

No. 848,277.

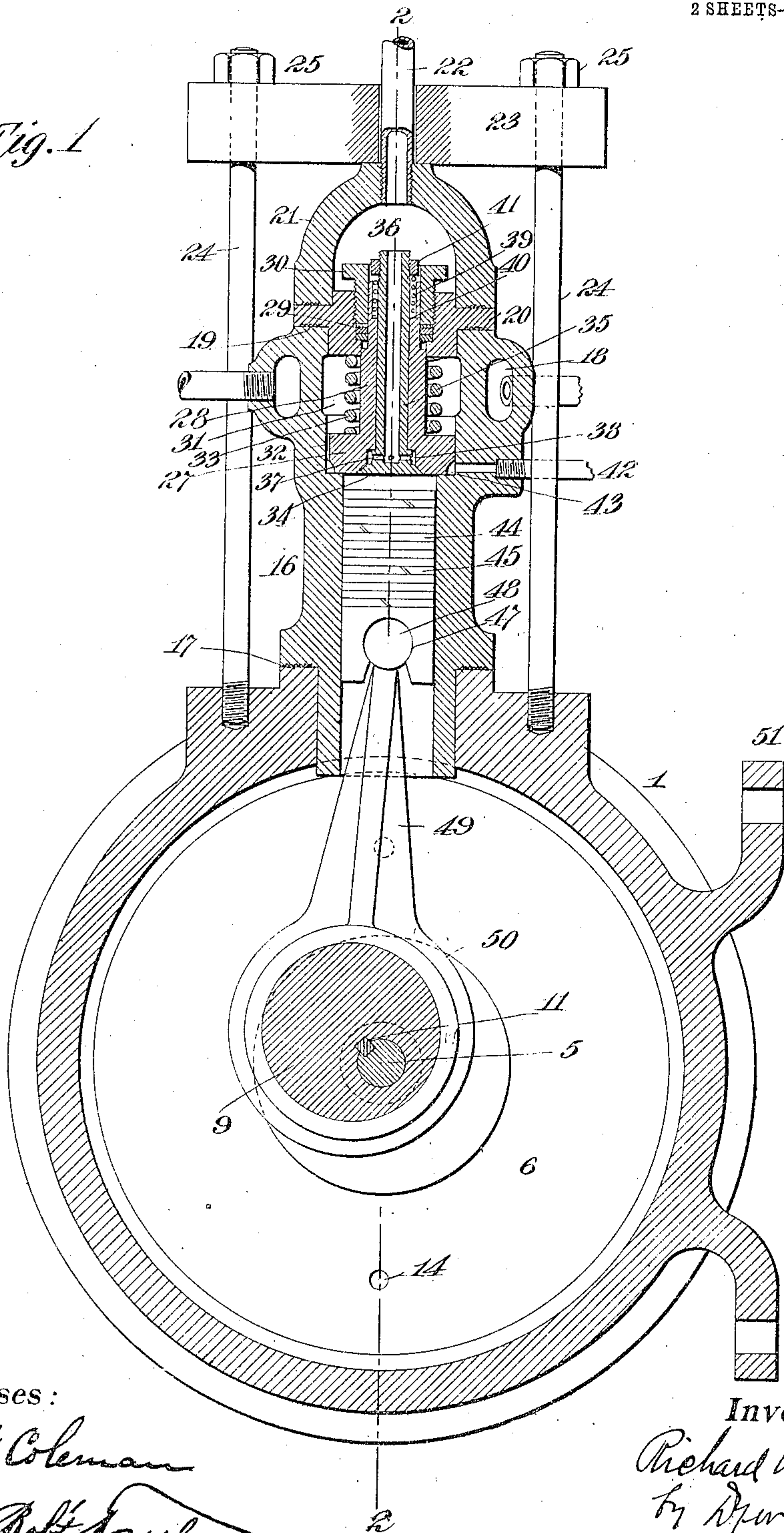
PATENTED MAR. 26, 1907.

R. WHITAKER.
GAS PUMP.

APPLICATION FILED JAN. 11, 1904.

2 SHEETS—SHEET 1

Fig. 1



Witnesses:

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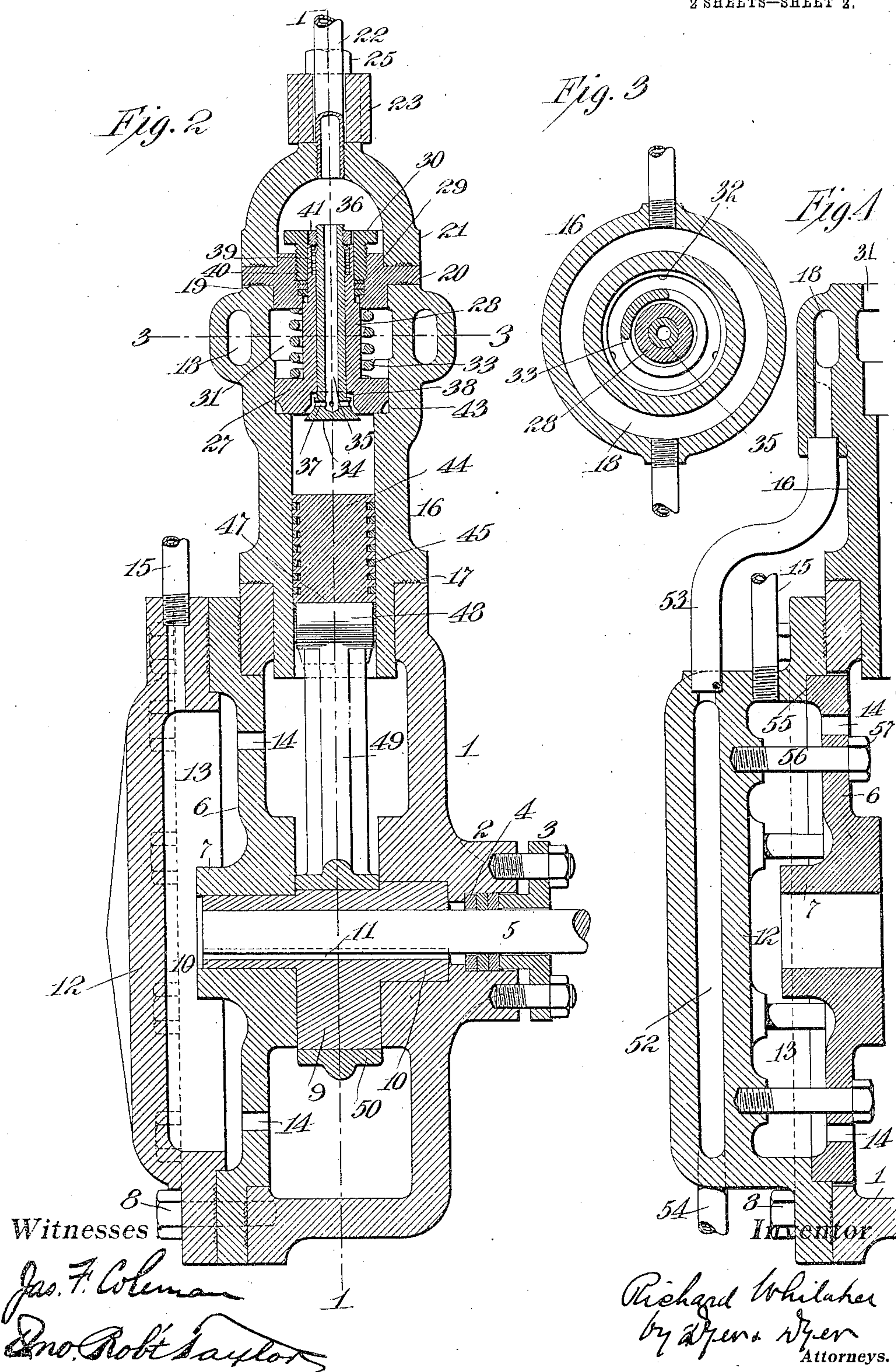
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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

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COMPANY, A CORPORATION OF NEW JERSEY.

GAS-PUMP.

No. 848,277.

Specification of Letters Patent.

Patented March 26, 1907.

Application filed January 11, 1904. Serial No. 188,612.

To all whom it may concern:

Be it known that I, RICHARD WHITAKER, a citizen of the United States, residing in the city of New Brunswick, county of Middlesex, and State of New Jersey, have invented a certain new and useful Improvement in Gas-Pumps, of which the following is a description.

This invention relates to improvements in pumps for compressing any gas, as ammonia-gas, in ice-making machines. Many of the improvements disclosed herein can be employed in pumps or compressors used for other purposes and in machines of analogous character.

The objects of the present invention are to produce a pump made of as few parts as possible and connected together by grooved joints, so that packing will be dispensed with.

Another object is to improve the construction of the eccentric and the bearing of the connecting-rod with the piston.

Other objects are to provide means for separating ammonia-gas which may leak by the packing-rings of the piston into the oil-chamber and the improvement of the valve.

The invention comprises a base or foundation of the pump in the form of a casing containing one bearing for the eccentric-shaft and a support for the cylinder. The casing is provided with a double cover, so as to make a receptacle for the lubricating-oil, the inner cover having a bearing for the eccentric-shaft and forming, together with the outer cover, a condenser-chamber for separating ammonia from the oil. The two covers are provided with grooved joints and are connected together and to the casing by means of a single set of stub-bolts. The cylinder is connected to the casing and to the valve-support and valve-casing, the parts being secured in position by means of tie-bolts and a tie-block bearing at its center at the top of the valve-casing, so that the parts will be firmly locked and kept in alinement. The eccentric is cast integral with its two short shafts, by means of which it is supported within the casing, and a driving-shaft is keyed to the eccentric and serves to rotate it. The connecting-rod is secured to the piston by a cylindrical joint which has no separable parts and is susceptible to but

little wear. The valve is of the balanced type and double—that is to say, the pressure-valve is of large size and carries within it the inlet-valve, ports being provided to admit the compressed gas to both sides of the pressure-valve, so that it will be balanced and the actuating-spring will not have to be excessively powerful.

In order to better understand the nature of the invention, attention is directed to the accompanying drawings, which show one embodiment of the invention, and in which—

Figure 1 represents a side view of the pump, partly in section, on the line 1 1 of Fig. 2. Fig. 2 is a vertical section taken on the line 2 2 of Fig. 1. Fig. 3 is a horizontal section taken on the line 3 3 of Fig. 2, and Fig. 4 is a fragmentary vertical sectional view of a modification.

In all of the several views like parts are designated by the same figures of reference.

The casing 1 is of the general shape shown and is provided with a bearing 2, a gland 3, and packing-rings 4 for the passage of the actuating-shaft 5. A cover 6, having a bearing 7, is secured to one side of the casing 1 by means of stub-bolts 8, the joint between it and the casing being grooved or otherwise rendered oil-tight, so that the casing will serve as a receptacle for the lubricating-oil.

The eccentric 9 is provided with integral bearing portions or stub-shafts 10, which are mounted within the bearings 2 and 7 and end play prevented by the casing and cover, which hold the eccentric in position. The shaft 5 passes through the center of the eccentric and is secured in place by any suitable means, such as the key 11. By mounting the eccentric upon integral bearing portions no support is given to it by the shaft 5, the latter serving merely to impart rotary motion to the eccentric. The shaft therefore may be of smaller size than would be necessary if the eccentric were directly supported upon it. It may be removed and a shorter or longer shaft substituted without changing the adjustment of the bearings for the eccentric. Furthermore, the key 11 may be made longer and applied or removed with greater facility.

The outside cover 12, dished, as shown, is applied to the cover 6 and forms, in conjunc-

tion with the cover 6, a double cover constituting a condensing-chamber 13. The cover 12 is preferably secured in place by the same set of securing-bolts as are used for the inner cover. This chamber communicates with the inside of the casing 1 by two or more small openings 14, by means of which the oil within the chamber 13 will always be at the same height as that within the casing 1. The chamber 13 serves the purpose of a condensing-chamber and collects the ammonia-gas which may leak by the packing-rings of the piston into the oil-casing 1. The gas collected in the chamber 13 may be drawn off by means of the pipe 15 into the gas-tank and again compressed.

The cylinder 16 is entirely separate from the casing and is provided with a grooved shoulder 17, which rests upon the upper part of the casing 1. This shoulder is provided with a number of sharp-faced concentric grooves, as shown, which constitute baffling and condensing grooves, to form a gas-tight joint. The cylinder is preferably provided with an integrally-formed water-jacket 18 and a concentrically-grooved upper face 19. Upon the upper face 19 is a valve-support or guide 20, having a concentrically-grooved upper face upon which rests a valve cap or crown 21. Secured to the upper part of the cap 21 is the gas-inlet pipe 22. These parts are all firmly secured together and to the casing by means of the tie-bar 23, which surrounds the gas-inlet pipe 22 and through which pass two or more tie-bolts 24, their lower ends being secured firmly to the casing 1 and their upper extremities being provided with nuts 25, by means of which tension may be imparted to the bolts, and the tie-bar 23 may be drawn down, the cap 21, the valve-guide 20, and cylinder 16 all being firmly locked in place. The tie-bar 23, resting upon the center of the cap 21, which is spherically shaped, as shown, admits of tight joints being secured at all points, even if one of the nuts 25 be set up tighter than the other. By removing the nuts 25 and the tie-bar 23 the entire upper portion of the pump may be dismantled and the valve reached for examination or removal.

The grooved and ground joints between the casing and its cover, the cylinder and casing, and the valve-support and cylinder and crown are made up of a number of sharp-faced concentric grooves which are made in one element of each two being joined. The parts before being permanently joined are placed together and one or both rotated or oscillated, so as to make a close joint by grinding. A grinding substance may be introduced between the abutting surfaces, if desired, to assist the operation, although this is not necessary. The sharp edges of the grooves will wear away, allowing the two parts to closely join. This grinding opera-

tion is very easily accomplished when the parts are made of cast-iron or other easily-worked metal. The sides of the grooves will form concentric annular chambers which will serve as baffling-grooves for the condensation of any gas which may escape into the joint, so that leakage will be almost absolutely prevented.

The valve 27 is balanced and duplex—that is to say, it is balanced against pressure and is double, the pressure-valve carrying the gas-valve within it. The valve 27 is provided with a stem 28, which works within the valve-guide 20, a tight joint being secured by means of the rings 29 and gland 30. Above the valve 27 is an equilibrium-chamber 31, into which gas under cylinder-pressure is admitted through the ports 32. (See Fig. 3.) A spiral spring 33 is used to seat the valve. The gas at cylinder-pressure being admitted to the chamber 31 when the valve 27 is raised by the pressure of the gas in the cylinder will on the suction-stroke of the piston exert a downward pressure on the valve to assist the action of the spring 33, such pressure being determined by the difference in area between the lower and upper faces of the valve. This difference of area may be proportioned by varying the diameter of the stem 28 of the valve. The stem of the outlet-valve is of small size relatively to the size of the seat with which the outlet-valve engages, so that the area of surface of the outlet-valve within the equilibrium-chamber subject to pressure in the direction which tends to seat the valve will be large relatively to the area of surface within the cylinder tending to unseat the valve.

The inlet-valve 34 is of the shape shown and engages with a seat formed upon the valve 27. The inlet-valve is provided with a long stem 35, which passes within a central opening in the stem of the valve 27. This stem 35 is hollow and communicates with the chamber 36, which communicates with the gas-inlet pipe. A free passage for the entering gas through the valve 34 is secured by means of the small lateral openings 37, which communicate with an annular passage 38 above the valve-seat. The inlet-valve is held upon its seat by means of the spiral spring 39, which rests upon a shoulder 40, formed upon the stem of the valve 27. A nut 41 limits the vertical movement of the inlet-valve and to some extent serves as a means of adjustment of the tension of the spring 39. The gas-pipe 42 communicates with the annular chamber 43 above the seat of the pressure-valve 27 and serves to draw off the compressed gas. This valve is extremely simple and has but one packing—viz., the rings 29 and gland 30. Its operation is the same as all balanced valves. Upon the descent of the piston the valve 34 is opened by the intruding gas, and upon the ascent of

the piston the gas is compressed between the piston and the two valves. Upon the pressure within the cylinder exceeding that of the spring 33 the pressure-valve will open sufficiently to permit gas under cylinder-pressure to pass through the ports 32 to the chamber 31. As soon as the pressure exceeds the equilibrium thus established the valve will open at every ascending stroke of the piston.

10 The piston 44 is provided with a number of packing-rings 45 of the usual type and has integrally formed within it a cylindrical bearing 47, which engages with a cylindrical head 48, formed integrally upon the upper end of the connecting-rod 49. The connecting-rod is preferably cast integral with the eccentric-strap 50. The cylindrical cross-head 48 is kept in proper position relatively to the piston by engagement with the walls of the cylinder, no other means being necessary. By making the cylindrical portions 48 of a length equal almost to the diameter of the piston and of considerable diameter a sufficient bearing-surface will be secured, so as not to require the need of any adjusting devices. This bearing is extremely cheap and is efficient in operation and may be very readily taken apart by removing the tie-bolts, then lifting the cylinder 16 from its seat, then turning the eccentric 9 until the head 48 and piston 44 reach their uppermost limit, when the piston may be slid from the head 48.

The casing 1 may be provided with lugs 51, having openings for the attachment of supporting-bolts, so that it may be attached to a wall or other support.

In Fig. 4 is shown a construction having an additional water-jacket 52 for the condensing-chamber 13. This jacket may be cast integrally with the cover 12, as shown, or made by attaching a separate cover thereto. The water-jacket 52 preferably communicates with the jacket 18 of the cylinder by any suitable means, such as a pipe 53. The circulation of water will pass through both jackets and exhaust through the pipe 54. In the same view an improvement is shown by means of which one of the joints will be dispensed with and the chance of leakage reduced. The cover 12 in this view bears directly against the casing 1 and is secured thereto by the bolts 8, as before described. The inner cover 6, which carries the bearing 7, is mounted within a shoulder 55, formed upon the inner face of the cover 12 and entirely within the chamber 1. The covers 6 and 12 are secured together, as shown, by means of stub-bolts 56, entering threaded openings within the cover 12 and passing through openings in the cover 6 and being set up by nuts 57, as shown. It is to be understood that the covers 6 and 12 are secured together and the cover 12, with the other cover attached thereto, applied to the casing 1

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

1. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the cylinder and casing, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, a tie-bar engaging with the valve-cap and tie-bolt connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

2. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, a tie-bar engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, the tie-bolts being secured to the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

3. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, and of spherical shape, a tie-bar engaging with the valve-cap, and tie-bolts connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

4. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, and of spherical shape, a tie-bar engaging with the valve-cap, and tie-bolts connecting the tie-bar with the casing, the tie-bolts being se-

cured to the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

5. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap, and tie-bolts connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

6. An improved pump which comprises in combination, a casing with a cylinder-opening, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and the support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, the tie-bolts being secured to the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

7. An improved pump which comprises in combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between the cap and support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

8. An improved pump which comprises in

combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, a cylinder having a shoulder and engaging with the cylinder-opening, baffling-grooves between the casing and cylinder, a valve-support engaging with the other extremity of the cylinder, baffling-grooves between the support and cylinder, a valve-cap engaging with the valve-support, baffling-grooves between cap and support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, the tie-bolts being secured to the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-body and valve-cap will be connected to the casing.

9. An improved pump which comprises in combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, an eccentric within the casing, with stub-shafts mounted within the bearings, a connecting-rod and eccentric-strap engaging the eccentric, the rod having a cylindrical head, the head being substantially as long as the diameter of the piston, a cylinder having a shoulder and engaging with the cylinder-opening, a piston, the said piston having a central bearing within which is carried the head of the connecting-rod, the ends of the head engaging with the cylinder-walls and held in position by such means, a valve-support engaging with the other extremity of the cylinder, a valve-cap engaging with the valve-support, a tie-bar engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-body and valve-cap will be connected to the casing, and the connecting-rod held in position.

10. An improved pump which comprises in combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, an eccentric within the casing, with stub-shafts mounted within the bearings, a connecting-rod and eccentric-strap engaging the eccentric, the rod having a cylindrical head, the head being substantially as long as the diameter of the piston, a cylinder having a shoulder and engaging with the cylinder-opening, a piston, the said piston having a central bearing within which is carried the head of the connecting-rod, the ends of the head engaging with the cylinder-walls and held in position by such means, a valve-support engaging with the other extremity of the cylinder, a valve-cap engaging with the

valve-support, a tie-bar engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-support and valve-cap will be connected to the casing, and the connecting-rod held in position.

11. An improved pump which comprises in combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, an eccentric within the casing, with stub-shafts mounted within the bearings and held in position by the casing and cover, a connecting-rod and eccentric-strap engaging the eccentric, the rod having a cylindrical head, the head being substantially as long as the diameter of the piston, a cylinder having a shoulder and engaging with the cylinder-opening, a piston, the said piston having a central bearing within which is carried the head of the connecting-rod, the ends of the head engaging with the cylinder-walls and held in position by such means, a valve-support engaging with the other extremity of the cylinder, a valve-cap engaging with the support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, and means for imparting tension to the tie-bolts, whereby the cylinder, valve-support and valve-cap will be connected to the casing, and the connecting-rod held in position.

12. An improved pump which comprises

in combination, a casing with a shaft-bearing, and cylinder and cover openings, a cover carrying a bearing and engaging with the casing, an eccentric within the casing, with stub-shafts mounted within the bearings and held in position by the casing and cover, a connecting-rod and eccentric-strap engaging the eccentric, the rod having a cylindrical head, the head being substantially as long as the diameter of the piston, a cylinder having a shoulder and engaging with the cylinder-opening, a piston, the said piston having a central bearing within which is carried the head of the connecting-rod, the ends of the head engaging with the cylinder-walls and held in position by such means, a valve-support engaging with the other extremity of the cylinder, a valve-cap engaging with the support, and of spherical shape, an entrance-pipe communicating with the valve-cap in the center, a tie-bar surrounding the entrance-pipe and engaging with the valve-cap and tie-bolts connecting the tie-bar with the casing, the tie-bolts being secured to the casing, and having nuts on their free ends, which engage with the tie-bar, and force it into engagement with the valve-cap, whereby the cylinder, valve-support and valve-cap will be connected to the casing, and the connecting-rod held in position.

This specification signed and witnessed this 5th day of January, 1904.

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