No. 708.669. Patented Sept. 9, 1902.

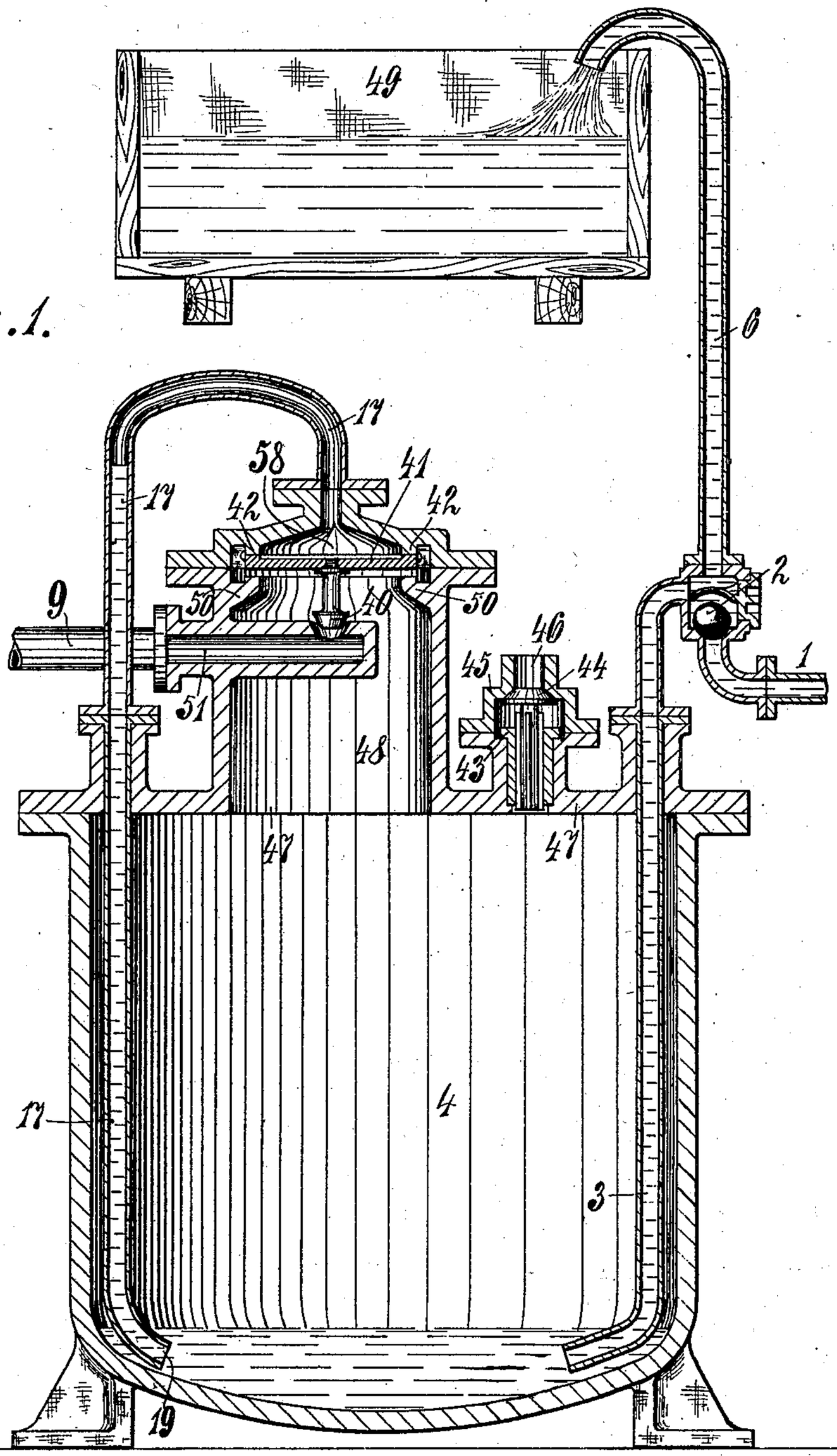
A. SCHOLL.

APPARATUS FOR RAISING LIQUIDS BY MEANS OF STEAM OR COMPRESSED AIR.

(Application filed Jan. 27, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses
A. J. Maddux
E. M. Moore

Inventor
Albert Scholl
by his Attorney, R. Maddux

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 708,669. Patented Sept. 9, 1902.

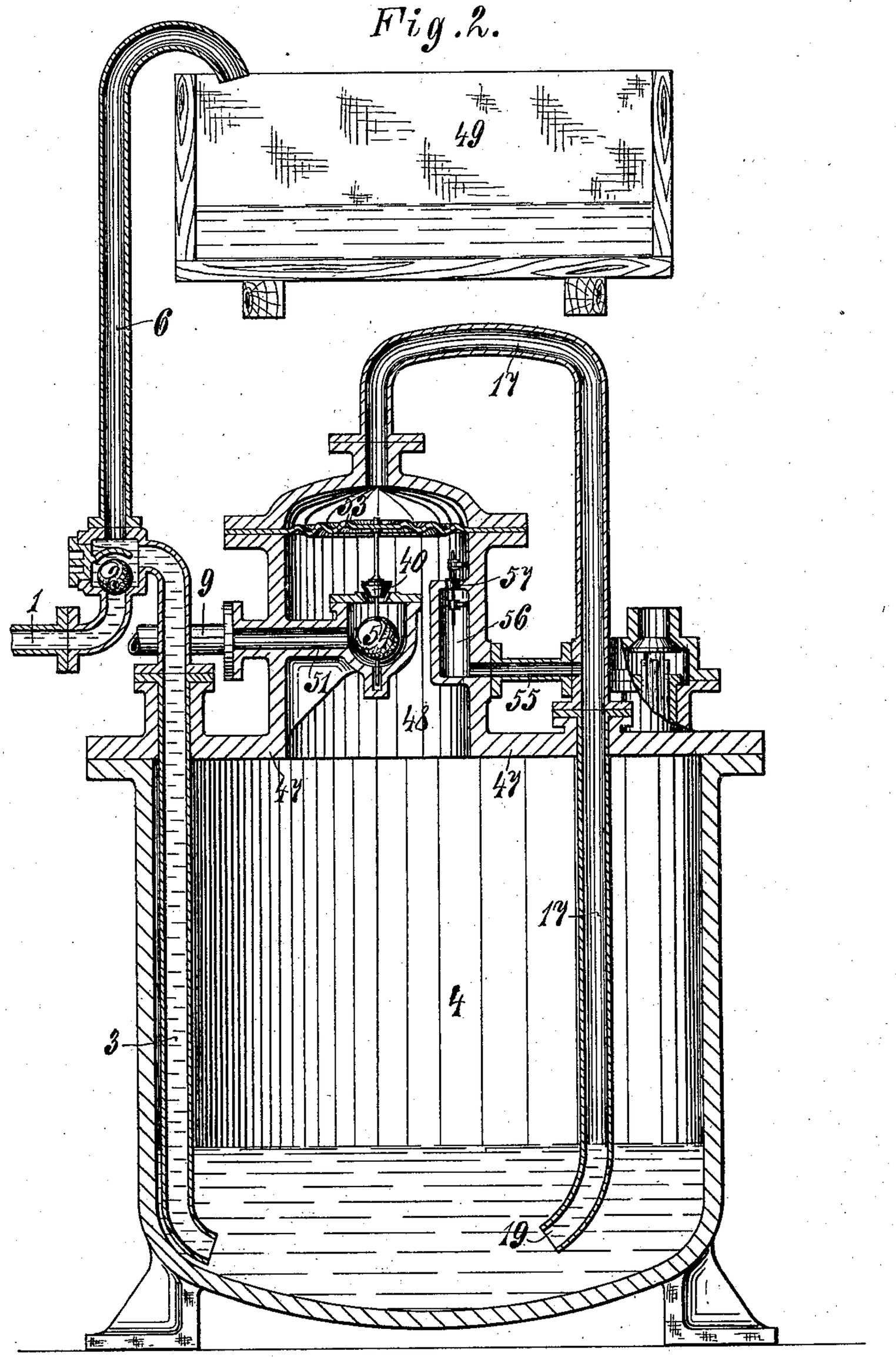
A. SCHOLL.

APPARATUS FOR RAISING LIQUIDS BY MEANS OF STEAM OR COMPRESSED AIR.

(Application filed Jan. 27, 1902.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.



Witnesses
A. G. Maddaus
E. M. Moore

Inventor
Albert Scholl
by his Attorney A. G. Maddaus

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALBERT SCHOLL, OF MANNHEIM, GERMANY.

APPARATUS FOR RAISING LIQUIDS BY MEANS OF STEAM OR COMPRESSED AIR.

SPECIFICATION forming part of Letters Patent No. 708,669, dated September 9, 1902.

Application filed January 27, 1902. Serial No. 91,487. (No model.)

To all whom it may concern:

Be it known that I, ALBERT SCHOLL, a subject of the German Emperor, residing and having my post-office address at 11 Tullastrasse, Mannheim, Germany, have invented certain new and useful Improvements in Apparatus for Raising Liquids by Means of Steam or Compressed Air, of which the following is a specification.

In apparatus for raising acids and other liquids by means of steam or compressed air in which the interior of the pressure-chamber is alternately placed into communication with the conduit of the pressure agent and with the outer atmosphere by means of a cut-off device (cock, valve, slide, or the like) operated by a float it frequently occurs that when acid and caustic liquids are raised the material of which the float is made is attacked by the said fluid. This results in a reduction of the weight of the float, and the action of the apparatus is thus effected. With impure liquids, such as sewage and the like, there is also the circumstance that the coarser impurities adhere to the float and interfere with the action of the apparatus.

The present invention relates to an apparatus for raising liquids by means of steam or compressed air in which the float hitherto used in apparatus of the kind is dispensed with and the number of movable governing elements and the contact thereof with the liquid to be raised are reduced.

In the annexed drawings, Figure 1 is a vertical section of the apparatus in one form of construction, and Fig. 2 is a similar view of a modified construction.

The form shown in Fig. 1 comprises the pressure vessel 4, which is connected by the nozzle 51 and the pipe 9 with a steam-boiler or compressed-air chamber. In the following description compressed air will always be referred to as the pressure agent for the sake of simplicity, since the action is the same whether air or steam is used. The liquid to be raised passes into the closed vessel 4 through the conduit 1, valve 2, and pipe 3 and is forced upward through the pipes 3 and 6 into the tank 49. 1 is therefore the inflow-pipe; 6, the leading-pipe; 2, the supply and return valve, and 3 the rising-pipe, the latter reaching close to the bottom of the vessel 4. The said vessel 4 is connected, by means of the valve 40 and the nozzle 51, with the compressed-air conduit 9. The plug of the valve 40 is rigidly connected with the valve-plate 41, which latter partitions off the space 58, connected by the pipe 17 with the lower part of the vessel 4. The weight of the parts 40 and 41 is sufficient to overcome the pressure underneath valve 40 and in addition to create overpressure sufficient to secure the hermetical closing of the said valve 40. The size of the valve-plate 41 is so calculated that an infinitesimal degree of surface overpressure from below is sufficient to force it against its stops 42 and to open the valve 40. The pressure vessel 4 is also provided with an exhaust-valve 44. The latter is forced against its seat 45 as soon as a certain degree of overpressure has been produced in the pressure vessel and then shuts off the interior of said vessel from the outer atmosphere. When, however, the overpressure has ceased, owing to the escape of air from the vessel 4 through the pipes 3 and 6, the valve 44 falls back onto the stops 43 and places the interior of the pressure vessel in communication with the outer atmosphere in order that the air can be exhausted from the said vessel while fresh liquid flows in.

The action of the apparatus described above is as follows: The liquid to be raised passes through the pipe 1, valve 2, and pipe 3 into the pressure vessel 4, the air in the latter being forced out through the valve 44 and the short length of tube 46. When the liquid reaches the flat cover 47, the air in the space 48 is compressed, since it can no longer escape. The tendency of this compressed air is to pass into the stand-pipe 17, and in order to do so it lifts the valve-plate 41 from its lower support 50 and opens the valve 40, so that compressed air from the pipe 9 passes through the nozzle 51 into the pressure vessel, presses the plate 41 tightly against its upper seat 42, and forces liquid through the pipes 3 and 6 into the tank 49. At the same time the valve 44 is lifted from its supports 43 and pressed against its seat 45, so that during the period of pressure the exhaust-tube 46 is closed. Part of the liquid to be raised is, however, forced into the stand-pipe 17, and a column of liquid is thus produced which reduces the specific pressure above the valve-

plate 41 to an extent depending upon the specific gravity of the column and its height above the level of the liquid in the vessel 4. Below the plate 41 the full pressure remains. The effect of this is that the valve-plate 41 and the valve-plug 40, rigidly connected therewith, are held in their upper position during the period of pressure and that the inflow of compressed air to the vessel 4 is thus not interrupted. When, however, toward the end of the period of pressure the level of the liquid in the pressure vessel falls below the lower end of the stand-pipe 17, the column of liquid in the latter descends and places the space 58 above the valve-plate 41 in communication with the vessel 4 through the pipe 17. The pressure on both sides of the plate is thus equalized, so that the plate and the valve-plug descend by gravity and cut off the supply of compressed air to the vessel 4. When the air contained in the latter has escaped through the pipes 3 and 6 until normal atmospheric pressure is restored in the pressure vessel, the valve 44 descends onto its lower supports 43 and the supply of liquid recommences. The modification shown in Fig. 2 differs from the apparatus described only by the fact that the valve-plate 41 (shown in Fig. 1) is replaced by a membrane 53 and a weight 54. The liquid, which enters through the pipes 1 and 3 and rises to the cover 47, compresses air in the space 48, as before. This causes the membrane 53 to be pressed slightly upward and the weight 54 to be lifted, so that the valve 40 is opened and compressed air passes from the pipe 9 through the nozzle 51 into the pressure vessel and forces the liquid in the latter through the pipes 3 and 6 into the tank 49. When toward the end of the period of pressure the level of the liquid in the vessel 4 falls below the lower end of the stand-pipe 17, the column of liquid in the latter descends, and thus causes the pressure to be equalized on both sides of the membrane 53, so that the weight 54 descends and closes the valve 40. In order that part of the air between the membrane and the liquid in the stand-pipe can escape when compressed by the inflow of liquid through pipes 1 and 3 and the consequent rise of the liquid-level in the vessel 4, the stand-pipe is connected by a tube 55 with a chamber 56, and the latter can communicate with the chamber 48 by means of the valve 57. The latter therefore allows of the exhaust of air from the stand-pipe, so that the liquid ascending therein is not held back by air above it.

I declare that what I claim is: In apparatus for raising liquids by means of steam or compressed air—

1. The combination of a pressure vessel having a compressed-air space at its upper part and inlets for liquid and compressed fluid and an outlet for the liquid to be raised, a stand-pipe extending into said vessel and in communication with said air-space, a valve in said compressed-fluid inlet a valve-plate rigidly connected with said valve and adapted to close communication between said stand-pipe and air-space and open the compressed-fluid valve on overpressure existing in the vessel, and means for putting the pressure vessel into communication with the atmosphere on cessation of overpressure therein, substantially as described for the purpose set forth.

2. The combination of a pressure vessel having a compressed-air space at its upper part, a stand-pipe extending at one end into said vessel and in communication at the other end with said air-space, an inlet-pipe for liquid, an inlet-nozzle for compressed fluid, a valve in said nozzle, a valve-plate rigidly connected with said valve and adapted to close communication between the stand-pipe and air-space and open the compressed-fluid valve on overpressure existing in the vessel, an outlet-pipe for the liquid to be raised, and means for putting said vessel into communication with the atmosphere on cessation of overpressure therein, substantially as described for the purpose set forth.

3. The combination of a pressure vessel having a flat cover and a compressed-air space at its upper part, a stand-pipe extending into said vessel and in communication with said air-space, an inlet-pipe for liquid, an inlet-nozzle for compressed fluid, a valve in said nozzle, a valve-plate rigidly connected with said valve and adapted to close communication between said stand-pipe and air-space, and open the compressed-fluid valve on overpressure existing in the vessel, an outlet-pipe for the liquid to be raised and an exhaust-valve in said cover adapted to put the pressure vessel into communication with the atmosphere on cessation of overpressure in said vessel, substantially as described for the purpose set forth.

4. The combination of a pressure vessel having a flat cover and a compressed-air space at its upper part, a stand-pipe extending below to near the bottom of said vessel and in communication above with said air-space, an inlet-pipe for liquid, an antireturn-valve in said pipe, an inlet-nozzle for compressed fluid, a valve in said nozzle, a valve-plate rigidly connected with said valve and adapted to close communication between said stand-pipe and air-space and open the compressed-fluid valve on overpressure existing in the vessel, an outlet-pipe for the liquid to be raised and an exhaust-valve adapted to be closed by the liquid and to put the pressure vessel into communication with the atmosphere on cessation of overpressure in said vessel substantially as described, for the purpose set forth.

In witness whereof I have signed this specification in the presence of two witnesses.

ALBERT SCHOLL.

Witnesses:
JACOB ADRIAN,
H. W. HARRIS.