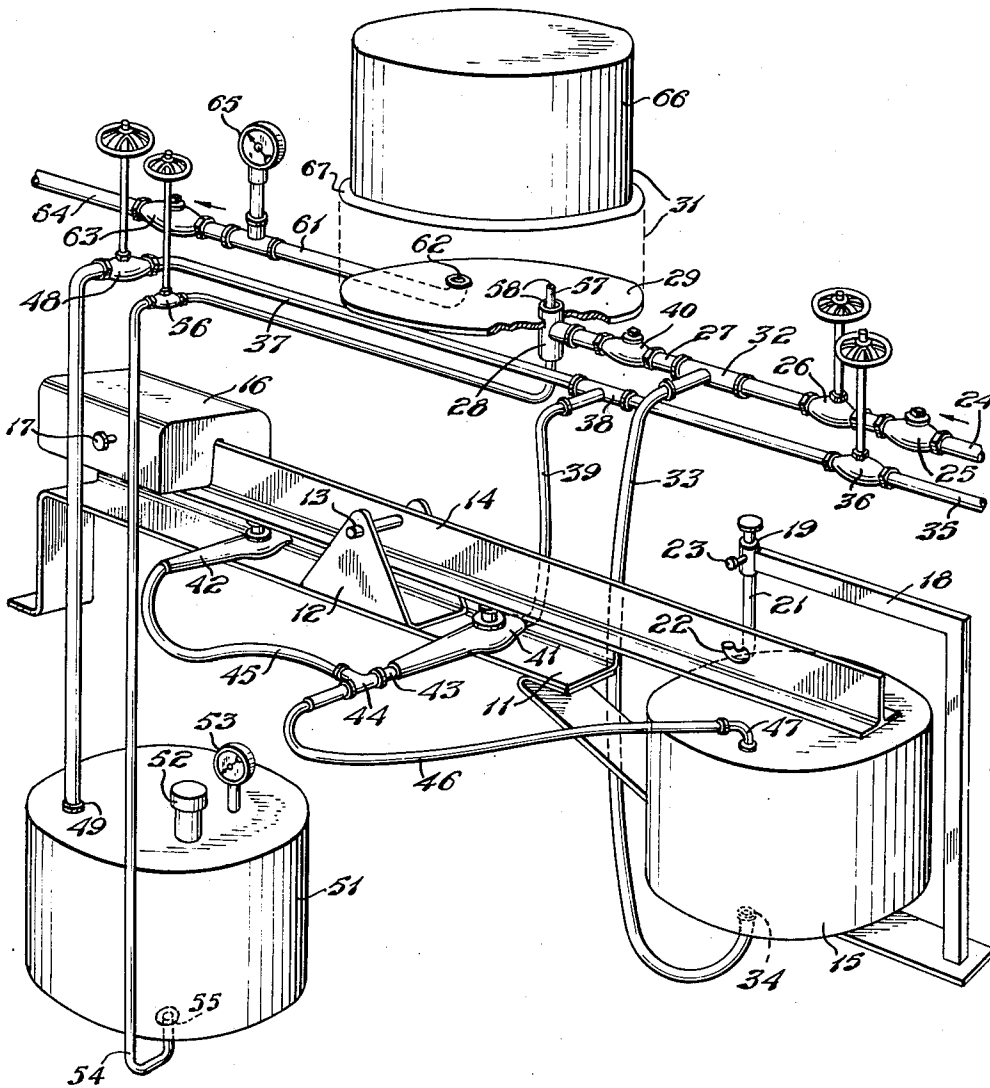


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PRESSURE JET APPARATUS
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Fig. 1.



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PRESSURE JET APPARATUS

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My invention relates to apparatus for producing jets of liquid, and more particularly relates to a machine for washing automobiles and machinery and for flushing radiators, plumbing, and the like, for which a high pressure jet is desirable, and has as a purpose the provision of simple, rugged, and easily controlled means for developing and propelling a jet of liquid in repeated surges and at relatively high nozzle velocity and pressure.

A further purpose is to provide apparatus utilizing compressed air, which is usually available at automobile service stations, and garages, to supplement or to substitute for hydraulic pressure in the liquid supply line.

Still another purpose of my invention is to provide apparatus utilizing compressed air to force a supply of solvent or detergent into the water stream and then to eject the mixture at greater pressure than normally hydraulically available.

A further purpose of my invention is to provide apparatus in which compressed air may be used intermittently to propel a jet stream of water, or of a mixture of water and cleaning compounds, whereby a saving in the use of compressed air is effected.

Another purpose of my invention is to provide in apparatus for the above stated purposes, a surge tank for maintaining a high average pressure on the ejected stream which also serves as an emulsifying chamber for solvents and detergents and which preferably affords the operator visual control of the supply and emulsification of the cleaning compounds and thereby more efficient and economical operation.

In many rural districts, water is available only from tanks or reservoirs which afford only slight supply pressure, quite insufficient to break loose accumulations of grease and dirt in manually inaccessible places. Furthermore it is established in such hydraulic flushing operations that a few jets of relatively high velocity are more effective than a steady stream at relatively low mean velocity, and it is a purpose of my invention to make such high velocity jets available to rural and urban communities alike, independently of supply-line water pressure.

Broadly stated my invention embodies the use of a closed tank mounted on one end of a counterweighted pivot beam and having a bottom connection to the water supply line through which it may be alternately filled and discharged. Compressed air, valved by the tilting of the pivot beam discharges the tank, each time it fills, back

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into the supply line, wherein a check valve directs the water, now under relatively heavy pressure into a surge chamber, also closed to the atmosphere, and thence to the washing nozzle. The compressed air is also connected to a container for solvents or detergents and may be used to force such cleaning compounds into the surge chamber in a manner to produce efficient emulsification. Means are provided for locking the pivot beam in position to cut off or leave on the compressed air, so that either a gentle stream at supply line pressure or a violent spray of air and water may be obtained at the washing nozzle in addition to the pressure jets obtained when the pivot beam is free to tilt.

I will describe a preferred form of my apparatus and will then point out the novel features thereof in claims.

The accompanying drawing is a perspective view of an apparatus embodying my invention, the surge chamber being shown partly assembled and in part broken away to provide better illustration of the pipe connection thereto.

Having reference now to the details of the drawings, this embodiment of my invention comprises a frame 11 to which is secured a bearing bracket 12 providing support for a pivot pin 13. A beam 14 is mounted upon the pivot pin 13 so as to pivot within the bracket 12 and supports at one end a tank 15 and at the other end a counterweight 16, secured thereto by a set-screw 17 so as to be movable along the beam. A standard 18 has a slip bearing 19, slidably supporting a rod 21 which is connected to the beam 14 by a hook 22 and which may be locked in any desired position by a set screw 23 to prevent tilting of the beam 14.

A water supply conduit 24 is provided with a check-valve 25 and a shut-off valve 26 and has a portion 27 extending therebeyond to a T-fitting 28, one arm of which is set in the base plate 29 of a surge chamber 31 as an inlet thereto. Between the check-valve 25 and the fitting 28, is a fitting 32, from which a flexible branch conduit 33 extends to the lower portion of the tank 15, entering therethrough an orifice 34, which as will be seen serves both as inlet and outlet for water to and from the tank. An air supply line 35, leading from a source of compressed air (not shown), is similarly fitted with a shut-off valve 36, and has an extended portion 37 beyond the valve 36 provided with a T-fitting 38 from which a pipe 39 leads to a trigger valve 41. A check-valve 40 is provided in the water conduit between the fitting 32 and

the fitting 28, to prevent re-entry of water which has been pumped to the surge chamber 31.

Normally closed tripper valve 41 and a like trigger valve 42 are mounted on the frame 11 under the beam 14 and on opposite sides of the bracket 12 so that they may be alternately opened by contact with the beam 14 as one end or the other of that beam descends, and closed as the beam rises. A nipple 43 leads from valve 41 to a T-fitting 44, from which a pipe 45 branches to valve 42 and a flexible hose 46 leads to an inlet 47 in the upper portion of tank 15. Opening valve 41, with concomitant closing of valve 42, will thus admit compressed air to tank 15; and closing of valve 41 with concomitant opening of valve 42 will shut off the supply of compressed air and will permit the pressure in tank 15 to be exhausted through hose 46, T-fitting 44, and valve 42 which opens to the atmosphere.

The extended portion 37 of the air supply line 35 leads through a valve 48 to an inlet 49 in the upper portion of a container 51, adapted to contain liquid solvents or detergents or similar cleaning compounds, and having a closure 52 through which it may be filled and a pressure gage 53 by which the air pressure in the container may be measured. A pipe 54 leads from an outlet 55 in the lower portion of the container 51 to the T-fitting 28 in the base plate 29 of the surge chamber 31, and is provided with a valve 56 to regulate the flow of solvents from the container to the surge chamber. Pipe 54 is threaded to the lower arm of the T-fitting 28 and carries a nipple 57 which extends through the fitting and emerges from the upper arm thereof, leaving an annular space for the admission of water from the conduit portion 27, and forming a nozzle 58 which, by admitting the cleaning compounds concentrically of a circular water jet, encourages rapid mixture and emulsification.

A pipe 61 leads from an outlet 62 in the base-plate 29 and is provided with a check valve 63 which serves in cooperation with the check valve 25 to make the hydraulic system between these valves a one-way system. That portion 64 of the pipe 61 extending beyond the check valve 63 may be fitted with any suitable discharge devices such as a flexible hose, spray-nozzles, and the like, not a part of this invention and not shown. A pressure gage 65 mounted on the pipe 61 indicates the pressure at which the water is discharged from the jet-forming apparatus.

To enable the operator to observe the mixture of the solvents from the container 51 and the water from the tank 15, so that he may suitably regulate the mixture by manipulation of the valves 26, 36, 48, and 56, the dome 66 of the surge chamber 31 is preferably of transparent material, numerous plastic substances for that purpose being available. As illustrated, the surge chamber 31 comprises such a dome, provided with a flange 67 by which it may be clamped by any suitable clamping means to the base plate 29. The plate 29 is preferably metallic so as to receive threadedly the fittings 28 and 62. It will be understood that the exact form of the surge chamber 31 is immaterial to my invention, and that for example, a one-piece chamber having transparent windows might be substituted for the device shown.

To operate the herein-described device to produce a pressure jet in the outlet pipe 64, the

operator opens the valves 26 and 36 to the desired degree. The apparatus will at once begin pumping water, provided that water at any pressure is available at the valve 26. If the tank 15 is at the moment filled sufficiently to overbalance the counterweight 16, the valve 41 will be open and the valve 42 closed, and compressed air will rush into the tank 15 forcing water through the flexible conduit 33 to the fitting 32. As the check-valve 25 prevents the water from then flowing in that direction, the water is propelled into the surge chamber 31. As soon as tank 15 is sufficiently emptied so as to be raised by the counterweight 16, valve 41 will be closed and valve 42 will be opened, thus cutting off the compressed air and releasing the pressure in tank 15. Water will again flow through the conduit 33 to the tank 15, and this cycle will be repeated as long as both valves 26 and 36 are open. The water will enter the surge chamber 31 in surges and will depart therefrom in a continuous stream of fluctuating pressure and velocity, the maximum pressure being necessarily limited by the available air pressure, and the minimum pressure being governed by the back-pressure on the outlet of the surge chamber. The check-valve 40 will cause the pressure accumulated in the surge chamber to be expended through the outlet 62.

By opening the valves 48 and 56, the operator may inject cleaning compounds into the surge chamber there to be mixed with water at the nozzle 58 and emulsified by the surging action of the water in the chamber.

Changing the position of the counterweight 16 on the beam 14 will change the amount of water in the tank 15 required to overbalance the counterweight, and consequently the head-space in the tank above the water. This head-space acts as an accumulator for the energy of the compressed air, and consequently by regulating its size, the energy available at the beginning of each pumping stroke can be regulated, and the rapidity of pumping controlled. This, in turn will affect the steadiness of the outflow from the surge chamber 31, which thus comes under the operator's control.

If the operator so desires he may lock the valve 41 open and the valve 42 closed by manipulation of the rod 21 and set-screw 23, thus sending a stream of air through the tank 15 and surge chamber 31, to dry surfaces already washed, or to remove dust preparatory to washing.

Although I have herein shown and described only one form of pressure jet apparatus, it is to be understood that various changes and modifications may be made therein without departing from the spirit of my invention and the spirit and scope of the appended claims.

I claim.

1. Apparatus for delivering a continuous stream of water with intermittent pulses of high pressure, including: conduit means for leading a continuous stream of water from an external source of supply to the apparatus and delivering water from the apparatus for use; check valve means in said conduit means preventing reverse flow of the water in said conduit means; valve means for controlling the supply of water to said conduit means; a pivotally supported beam; a closed tank supported on said beam and spaced from the pivot thereof; means constantly acting to urge said beam to a position in which said tank is raised when relieved of water; a first flexible conduit connecting said conduit means and the bottom

of the tank, and serving to lead water at times from, and at other times to said conduit means; a second flexible conduit leading compressed air from an external source into the top of the tank; and valve means controlling the flow of compressed air through the second flexible conduit and operated by the movement of the beam to admit compressed air through the second flexible conduit to the tank when the tank is in lowered position to expel the water therefrom through said first flexible conduit, and to connect the top of the tank to the atmosphere when the tank is in raised position, the alternate lowering of the tank due to the weight of the water flowing into it and raising of the tank due to the expulsion of water therefrom being automatically and continuously effected to impart a continuous series of high pressure pulses to the stream of water issuing for use from the apparatus.

2. Apparatus for delivering a continuous stream of water with intermittent pulses of high pressure, including: conduit means for leading a continuous stream of water from an external source of supply to the apparatus and delivering water from the apparatus for use; check valve means in said conduit means preventing reverse flow of the water in said conduit means; valve means for controlling the supply of water to said conduit means; a beam pivotally supported intermediate its length; a weight mounted on one arm of said beam and a tank mounted on the other arm of said beam, the weight being effective to raise the tank when the latter is relieved of water; a first flexible conduit connecting the valve controlled water conduit means and the bottom of the tank, and serving to lead water at times from, and at other times to said conduit means; a second flexible conduit leading compressed air from an external source into the top of the tank; and valve means controlling the flow of compressed air through the second flexible conduit and operated by the movement of the beam to admit compressed air through the second flexible conduit to the tank when the tank is in lowered position to expel the water therefrom through said first flexible conduit and to connect the top of the tank to the atmosphere when the tank is in raised position, the alternate lowering of the tank due to the weight of the water flowing into it and raising of the tank due to the expulsion of water therefrom being automatically and continuously effected to impart a continuous series of high pressure pulses to the stream of water issuing for use from the apparatus.

3. Apparatus for delivering a stream of water

having detergent and other material injected under pressure into the water stream, including: conduit means leading a stream of water from an external source of supply to the apparatus and delivering water from the apparatus for use; a control valve controlling the admission of water to said conduit; a first check valve in said conduit adjacent said control valve; a second check valve in said conduit spaced from the first check valve in the direction of flow of water through said conduit; a closed tank mounted for up and down movement; means constantly urging said tank in upward direction; a first flexible conduit connected at one end with said check valve controlled conduit between the first and second check valves and at the other end connected to the bottom of said tank; a second flexible conduit leading compressed air from an external source into the top of the tank; valve means controlling the flow of compressed air through the second flexible conduit and operated by the downward movement of the tank under the weight of water entering said tank to admit compressed air to the tank to force the water therein into the conduit, and operated on the upward movement of the tank to connect the top of the tank to atmosphere; a closed chamber having an inlet in the bottom thereof to which the check valve controlled conduit, beyond the second check valve in the direction of flow of water therethrough, is connected; a nozzle arranged concentrically within said inlet, the detergent and the like being forced into the chamber through said nozzle; an outlet conduit from the bottom of said chamber; and a third check valve in said outlet conduit to prevent the reverse flow of fluid through said outlet conduit.

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