

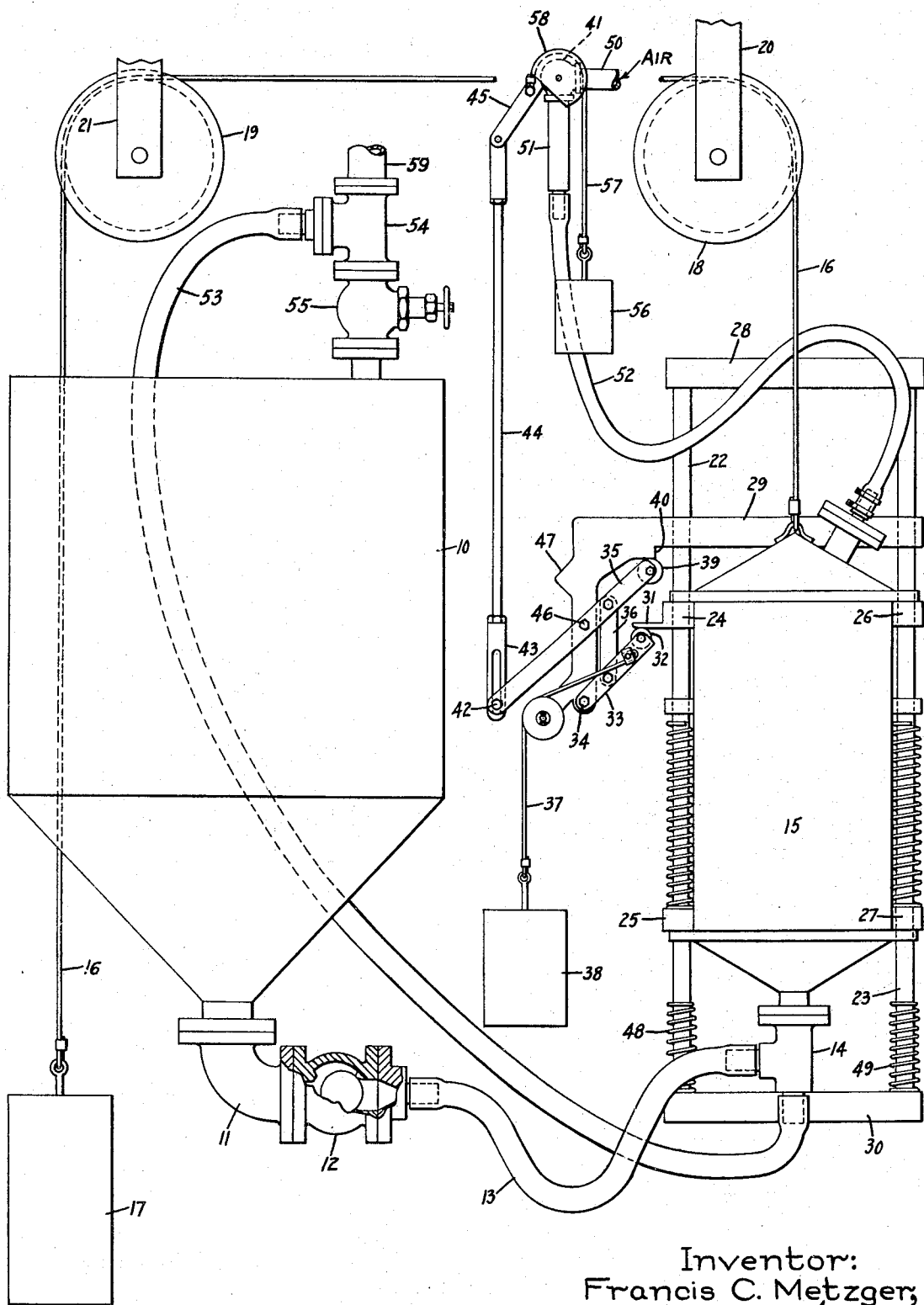
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APPARATUS FOR PUMPING AND MIXING LIQUIDS

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APPARATUS FOR PUMPING AND MIXING LIQUIDS

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3 Claims. (Cl. 103-243)

My invention relates to apparatus for pumping liquids and more particularly relates to apparatus for pumping and mixing corrosive liquids such as are used in etching the glass bulbs of electric lamps. Although rubber and other materials are not affected by the corrosive liquid, it has been difficult to utilize them fully on account of the pump construction, involving, as it did, a number of moving parts. I have devised a construction in which the rubber protective material may be readily incorporated. My pump comprises a tank into which the liquid flows by gravity from the supply tank and means for supplying compressed air to the first tank at intervals to force the liquid therein to the point desired. The parts of my pump are protected by rubber liners. By returning the unused liquid to the supply tank, the complete supply thereof is mixed.

The principal object of my invention is to provide an apparatus for pumping corrosive liquids which is economical of construction and still, which affords satisfactory protection from the liquid. Another object of my invention is to provide an apparatus for mixing as well as pumping corrosive liquids. Other objects of my invention will appear from the detailed description which follows of one species thereof and from the accompanying drawing.

The drawing is a side elevation of the liquid mixing and pumping apparatus of my invention.

The corrosive liquid is contained within the tank 10 and is mixed by the turbulence resulting from the alternate withdrawing of a quantity of the liquid from the bottom and the pouring of it back in the top. The liquid leaving the bottom of the tank 10 flows by gravity through the pipe elbow 11, the check valve 12, the flexible hose 13 and the pipe T 14 to the tank 15. This tank 15 is supported by the cable 16 and the counterweight 17, the counterweight 17 being slightly heavier than the tank 15. The cable 16 passes over the pulleys 18, 19 which are stationarily mounted through brackets 20 and 21 respectively. The tank 15 is held in position by the guide rods 22 and 23 which it engages slidably through the blocks 24, 25 and 26, 27 respectively. The rods 22 and 23 are mounted by means of the brackets 28, 29 and 30 which grip them and prevent any movement thereof.

When the weight of the tank 15 and the liquid therein becomes more than that of the counterweight 17, the tank 15 moves downward until finger 31 engages roller 32. The roller 32 is attached to arm 33 which is pivotally attached

to bracket 29 through pin 34 and to lever 35 through link 36. The arm 33 is held in this position by the cable 37 and the weight 38 which pull the arm 33 upward so that the roller 39 in the end of lever 35 rests against the projection 40 of bracket 29. As the tank 15 fills, the pressure on roller 32 increases until when the tank is filled it finally becomes so great as to cause the arm 33 to swing down. This movement occurs very rapidly once the arm 33 begins to move as the mechanical advantage of the system changes until finally the cable 37 passes below the pin 34 whereupon the arm 33 and roller 32 are pulled down out of the way of finger 31. In this way sufficient force is produced to cause adjustment of the two-way valve 41 which is connected to lever 35 through pin 42, block 43, rod 44 and lever 45. The pin 42 strikes the upper end of the slot in block 43 when the cable 37 is some distance below pin 34. The lever 35 turns about the pin 46 extending from bracket 29 and when in the down position rests against the extended portion 47 of said bracket 29. The tank 15 has moved during this interval until it rests on springs 48 and 49.

The pumping operation begins as the valve 41 is adjusted so that the compressed air of pipe 50 passes to pipe 51 and hence through hose 52 to the tank 15. The air pressure on top of the liquid forces it out the pipe T 14 through the branch connected to hose 53, through pipe T 54, valve 55 to the tank 10. Circulation of the liquid through the other branch of pipe T 14 and hose 13 is prevented by the check valve 12.

When tank 15 has been emptied, the counterweight 17 pulls it upward and the finger 31 strikes roller 39 moving it into the up position. The valve 41 is turned by the movement of lever 35 so that it stops the flow of compressed air and opens the tank connection to the atmosphere. The liquid now flows into the tank 15 and the operating cycle described is repeated. The weight 56 attached to the cable 57 passing over the pulley 58 on the stem of the valve 41 counterbalances the weight of the lever 45, rod 44 and block 43 so that the valve can be adjusted more easily. If it is desired to take some of the liquid from the tank 10, the valve 55 is closed and the liquid will be pumped out the other branch of pipe T 54 to pipe 59. Because of the construction of all parts, a rubber liner (not shown) may be used therewith to protect the apparatus from the damaging effect of corrosive liquids.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An apparatus for pumping and mixing liquids comprising a tank having openings at the top and bottom therein, a second tank mounted above and adjacent to the first tank and having top and bottom openings therein, a pipe connecting the bottom openings of said tanks, a two-way valve connected to the top opening in the first tank, to a supply of compressed air and to the atmosphere, means mounted adjacent the first tank operated by the combined weight of said first tank and the liquid therein for turning said valve to one position so that the first tank is opened to the atmosphere and the liquid flows by gravity from the second tank and into the first tank and to a second position so that the compressed air is admitted to said first tank and the liquid is forced out the bottom opening therein, a second pipe connecting the bottom of the first tank and the top of the second tank and a check valve connected in said first pipe for preventing the liquid from returning therethrough to the second tank and for causing the liquid to be forced through said second pipe to said second tank.
2. An apparatus for pumping and mixing liquids comprising a tank having openings at the top and bottom thereof, a second tank mounted above and adjacent to the first tank and having top and bottom openings therein, a pipe connecting the bottom openings of said tanks, a two-way valve connecting the top opening in the first tank with a supply of compressed air or with the atmosphere, means mounted adjacent the first tank and operated by the combined weight of said first tank and the liquid therein for turning said valve to one position so that the first tank is opened to the atmosphere and the liquid flows by gravity from the second tank and into the first

tank and to a second position so that the compressed air is admitted to said first tank and the liquid is forced out the bottom opening therein, an outlet connected to the top opening of said second tank and having a valve therein, a second pipe connecting the bottom of the first tank with said outlet above the valve therein, and a check valve connected in said first pipe for preventing the liquid from returning therethrough to the second tank and for causing the liquid to be forced through said second pipe to said second tank or out through said outlet depending upon whether the valve therein is opened or closed.

3. An apparatus for pumping and mixing liquids comprising a vertically movable closed tank, a second stationary tank mounted higher than said movable tank, a conduit connecting the bottom of said stationary tank with said movable tank to permit the liquid to flow by gravity from said stationary tank to said movable tank, a check valve in said conduit to prevent the flow of liquid back to said stationary tank through said conduit, means actuated by the downward and upward movement of said movable tank due to the presence or absence of liquid therein for causing the interior of said tank to be connected respectively with a compressed air source or with the atmosphere, an outlet opening from the top of said stationary tank and having a valve therein, and a conduit connecting the movable tank with said outlet above said valve therein whereby when said movable tank is connected to said compressed air source the liquid therein is forced through said second-mentioned conduit to said stationary tank or out through said outlet depending upon whether the valve therein is opened or closed.

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