(No Model.) 2 Sheets—Sheet 1.

J. HOROWITZ.

PUMPING APPARATUS.

No. 583,231. Patented May 25, 1897.

Fig. I.

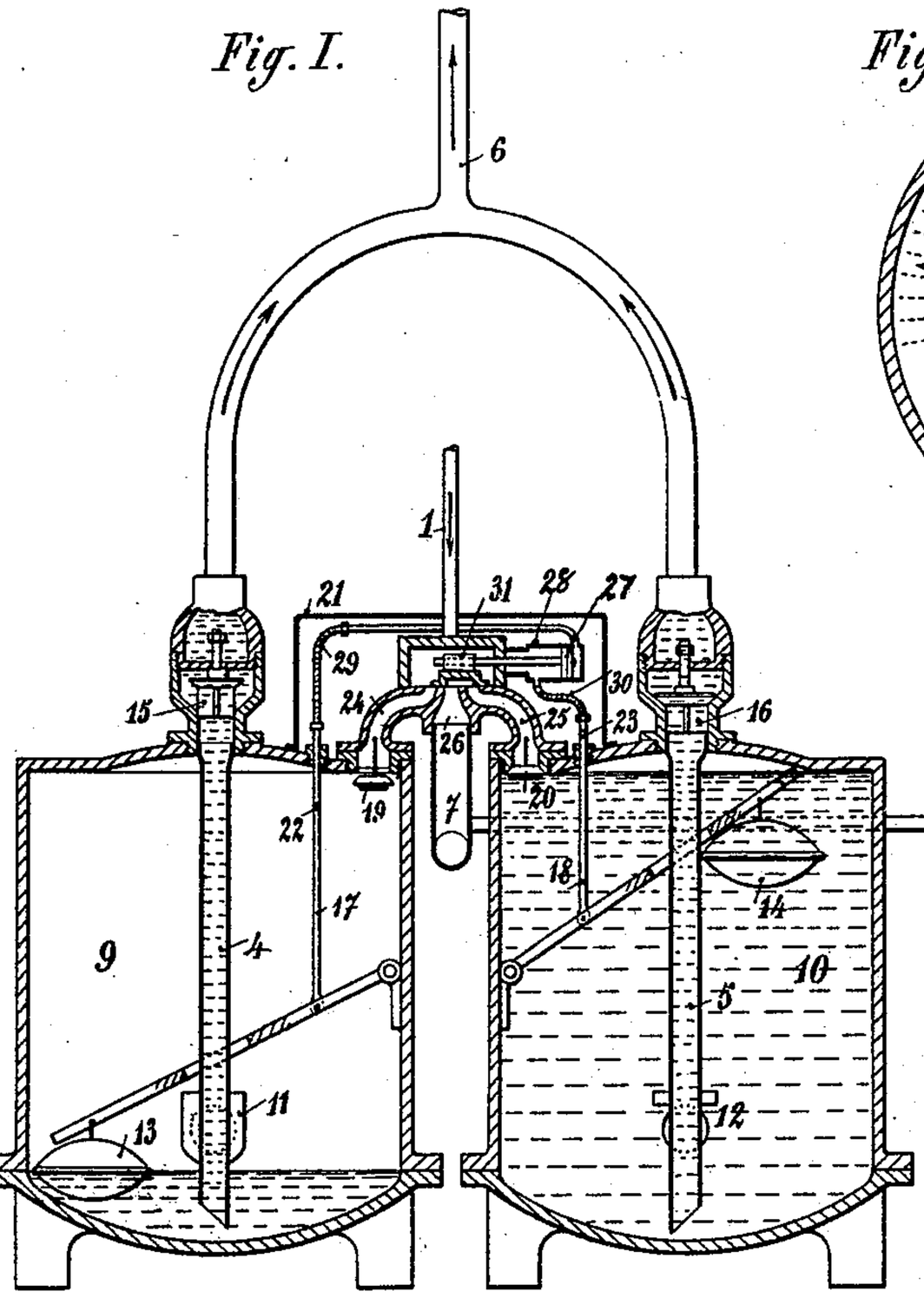


Fig. III

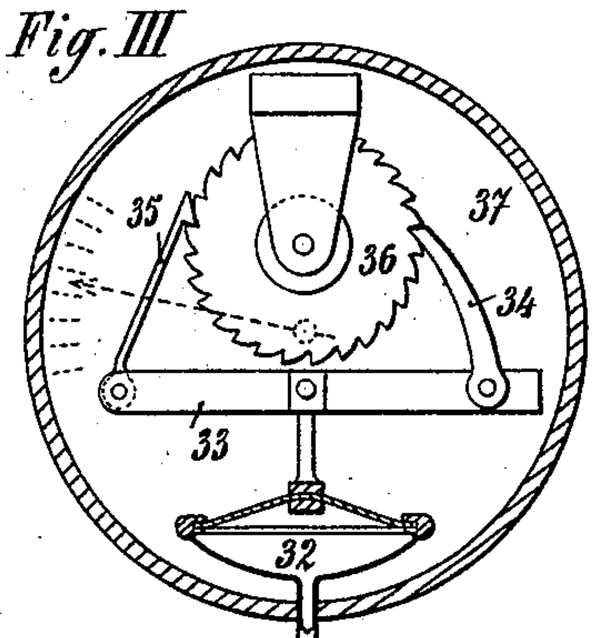
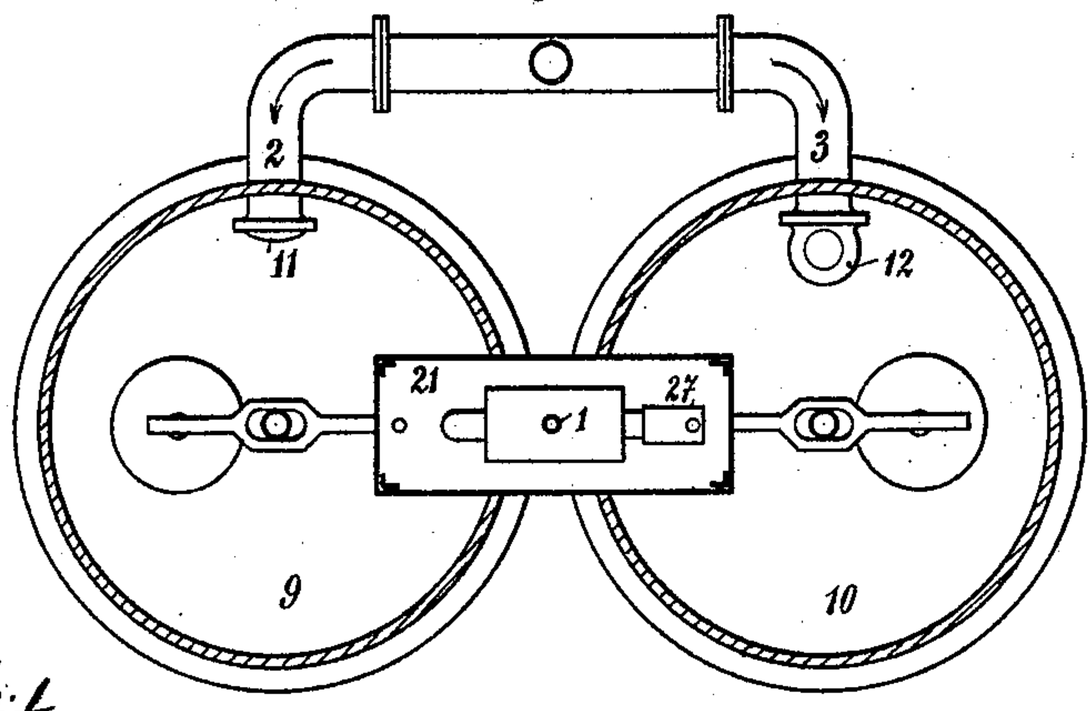


Fig. II.



Witnesses:-
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Jos. Kingsbery

Inventor:-
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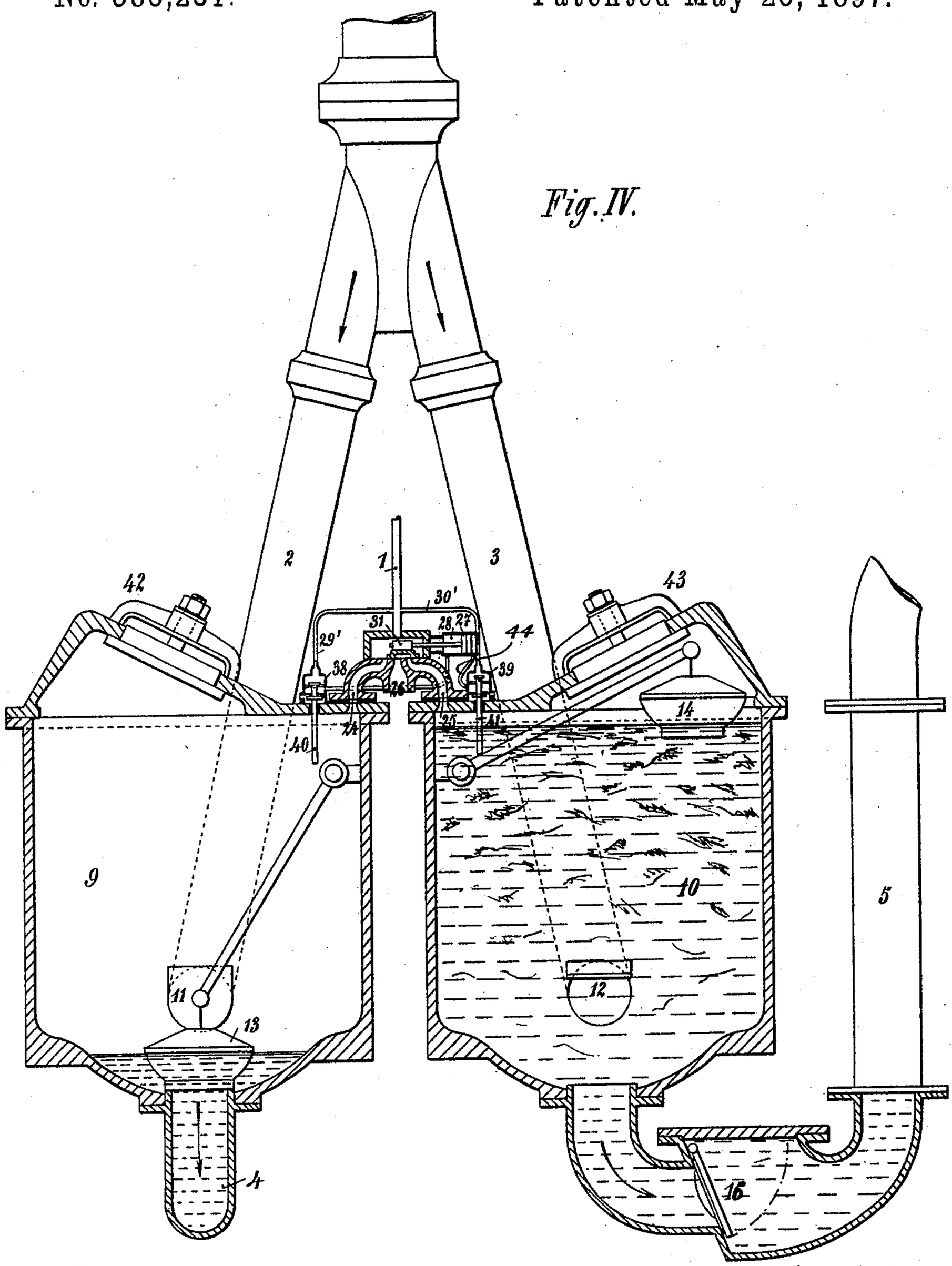
Fig. IV.



Witnesses:-
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I. D. Kingsbery.

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" attorney

UNITED STATES PATENT OFFICE.

JOSEPH HOROWITZ, OF PARIS, FRANCE.

PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 583,231, dated May 25, 1897.

Application filed February 24, 1896. Serial No. 580,413. (No model.) Patented in Belgium August 27, 1895, No. 117,170; in France December 10, 1895, No. 252,356; in England December 14, 1895, No. 24,042; in Germany December 20, 1895, No. 16,780; in Austria June 4, 1896, No. 4,711, and in Hungary October 6, 1896, No. 6,412.

To all whom it may concern:

Be it known that I, JOSEPH HOROWITZ, a citizen of the Austrian Empire, residing at Paris, France, have invented certain new and useful Improvements in or Relating to Pumping Apparatus, (for which I have obtained Letters Patent in France, No. 252,356, dated December 10, 1895; in Belgium, No. 117,170, dated August 27, 1895; in England, No. 24,042, dated December 14, 1895; in Austria, No. 4,711, dated June 4, 1896; in Hungary, No. 6,412, dated October 6, 1896, and for which I have made application for patent in Germany under date of December 20, 1895, No. 16,780, said application still pending,) of which the following is a specification.

The present invention, which relates to pumping and removing liquid matter, is based on the use of compressed air or gas, under the supposition that such compressed medium is available.

The objects of the new arrangement are chiefly the three following, which are very essential for proper working: first, raising liquid to a desired height, keeping it at the same time under a constant and regular pressure; second, removing liquid from a closed or open receptacle, in order to raise it to a certain height or to discharge it into a receiver, such as a cesspool or the like, or into the sea, a river, canal, or elsewhere; third, recording at the pumping-station or at a distance therefrom for the purpose of obtaining an exact indication of the volume of liquid which has been raised or removed by means of the apparatus. For this purpose there is used a special recording apparatus connected to the apparatus for raising the liquid by means of a flexible or rigid tube, the organs operating that recording apparatus having no direct connection with the liquid.

In accordance with these objects the liquid is raised by means of an apparatus in which compressed air is the operating medium and which has two alternately filling and emptying chambers and slide-valve, also operated by compressed air. In order to ascertain the amount of liquid raised, a simple counter is used, which, being provided with a flexible diaphragm and with a pipe leading to the discharge-chamber, indicates the periodic pulsations of pressure whether they be brought about by the entering or leaving compressed air. This counter permits the double counters usually employed for liquid and compressed air to be dispensed with.

The applications of the system are numerous. It may be used with advantage in all cases in which it is desired to raise liquid from wells, cisterns, streams, cesspools, and the like, and whether it be necessary to quickly raise the liquid to the surface of the ground or to keep it under pressure in reservoirs or pipes.

In the accompanying drawings are illustrated instances of such apparatus which are used, preferably, for liquid which has to be kept under pressure or raised directly to the surface of the ground.

Figures 1 and 2 are respectively a section and plan of an apparatus for raising liquid and keeping a volume of liquid under pressure. Fig. 3 is a view of the counter with flexible diaphragm, which indicates the amount of liquid raised and the compressed air used for that purpose. Fig. 4 is a vertical section of a draining apparatus constructed according to this invention for raising and discharging waste water, liquid manure, or other foul liquid, which may be thereby made to flow onto the surface of the ground continuously or intermittently.

Referring to Figs. 1 and 2, the two chambers of the apparatus which are to be alternately filled and emptied are marked 9 and 10. The pipe 1 introduces the compressed air into a valve-box inclosed within a casing 21, and with this valve-box communicate passages 24 25, which also communicate with the chambers 9 10 and have at their ends check-valves 19 20, respectively. The slide-valve 31 alternately sets the passages 24 and 25 into communication with the exhaust 26 and outlet-pipe 7. The slide-valve 31 is operated by a piston 27, which is connected with it and moves in a cylinder 28, with the two ends of which connect flexible tubes 29 30, jointed to tubular rods 17 18.

At the starting of the apparatus the chambers 9 10 are filled from a reservoir above or

through pipes with branches 2 3, Fig. 2, the ends of which are provided with check-valves 11 12.

When the chambers are filled, compressed air is admitted, which, when the slide-valve 31 is in the position shown in Fig. 1, flows through the passage 24 and valve 19 (the latter of which it forces open) into the chamber 9 and drives out the liquid by exercising pressure on the whole of its surface, so that the liquid is forced up through a pipe 4, provided with a valve 15, into the discharge-pipe 6. Meanwhile the check-valve 11 of the pipe 2, through which the liquid is admitted into the chamber 9, is closed by the pressure, and by the sinking of a float 13, suspended from a lever, the hollow rod 17 is lowered to such a position (for example, that shown in Fig. 1) that the hole 22, which was before in communication with the atmosphere, allows compressed air inside the chamber 9 to pass through the flexible tube 29 to the back of the piston 27. In consequence of that the slide-valve 31 is moved so as to allow the compressed air to escape from the chamber 9 and through the valve 19, passage 24, and exhaust 26, and on the contrary to allow compressed air to enter the then filled chamber 10 through the passage 25 and valve 20. While the liquid is being driven out of the chamber 10 through the pipe 5, which is provided with a valve 16, there takes place in that chamber the same action as in chamber 9—the float 14 lowers the hollow rod 18, with an opening 23 for compressed air, and so finally produces again a movement of the slide-valve 31.

The filling of each chamber, which becomes possible by the compressed air being let out, is effected by the automatically-opening valve 11 or 12 till the upper part is reached, and in that moment the valve 19 or 20 is closed, so that the liquid cannot enter the valve-box. During that period of filling the float 13 or 14 rises up to the cover of the chamber and pushes the hollow rod 17 or 18 upward, during which movement the hole 22 23 remains in communication with the atmospheric air, even when it (the rod) is inside the chamber. The valves 15 and 16 prevent in each case the return of the liquid from the discharge 6.

The apparatus as adapted for pumping or displacing sewage and other more or less dense matter is shown in Fig. 4. This comprises two chambers 9 and 10 and valve-gear substantially similar to those previously described, only here the pipes or passages 29′ 30′ branch off directly from the compressed-air pipe 1 and lead as rigid pipes throguh from valve-boxes 38 39 to the ends of the cylinder 28, containing the piston 27. The valves in the boxes 38 and 39 are mounted on and guided by rods 40 and 41. The passages 24 and 25, leading from the slide-valve box to the chambers 9 and 10, unlike the arrangements shown in Fig. 1, have no valves.

When the valve 31 is in the position shown on the drawings, the air passes through the passage 24 into the chamber 9, and in consequence of its pressure keeps the liquid-inlet valve 11 closed and presses the float 13, which is formed as a valve-body with a rubber facing, against the orifice of the outlet or discharge pipe 4.

While the chamber 10 is in communication with the atmosphere through the passages 25 and 26, it becomes filled and the float 14 is raised, so that its lever raises the rod 41 and thereby opens the double valve in the casing 39. In consequence of that compressed air passes from the pipe 1 through the branch 30′ and through the pipe 44, which connects the valve-box 39 with the cylinder 28, whereby the slide-valve 31 is moved. This movement effects a communication between the passages 24 and 26 and opens the passage 25, whereby the compressed air contained in the chamber 9 is free to escape, while simultaneously a fresh supply of compressed air enters into the chamber 10, the liquid contained in this chamber being forced out, under the pressure which opens the flap-valve 16, through the passage 5. The inlet-valve 12 of the chamber 10 meanwhile closes and the inlet-valve of the chamber 9 opens to permit the liquid to enter.

The chambers 9 and 10 are provided with manholes 42 and 43 in order to allow of the chambers being cleaned, and all parts of the system are air-tight, so that no smell is noticeable in the works where the apparatus is placed.

Owing to the apparatus shown in Figs. 1 to 4 having two chambers, the liquid displaced flows out in a continuous stream.

The counter represented in Fig. 3 is arranged as follows: A diaphragm-chamber 32 is connected by means of a thin pipe 8 with the compressed-air exhaust 7 or with one of the inlet-passages 24 25. In this way each time the compressed air enters or is exhausted the diaphragm 32 is moved, whereby a bar 33 is raised and by means of its pawl 34 causes the ratchet-wheel 36 to turn, while during the descent the further turning of the wheel is produced by the pawl 35. Through a train of gearing motion is transmitted from the ratchet-wheel 36 to an index or pointer (dotted) in Fig. 3, which moves over a scale on the casing 37. From the divisions of this scale the volume of the displaced liquid can be readily ascertained, which volume is equal to that of the compressed air used for raising and discharging the contents of the chambers 9 and 10.

I claim—

1. In an apparatus of the character described, the combination with two chambers, of a compressed-air pipe, a valve-box into which said pipe leads, and having an exhaust, passages leading from the valve-box into the chambers, a cylinder, a piston therein, a slide-valve in the box adapted to alternately cut off communication between the valve-box and the chambers, and also to alternately place

the latter in communication with the exhaust, said slide-valve being connected with and operated by the movements of the piston, a valved discharge-pipe leading from each of the chambers, a lever carrying a float arranged within each chamber, pipes connected with the levers and leading from the chambers to opposite sides of the slide-valve piston, said pipes being each provided with an aperture adapted to be alternately brought into communication with the outer air and the interior of the chambers when operated by the movements of the float-levers, all as and for the purpose specified.

2. In an apparatus of the character described, the combination with two chambers, of a compressed-air pipe, a valve-box into which said pipe leads and having an exhaust, passages leading from the valve-box into the chambers, a check-valve in each of the passages adapted to be opened by the inflow of compressed air into the chambers and closed by the water flowing into the chambers to prevent said water entering the valve-box, a cylinder, a piston therein, a slide-valve in the box adapted to alternately cut off communication between the valve-box and the chambers and also to alternately place the latter in communication with the exhaust, said slide-valve being connected with and operated by the movements of the piston, a valved discharge-pipe leading from each of the chambers, a lever carrying a float arranged within each chamber, pipes connected with the levers and leading from the chambers to opposite sides of the slide-valve piston, said pipes being each provided with an aperture adapted to be alternately brought into communication with the outer air and the interior of the chambers when operated by the movements of the float-levers, all as and for the purpose specified.

3. In an apparatus of the character described, the combination with two chambers, of a compressed-air pipe, a valve-box into which said pipe leads and having an exhaust, passages leading from the valve-box into the chambers, a cylinder, a piston therein, a slide-valve in the box, adapted to alternately cut off communication between the valve-box and the chambers and also to alternately place the latter in communication with the exhaust, said slide-valve being connected with and operated by the movements of the piston, a discharge-pipe leading from a point adjacent to the bottom of each chamber, an upwardly-opening valve in each of said discharge-pipes, a lever pivotally arranged in each chamber, a float carried by said lever, pipes connected with the levers and leading from the interior of the chambers to opposite sides of the slide-valve piston, said pipes being each provided with an aperture adapted to be alternately brought into communication with the outer air and with the interior of the chambers when operated by the movements of the float-levers, as and for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of the two subscribing witnesses.

JOSEPH HOROWITZ.

Witnesses:
LOUIS SULLIGE,
CLYDE SHROPSHIRE.