3 Sheets--Sheet 1.

J. GOEHRING & L. SCHUTTE.

Air Compressing Pumps.

No. 150,317. Patented April 28, 1874.

Fig 1.

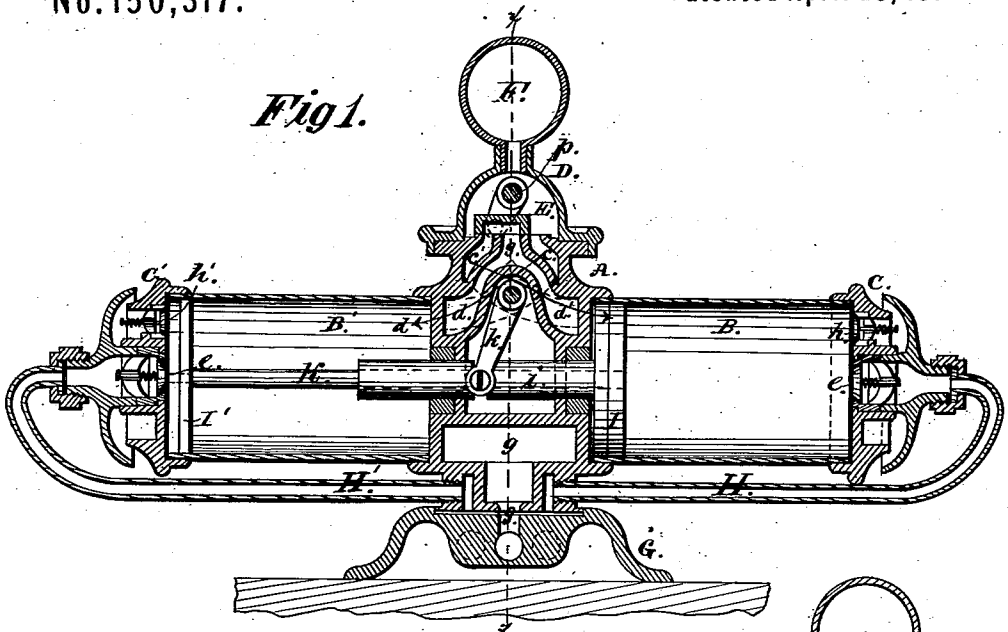


Fig 5.

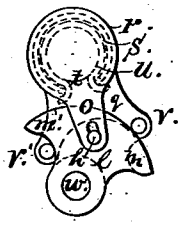


Fig 3.

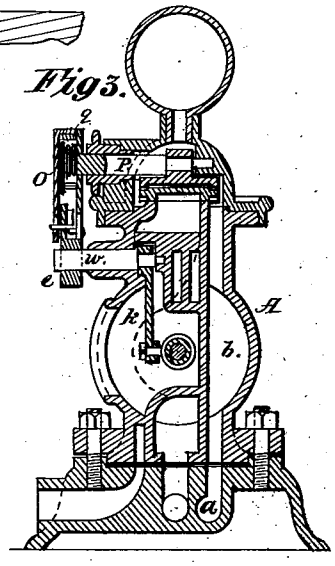


Fig 4.

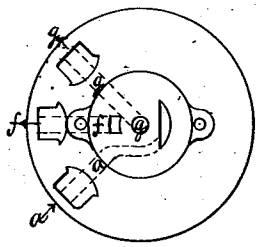
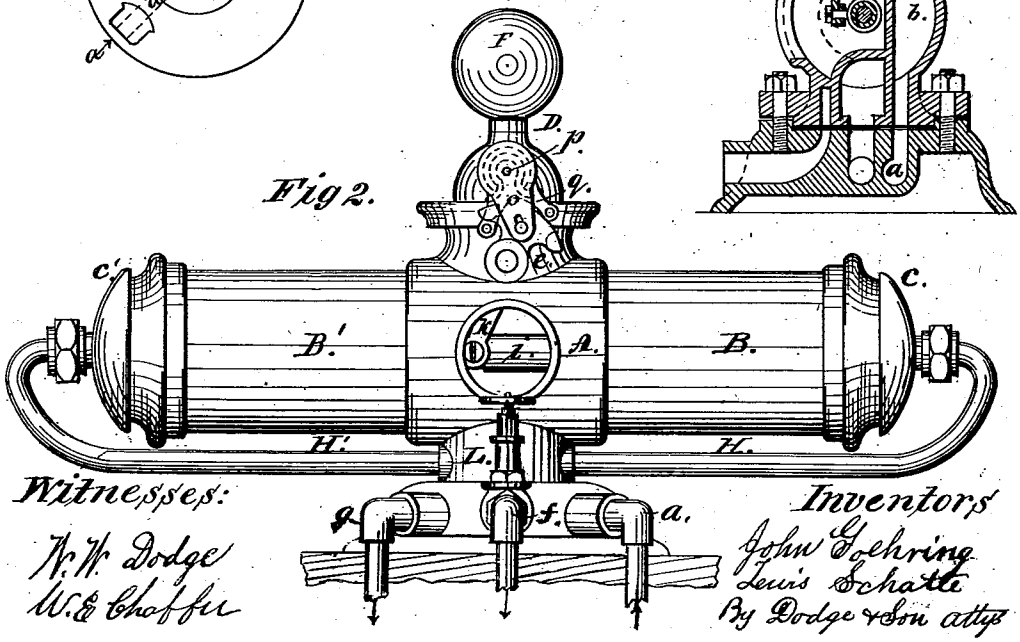


Fig 2.



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Air Compressing Pumps.

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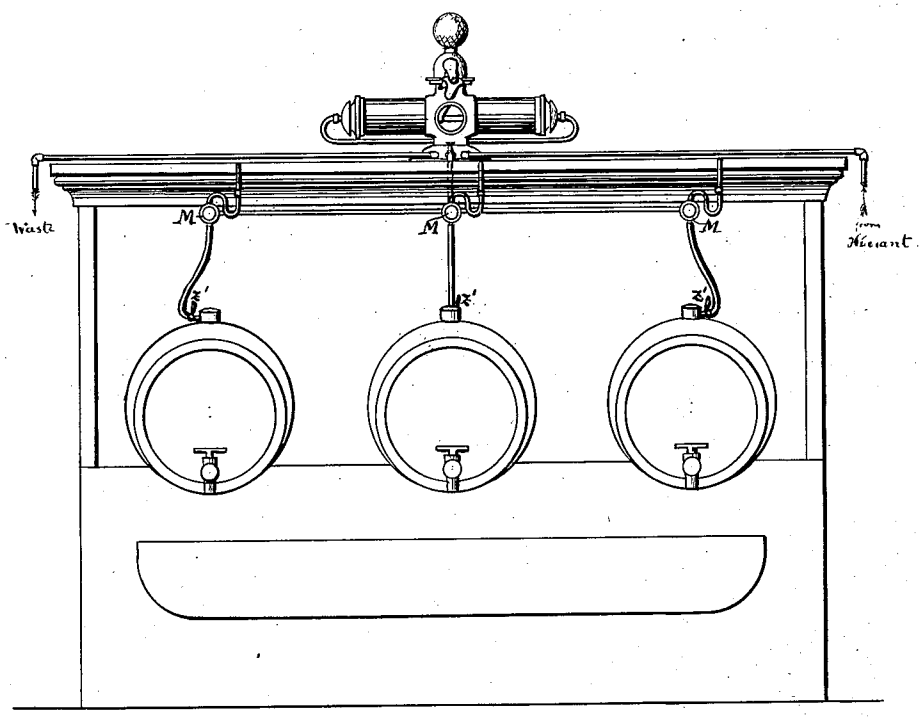
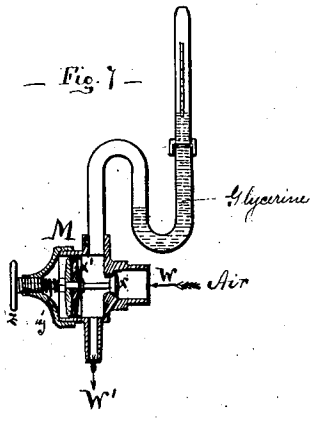
— Fig. 6. —



— Fig. 7 —



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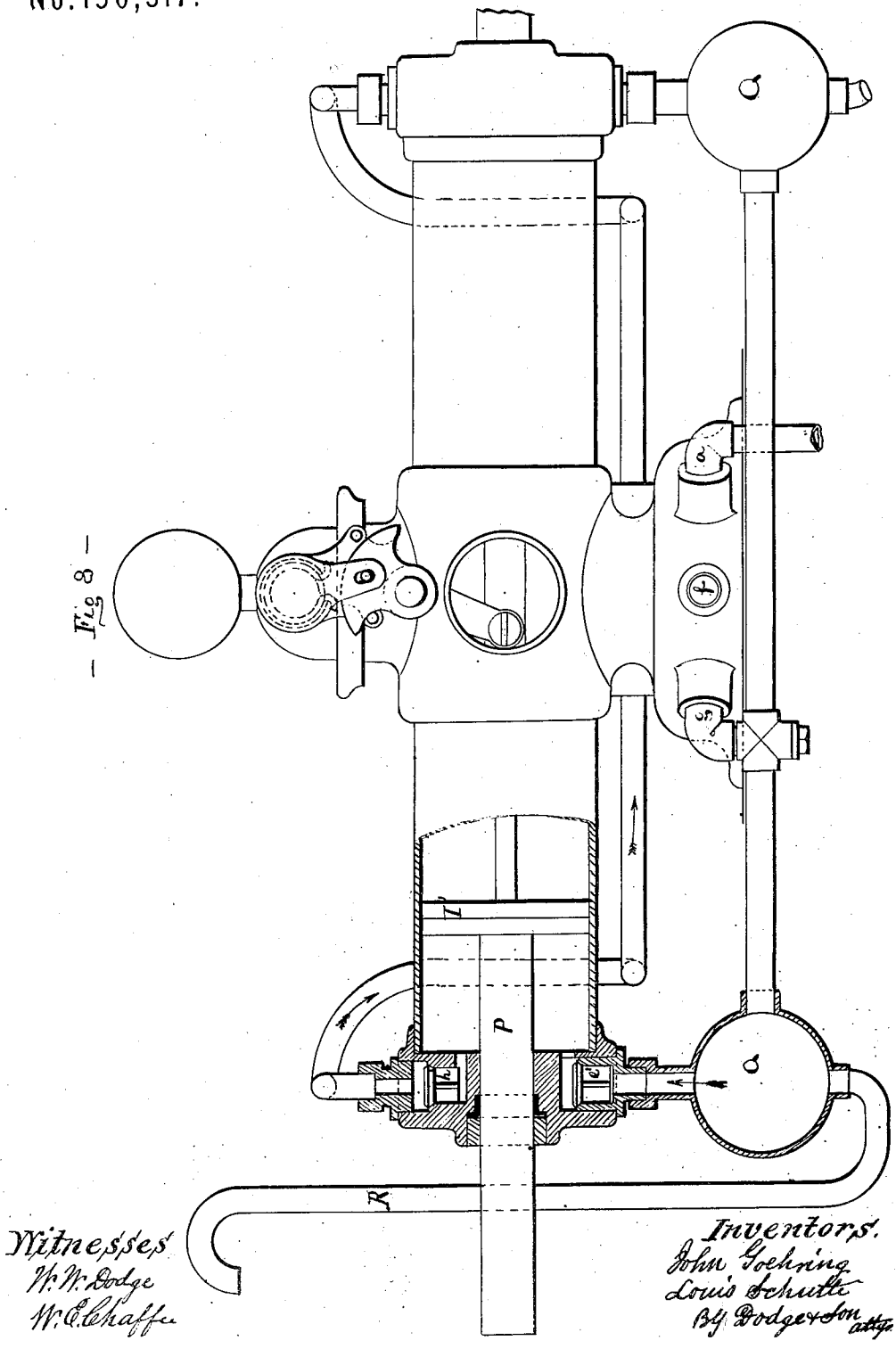

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UNITED STATES PATENT OFFICE.

JOHN GOEHRING AND LOUIS SCHUTTE, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN AIR-COMPRESSING PUMPS.

Specification forming part of Letters Patent No. 150,317, dated April 28, 1874; application filed March 5, 1874.

To all whom it may concern:

Be it known that we, JOHN GOEHRING and LOUIS SCHUTTE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Force-Pumps, of which the following is a specification:

Our invention relates to a direct-acting piston-pump, designed more especially to be operated by water-pressure, for the purpose of forcing air into ale and beer barrels, but adapted equally well for other purposes. The invention consists in a novel manner of constructing the pump as a whole, in a novel valve-gear therefor, and in the combination therewith of an automatic spring-valve to regulate the force or pressure of the discharge.

Figure 1 is a longitudinal vertical section through the center of our pump. Fig. 2 is a side elevation of the same; Fig. 3, a central cross-section of the same; Fig. 4, a plan view of the foot or base of the central body; Fig. 5, an enlarged face view of the valve-gear; Fig. 6, a front elevation of the pump connected with three beer-barrels; Fig. 7, a vertical central section through one of the automatic governing-valves; Fig. 8, a sectional elevation, on a large scale, showing a modified form of the pump.

Our pump consists of three main parts—viz., a central body or stand, A, and two horizontal cylinders, B B′—secured to opposite sides of the body in line with each other, as shown in Figs. 1 and 2. The central body serves as a support for the cylinders, and contains inlet and outlet passages, the main valve, and the gearing of the same. The two cylinders, their connections, and attachments are duplicates of each other. Each cylinder has its outer end closed by a head or cover, *c*, and its inner end closed by contact with the outside of the body. There is a space or chamber in the body between the cylinders, but it has no connection or communication with them. Each cylinder contains a sliding piston-head, I, and the two heads are connected by a straight unbroken rod, K, which passes through the central body, as shown, so that the two heads must always move together, one moving toward the inner end of its cylinder as the other moves toward the outer end of the opposite cylinder, and vice versa. The water or other motor is admitted into the two cylinders alternately inside of the pistons, so as to force one piston and then the other outward, each piston as it moves outward drawing the other inward by means of the connecting-rod. The forcing is done by means of the two pistons alternately forcing the air from the outer ends of the cylinders, as hereinafter explained. In the body A around the piston-rod there is mounted a sleeve or tube, *i*, the ends of which extend through stuffing-boxes into the respective cylinders, as shown in Fig. 1, so that as the pistons move back and forth they strike the sleeve alternately and move it endwise, first in one direction and then in the other. This sleeve is for the purpose of operating the main valve, as presently explained. The water or other motor is admitted through a pipe, *a*, into the base of the body A, and passes up through a passage, *b*, into a chamber, D, at the top. From the chamber D passages *c* lead into the inner ends of the cylinders to admit the water thereto inside of the pistons. The admission of water to the cylinders and its escape therefrom is controlled by a sliding valve, E, similar to the slide-valve of the common steam-engine. The water returns from the cylinders through the passages *c*, by which it entered, and passes under the valve E into a passage, *g*, which leads downward into the base of the pump, from which the water escapes through a pipe, *g*. The valve E is moved to and fro in such manner that it connects the two passages *c* with the outlet-passage *g* alternately, and so that it admits the water into first one cylinder and then the other. In this way the water is caused to carry the pistons back and forth in the cylinders. Each cylinder is provided at its outer end with a check-valve, *h*, opening inward to admit air, and with a check-valve, *e*, opening outward to permit the escape of the air. Each of the outlet-valves *e* is surrounded by a pipe, H, which leads downward into the base, where both pipes deliver into a common discharge-pipe, *f*. As each piston moves inward it draws air through the valve *h* into the cylinder, and then as it moves outward it forces the air from the cylinder through the valve *e* and pipe H out through the pipe *f*. As the two pistons are forcing alternately and through a common

delivery-pipe, a continuous discharge is maintained.

It will be observed that the pistons are solid, that the water and air enter the two cylinders alternately, that the water driving the pistons enters only inside of or behind them, and that the air enters only outside of or in front of them.

As before stated, the main valve E receives its motion from the sleeve *i*, which is moved to and fro by the pistons abutting against its ends.

A rock-shaft, *w*, is mounted in the body, and provided on its inner end with a depending arm, K, connected to the sleeve *i*, so that as the sleeve moves to and fro it imparts a rocking motion to the shaft *w*. The shaft *w* is provided on its outer end with an upright quadrantal plate, *l*, having on its rear corners projections or cams *m*, and on its front face at the middle a stud or pin, *n*, as shown in Figs. 2, 3, and 5. In the top of the body there is mounted another horizontal rock-shaft, *p*, having on its inner end depending arms which engage with the valve E, and on its outer end two depending arms, *o* and *q*, which engage with and are operated by the plate *l* on the lower rock-shaft, as shown in Figs. 2, 3, and 5. Thus it will be seen that when the pistons move the sleeve *i* it imparts motion, through the arm *k*, to the rock-shaft *w* and its plate *l*, and that said plate in turn transmits motion through the arms *o* and *q* to the upper rock-shaft *p*, which, through the arms on its inner end, moves the valve E. It is very desirable to have the valve move at the proper time very quickly, and hence we avail ourselves of the peculiar construction and arrangement shown and now to be described, by which the valve is thrown by a spring movement instantaneously. Of the two arms *o* and *q* on the outer end of the rock-shaft *p* the latter is attached rigidly, while the former is attached in such manner that it can be moved laterally, while the shaft *p* and the other arm are held stationary. The inner fixed arm *q* is provided on its outer side with a circular sleeve or collar, *s*, over which a corresponding collar, *r*, on the outer movable arm, fits, as shown in Figs. 3 and 5. These collars form the connection between the two arms *o q* and the support for the outer movable one, *o*. The two collars are cut away on the under side, so as to leave an opening, *t*, through them, as shown in Figs. 3 and 5. Within the inside collar there is mounted a coiled spring, *u*, the ends of which are turned outward and bear strongly against the sides of the opening *t*, as shown. The spring, thus arranged, tends to keep the openings *t* of the two collars opposite or in line with each other, and to hold the outer arm *o* opposite or in line with the middle of the rear arm *q*, which is made very wide, as shown. If the rear arm *q* be held still, and the front arm *o* turned to either side, a tension will be brought upon the spring, so that upon releasing the rear arm *q* the spring will throw it around opposite or in line with the front arm *o*. The rear arm or plate *q* is provided on its lower front corners with two studs, *v*, which, as the arm is moved to and fro, are carried down behind the quadrantal plate *l* of the lower shaft *w*. The front arm *o* of the upper shaft is provided in its lower end with a vertical slot which receives the stud or pin *n* on the lower quadrantal plate *l*, so that as said plate tips back and forth it imparts a positive motion to said arm *o*, moving the same to and fro. The shoulders or projections *m* on the upper rear corners of the quadrantal plate *l* extend back, so that at certain times they come in contact with the studs *v* on the arm or plate *q*.

The operation of the above parts is as follows: As the quadrantal plate *l* moves toward the right its stud *n* moves the arm *o* in the same direction, while the shoulder *m* on its left side slides under the corresponding stud *v* on the arm *q*, and holds said arm, and thereby the valve, from moving. This continues until the quadrantal plate has nearly finished its movement, when its shoulder passes from under the stud *v*, and thereby releases the rear plate *q*, whereupon the spring *u* instantly throws the arm *q* around in line with the arm *o*, and gives the valve E the required movement, the parts then being in the positions shown in Figs. 2 and 5. The spring is put under tension in order to throw the valve by the movement of the front arm *o*, while the quadrantal plate holds the rear arm *q* still, as before explained.

When the movement of the quadrantal plate is reversed, and it moves toward the left, its right shoulder *m* bears under the corresponding stud *v* of the plate *q* and holds the arm *q* and valve still, while the front arm *o* is moved to the left, until at the end of the movement the shoulder releases the rear arm and the spring throws the valve to the left in the same manner that it before did to the right.

Thus it will be seen that as the quadrantal plate moves to and fro it holds the valve, puts the spring under tension, and then releases the valve, so that the spring gives it a very quick movement.

In order to prevent all jar and concussion, the water-space or chamber D is provided with an air-chamber, F, as shown in Figs. 1 and 2.

It will be noticed that the central body A is composed of three parts, the main or central portion, the top or water-chamber, and the base or foot, as shown in Figs. 1, 2, 3, and 4. This construction admits of the parts being readily cast with the proper passages, &c., in them.

The passages in the base or foot are clearly shown in Fig. 4, which is a top plan view of the base detached.

When the pump is used where it is desirable to have it force only up to a certain pressure, and to have it govern automatically, we apply to the delivery-pipe a spring-valve, M,

as shown in Figs. 6 and 7. In this valve the inlet and outlet openings are at right angles to each other, and the former is provided with a check-valve, *x*, to prevent the entrance of air from the pump. This check-valve is provided with a stem which extends outward and has its end provided with a large piston, *x'*, which fits closely within the case or body, as shown in Fig. 7. Behind the piston there is a spiral spring, *y*, which tends to press the piston inward and force the check-valve *x* open. The spring rests at its outer end against a hand-screw, *z*, by which the tension of the spring may be increased or diminished, as required. As long as the pressure of the air from the pump is within the fixed limit, the spring holds the check open, and the air is allowed to pass freely through the valve; but when the pressure becomes too great, the air forces the piston *x'* backward, and thereby closes the check-valve to a greater or less degree, and limits the passage of the air. By turning the hand-screw, the valve may be set for any pressure required. A fluid-pressure gage may be applied to the valve, as shown in Fig. 7, as a guide, by which to set the same.

It is obvious that when the pump is constructed as above described, and as shown in Fig. 1, it can only force air up to a pressure nearly equal to that of the water by which the pump is driven. When it is desired to have the pump force air at a pressure greater than that of the water by which the pump is driven, each piston has secured to its outer side a rod or plunger, P, which extends out through the end or head of the cylinder, as shown in Fig. 8. These rods or plungers reduce the transverse area of the air-space below that of the water-space, so that the pump will force air at a greater pressure than that of the water. The capacity of the pump will, of course, be decreased in proportion to its increase in power. The heads of the cylinders will be provided with stuffing-boxes around the rods or plungers to prevent leakage. The inlet and outlet valves in the heads will, of course, be arranged out of the way of the rods or plungers.

When the pump is constructed, as in Fig. 1, with the inlet-valves in the cylinder-heads in communication with the outside air, it is not, of course, adapted for drawing air from any particular point, nor for pumping water; but, by connecting a suction-pipe, R, with the inlet-valves in the cylinder-heads, as shown in Fig. 8, the pump is adapted for drawing air or water from any desired point.

As before stated, the pump is intended mainly for use in forcing air into ale and beer barrels. In such case it is constructed as in Fig. 1, and connected permanently with the water-supply and the beer-barrels by pipes, as shown in Fig. 6. The pump thus arranged will be found of great service in restaurants in those cities which have the usual system of water-supply.

The pump operates automatically and constantly, and not only does away with the time, labor, and expense incident to the use of the present hand-pumps, but also maintains a continuous and uniform pressure in the barrels or casks.

Having thus described our invention, what we claim is—

1. In a water-power air-pump, the combination of a central body containing the valve motion and water-passages, and two pump-cylinders on opposite sides of the body, acting alternately as driving and forcing cylinders, as shown and described.

2. In a water-power air-pump, the combination of a central body containing the valve motion and water-passages, two cylinders mounted on opposite sides of said body, and acting alternately as driving and forcing cylinders, and provided each with an inlet and an outlet valve, as shown and described.

3. In a water-power air-pump, the combination of a central body containing the valve motion and water-passages, two cylinders mounted on opposite sides, and provided each with an inlet and an outlet valve at the outer end, and two pistons mounted in the cylinders, and connected by a straight unbroken rod, substantially as shown and described.

4. In a water-power air-pump, the combination of the central body, the two cylinders, the two pistons connected by a straight unbroken rod, and the sleeve *i* mounted on the rod, and extending into the two cylinders, and connected with the valve-gear, substantially as shown.

5. In a pump, substantially such as herein described, the valve motion, consisting of the quadrant *l*, having shoulders *m*, arm *q*, having studs *v*, arm *o*, and spring *u*, constructed and arranged to operate as shown and set forth.

6. In a water-power air-pump, a central body containing the valve-gear, and having its foot or base provided with the water-waste and delivery passages, as shown.

7. In combination with the pump, constructed and operating as shown and described, the automatic governing-valve M, constructed and applied as and for the purpose described.

8. In a water-power pump, the combination of a central body, two cylinders, two heads containing each an inlet and an outlet valve, two pistons connected by a straight unbroken piston-rod, and two plungers attached to the outer sides of the respective pistons and extending through the cylinder-heads, as shown.

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