No. 702,903. Patented June 24, 1902.

A. ABENDROTH.

PROPORTIONATE DISTRIBUTION VALVE SYSTEM FOR PUMPS.

(Application filed Dec. 18, 1901.)

(No Model.)

Fig. 1.

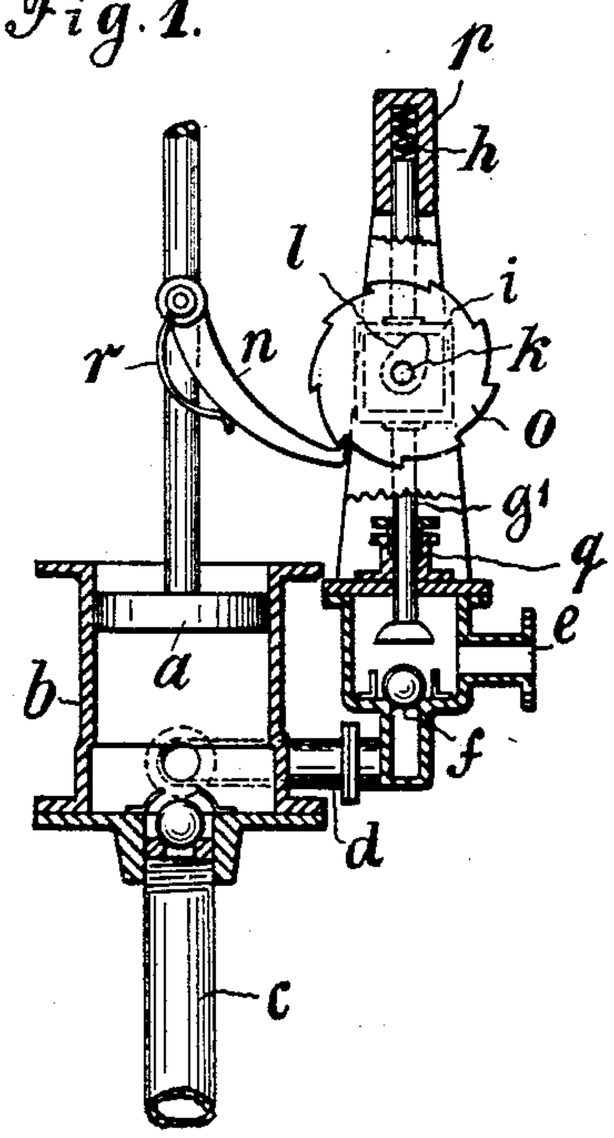


Fig. 2.

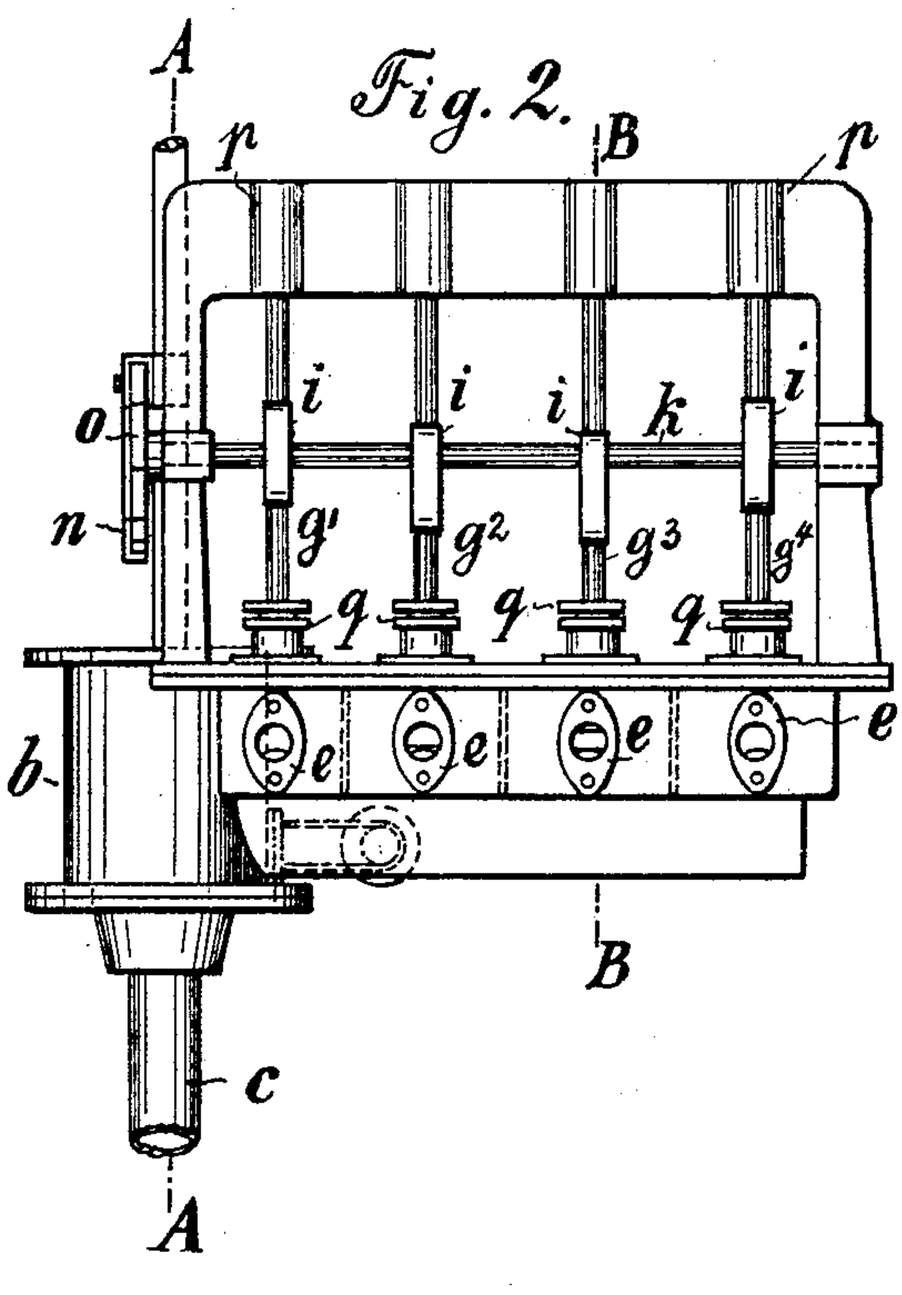


Fig. 3.

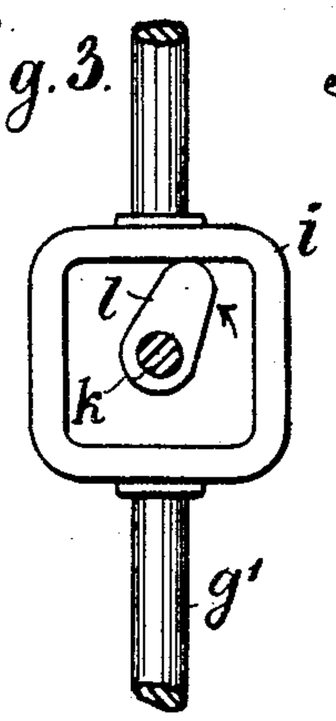


Fig. 4.

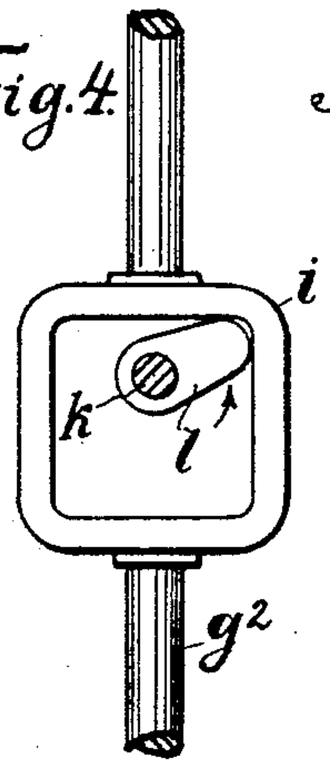


Fig. 5.

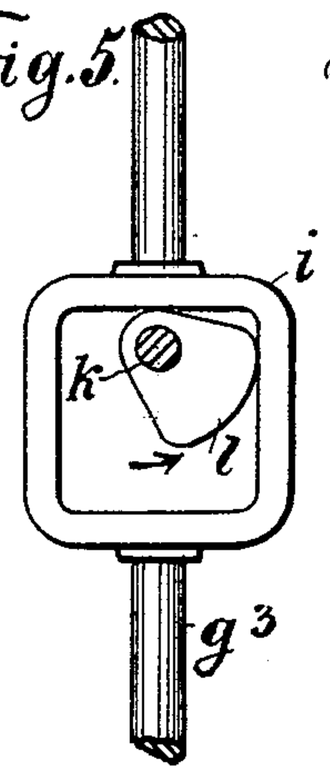
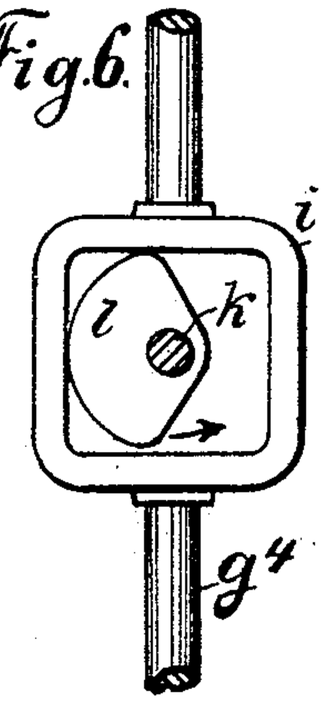


Fig. 6.



Inventor.
Arthur Abendroth.

Witnesses:
B. Tober
B. V. Sommers

by Munn & Co
Attys

UNITED STATES PATENT OFFICE.

ARTHUR ABENDROTH, OF BERLIN, GERMANY.

PROPORTIONATE-DISTRIBUTION VALVE SYSTEM FOR PUMPS.

SPECIFICATION forming part of Letters Patent No. 702,903, dated June 24, 1902.

Application filed December 18, 1901. Serial No. 86,379. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR ABENDROTH, a subject of the King of Prussia, German Emperor, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Proportionate-Distribution Valve Systems for Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

In the case of pumps which have for their object combining at stated intervals of time a definite quantity of one liquid with a definite quantity of another—as, for instance, where milk of lime and ammonia-water are to be mingled—it is often necessary that one pump shall in a given time interval deliver two or more unequal quantities of liquid to different receivers or reservoirs.

The herein-described invention relates to a proportionate-distribution valve system which may be advantageously used for the above-described purpose and that is operated by the piston-rod of the pump itself. The various pipes leading from the pump to the different reservoirs or receivers are controlled by valves which lie adjacent to each other and which are usually normally kept closed by appropriate means—as, for instance, by spiral springs or by weights on their stems. These stems can, however, as by means of rotating cams seated upon a common cam-shaft, be alternately raised and dropped, so that each valve can be opened and closed at the desired moment and during the desired intervals of time. The cam-shaft is, by means of a ratchet-wheel and a pawl connected with and actuated by the piston-rod, turned through a definite angle, preferably always in the same direction at each single pump-stroke. The ratchet-wheel teeth and the cams actuating the valve-stems are so constructed and are so adjusted with relation to each other that each pipe receives during the proper predetermined interval the quantity of liquid which it is intended that it shall convey. The accompanying drawings show an arrangement of this principle for the case where one milk-of-lime pump serves four ammonia-reservoirs, of which in a given time unit two must receive an equal quantity of liquid, the third double as much as either of these, and the fourth four times as much as either of the first two.

Figure 1 shows a central section in two vertical planes, one on the line A A, Fig. 2, through the pump, and the other on the line B B, Fig. 2, through one of the valves of the distribution system. Fig. 2 is a front elevation of the pump proper and the distribution valve system; Figs. 3 to 6, inclusive, the cams for the valve-stems g' g^2 g^3 g^4, respectively.

The piston b, which plays in the pump-cylinder a, draws the milk of lime through the suction-pipe c and forces it through the main discharge-pipe d to the various branch pipes e, which lead to the different ammonia-receivers. These pipes e are separated from the main discharge-pipe d by ball-valves f, (which are normally, by means of spiral springs h or by weights on their stems g' g^2 g^3 g^4, held closed.) These stems, which are guided above by suitable guides p and below by the stuffing-boxes q of their respective valves, have open enlargements or yokes i, the centers of which are when all the valves are fully closed axially in line and which always remain in the same vertical plane. Through these passes the shaft k with suitable end bearings and upon which there is for each valve-stem a cam l within one of the yokes i. The cams for the different stems are so placed with relation to each other upon the shaft k (see Figs. 3 to 6, inclusive) that the continuous rotation of the shaft will effect in any desired order the opening of one valve after another of the series and the prompt and thorough closing of each by means of the spiral spring upon its stem at the instant the following valve is opened. The forms of the various cams are so chosen that the period of opening of any one valve of the system for a given angular movement of the shaft corresponds to the amount of liquid desired to be passed through that particular valve. In the case here illustrated movement during the first forty-five degrees of shaft rotation in the direction of the arrow the first valve is held open by the cam Fig. 3. During the next forty-five degrees of rotation the second valve

is held open by the cam Fig. 4. During the next ninety degrees the third valve is held open by the cam Fig. 5, and during the remaining one hundred and eighty degrees of the complete rotation the fourth valve is held open by the cam Fig. 6. Each valve is closed promptly and quickly by the spring upon its stem as the next valve is opened by its cam. Thus, as desired, the third valve remains open twice as long and the fourth four times as long as either the first or the second. At each upward pump-stroke the shaft *k* is partially rotated forward through a definite angle—in this case forty-five degrees—the pawl *n*, freely attached to the piston-rod, actuating the eight-toothed ratchet-wheel *o*, which is fast upon the shaft and with which the pawl is held in continuous contact by the flat spring *r*. So the first two valves of the system are open during one pump-stroke each, the third during two strokes, and the fourth during four. The rapid closing of each valve is effected as soon as the position of its particular cam permits it by the spring *h*. Thus there is accomplished without any possibility of error the object of the system—namely, the distribution of exactly the desired quantities and properties of milk of lime to the various ammonia-reservoirs. The cams can of course be differently designed and arranged to effect a differently-proportioned distribution from or one greater or less than that here described.

Having now described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination of a force-pump, a plurality of distribution-pipes, back-pressure valves in these pipes, devices for locking these valves in closed position, means for releasing these locking devices, a rotating shaft, and means connected with said shaft to control the releasing of the locking devices.

2. The combination of a force-pump, a plurality of distribution-pipes, back-pressure valves in said pipes, guided rods, springs to lock the valves in closed position, a rotating shaft, arms fixed on the same in angular relation to each other for raising alternately the guided rods, and means connected with the pump-rod for rotating the shaft.

3. The combination of a force-pump *a*, discharge-pipe *d*, branch distribution-pipes *e*, a single-acting pawl *n*, a ratchet-wheel *o*, a shaft *k* rotating in one direction, two or more cams *l*, back-pressure valves *f*, suitable guided rods having yokes *i* surrounding the cams *l*, and spiral springs to press down the rods when released by the cams and thereby effect the prompt closing of the valves.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

ARTHUR ABENDROTH.

Witnesses:
JOHANNES HEIN,
HENRY HASPER.