R. WHITAKER & E. LOWE.

GAS PUMP.

APPLICATION FILED OCT. 1, 1907.

990,616. Patented Apr. 25, 1911.

2 SHEETS—SHEET 1.

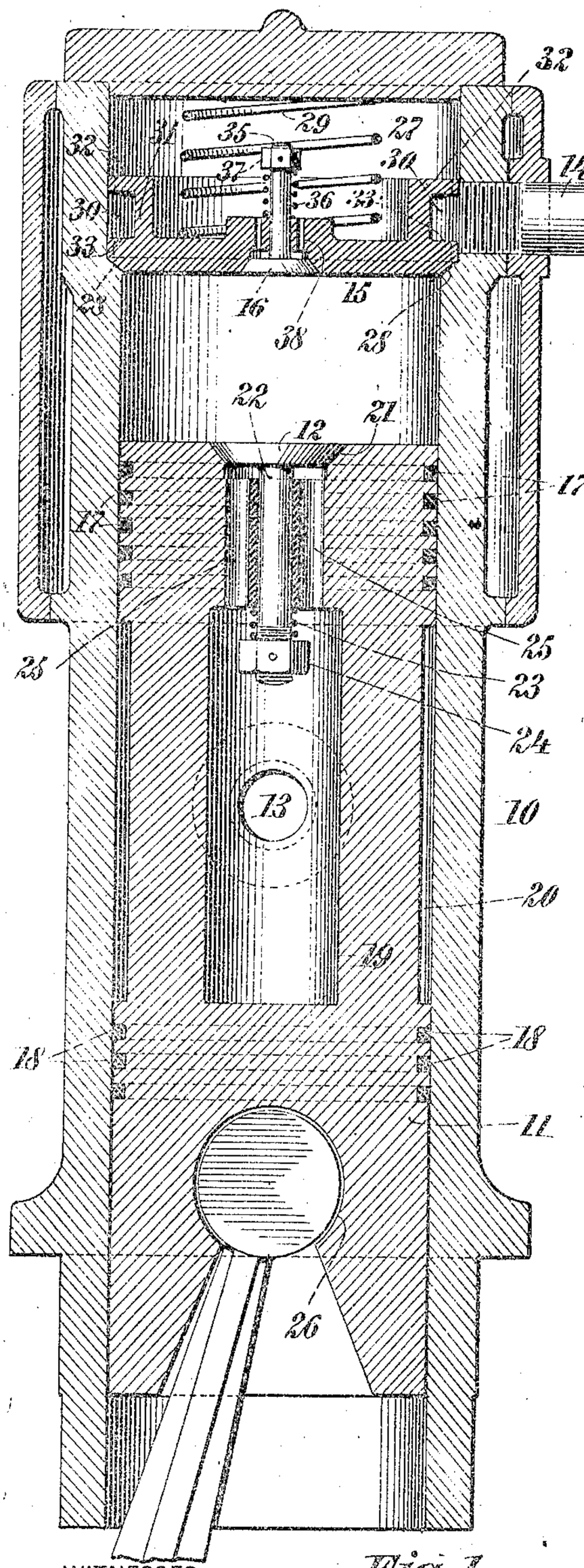


Fig. 1.

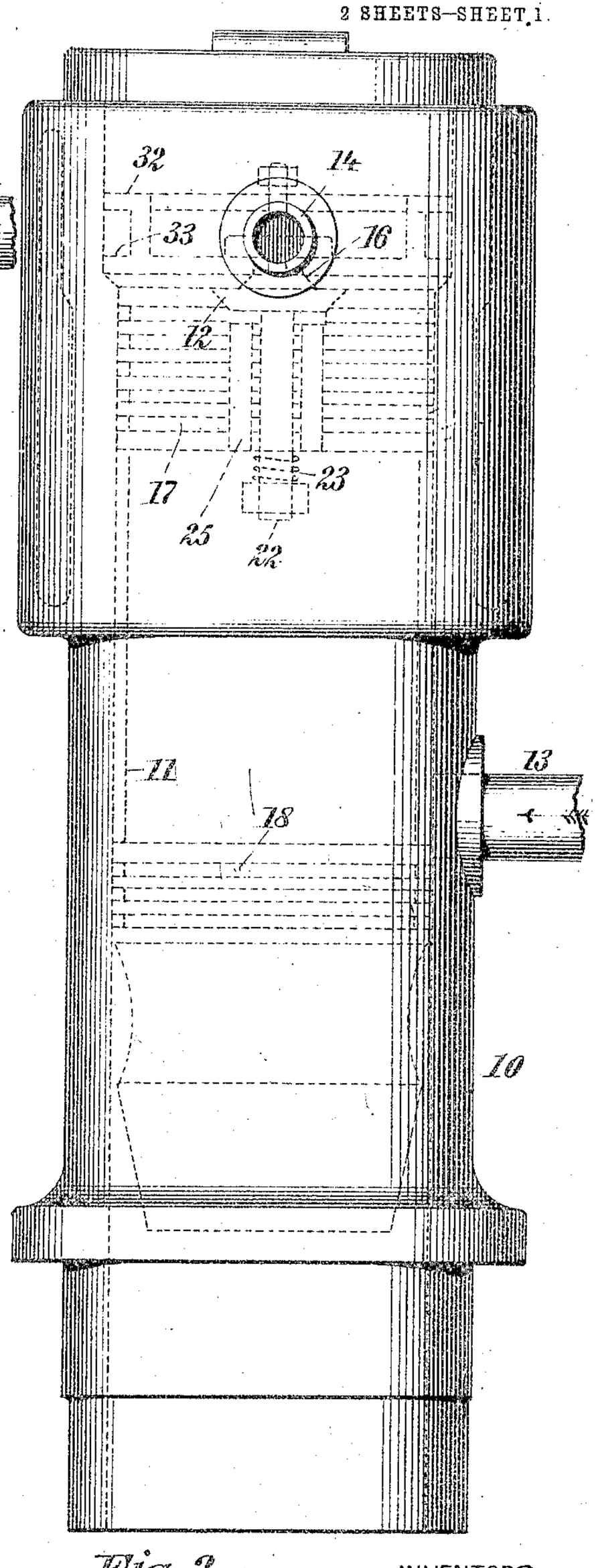


Fig. 2.

WITNESSES:

Edward Dieterich

Edwin F. Dieterich.

INVENTORS.

Richard Whitaker

Elmer Lowe.

BY

Archibald Cox

ATTORNEY

R. WHITAKER & E. LOWE.

GAS PUMP.

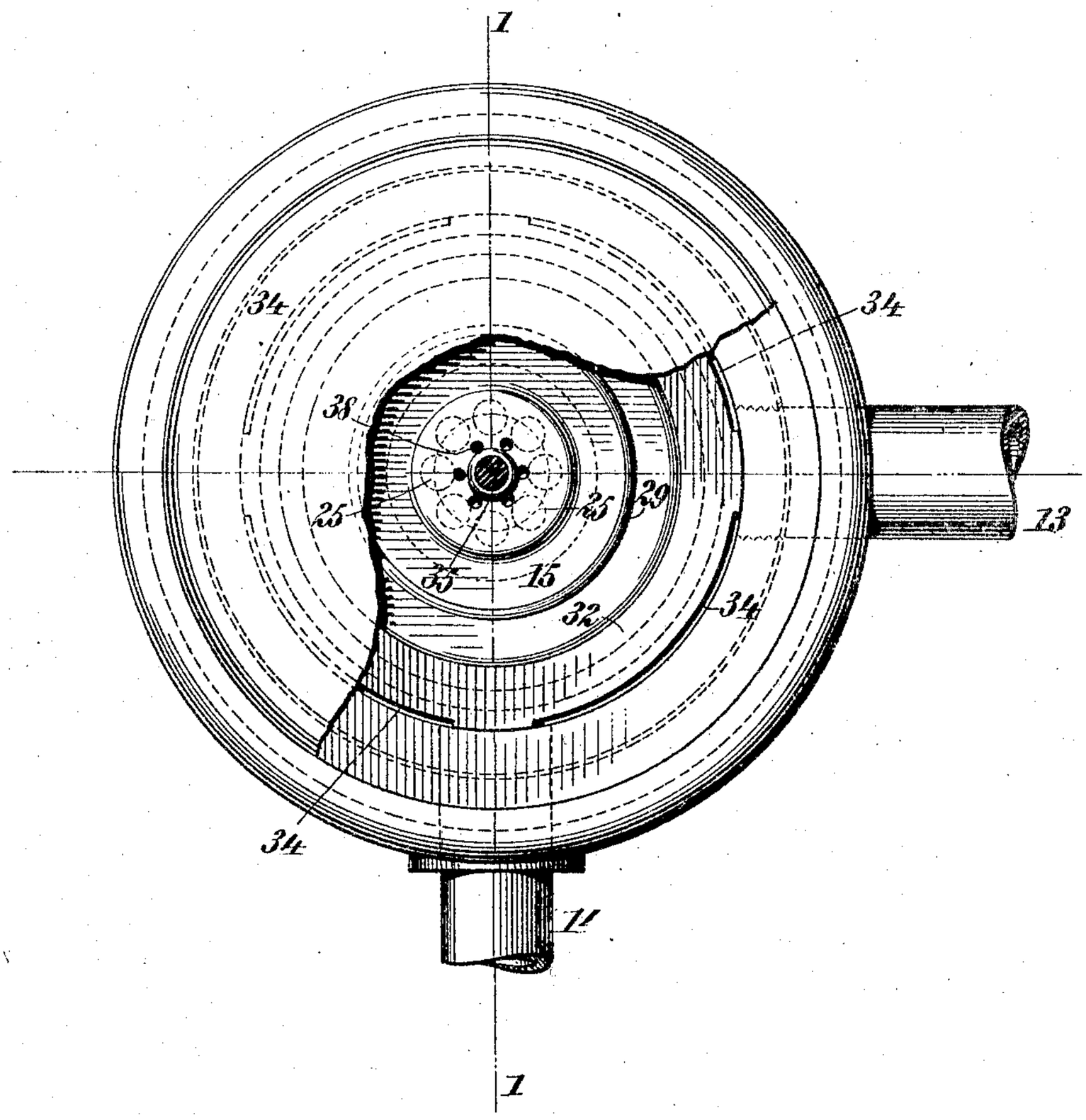
APPLICATION FILED OCT. 1, 1907.

990,616.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 2.

Fig. 3.



WITNESSES:

Gustave Dieterich.

Edwin N. Dieterich.

INVENTORS

Richard Whitaker,

Elmer Lowe.

BY

Archibald Cox

ATTORNEY

UNITED STATES PATENT OFFICE.

RICHARD WHITAKER AND ELMER LOWE, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNORS TO THE BRUNSWICK REFRIGERATING COMPANY, OF NEW BRUNSWICK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GAS-PUMP.

990,616. Specification of Letters Patent. **Patented Apr. 25, 1911.**

Application filed October 1, 1907. Serial No. 395,323.

To all whom it may concern:

Be it known that we, RICHARD WHITAKER and ELMER LOWE, citizens of the United States, and residents of New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Gas-Pumps, of which the following is a specification.

The invention relates to improvements in gas-compressing pumps, and pertains more particularly to improvements in pumps of the character shown and described in the following Letters-Patent heretofore granted to Richard Whitaker, to-wit: No. 795,014 dated July 18, 1905, No. 795,015 dated July 18, 1905, No. 821,563 dated May 22, 1906 and No. 848,277 dated March 26, 1907.

The objects of the present invention are generally to simplify and increase the efficiency of the pump and the system in which the pump may be connected, and more specifically to prevent the ammonia gas from leaking by the piston and entering the chamber in which, with a liberal quantity of lubricant, are contained the eccentric and rod for operating the piston, and to avoid the danger of abnormal or excessive discharge pressures either in the pump or the piping or parts connected therewith, it being entirely convenient in accordance with the present invention to prevent the creation of a discharge-pressure in excess of a predetermined limit. These objects and other advantages are attained by the mechanism hereinafter described and illustrated in the accompanying drawings, in which:

Figure 1 is a central vertical section of the cylinder portion of a compressor-pump constructed in accordance with and embodying our invention, the piston being indicated in its lower position; Fig. 2 is a side-elevation of the same, the piston being indicated in its upper or compressing position; and Fig. 3 is a top view, partly broken away, of the same.

In the drawings, 10 designates the pump-cylinder, 11 the piston therein having in it the gas inlet valve 12, 13 the supply pipe for gas, 14 the discharge pipe for compressed gas, 15 the pressure-valve, and 16 a pressure controlling and relief valve mounted in said valve 15 and capable of operation independently thereof.

The piston 11 is of elongated form and provided adjacent to its upper and lower ends with sets of rings 17, 18, between which said piston is formed with a through transverse chamber 19 and an external annular chamber 20 in communication therewith. The chamber 19 is elongated vertically and always in register with the gas supply pipe 13. In the upper or head end of the piston 11 is seated the gas inlet valve 12, said valve having a downwardly and inwardly converging periphery adapted to a correspondingly-formed seat 21 on the piston and a stem 22 which extends downwardly through a snugly receiving hole in the upper end of said piston and is exposed below the same in the gas-chamber 19, wherein the lower end of said stem is provided with a tension spring 23 and nut 24. The spring 23 exerts its force to normally hold the valve 12 on its seat and its tension may be regulated by the adjustment of the nut 24 toward and from it. Within the vertical plane of the outline defined by the valve-seat 21, the piston 11 is formed with vertical ports 25 which are in permanent communication with the gas-chamber 19 and up through which the gas, for compression, may pass to the upper side of the head of the piston when during the descent of the latter the suction thereby created effects the elevation of the valve 12 from its seat.

The lower end of the piston 11 is formed with the usual socket 26 to receive the upper end of the customary driving eccentric-rod, said rod as shown in the aforesaid Letters-Patent No. 848,277 being conveniently driven from an eccentric secured on a driving shaft and inclosed within a base-casing upon which the cylinder 10 is mounted and within which is provided a liberal supply of oil for lubricating the working parts therein. We do not show the said base-casing with its oil chamber and eccentric nor the whole of the eccentric-rod for driving the piston 11, since the same are fully shown and described in the aforesaid Patent 848,277. The cylinder 10 is vertical and entirely open at its lower end, as shown in Fig. 1, and at said end is constructed to seat within a socket in said base-casing. A difficulty experienced in the employment of the pump shown in said Patent 848,277 is that the gas will leak down the sides of the piston and enter the

oil chamber for the eccentric, and this difficulty is indicated in said patent wherein is shown a specially provided chamber to receive the gas from the oil-chamber. Our invention without changing the vertical arrangement of the piston and cylinder and without interfering with the use of a cylinder open at its lower end to receive and allow the movement of the eccentric-rod therein, provides a construction which prevents the leakage of the gas into the oil-chamber in the base-casing and simplifies the pump and increases its efficiency and the efficiency of the system employing it.

Within the upper end of the cylinder 10 is a chamber 27 at whose base is formed, on the inner laterally extended wall of the cylinder, an annular seat 28 for the pressure valve 15, which is normally held upon said seat by a spring 29 confined between it and the head of the cylinder. The valve 15 is formed in its periphery with an annular chamber 30, which when said valve is on its seat is in direct communication with the discharge pipe 14. The chamber 30 is defined by the side wall 31 of the valve 15, the lower surface of the upper encompassing flange 32 on said valve and the upper surface of the lower encompassing flange 33 on said valve. The flanges 32, 33 are removed at segmental portions of their peripheries, as at 34 (Fig. 3), to form openings which place the chamber 30 in permanent communication with the chamber 27 above the valve 15 and permit the compressed gas, upon the elevation of the valve 15 from its seat, to enter the chamber 30.

In the valve 15 is provided a pressure control valve 16 whose conical peripheral edge is adapted to a correspondingly formed seat on the valve 15 and whose stem 35 extends upwardly through a snugly receiving hole in said valve 15 and has upon its upper portion a tension spring 36 and nut 37, said spring exerting its force to normally retain the valve 16 on its seat and said nut being provided to regulate the tension of said spring or set the same to resist the opening of the valve 16 under any normal gas-pressure in the chamber 27 and to permit the opening of said valve 16 should, for any reason, the gas-pressure in said chamber become excessive or abnormal or greater than the predetermined amount therefor. The valve 15 is formed within the vertical plane of the periphery of the valve 16 with ports 38 which are sealed by the valve 16 when the latter is on its seat and communicate with the cylinder 10 below the pressure valve 15 when said valve 16 is off its seat. The ports 38 always remain sealed except in the event of the creation of abnormal gas-pressure in the chamber 27, when the valve 16 will open and permit such pressure to be relieved through the ports 38. The valve 16 enables the prevention of a gas-pressure in the chamber 27 or discharge pipe 14 or parts connected therewith beyond a predetermined maximum degree, and this is of very great importance in many respects, as, for example, if, in the absence of the valve 16, the operator should set or continue the pump in operation and neglect to open the valve or valves in the line leading therefrom a great and possibly disastrous gas-pressure would be created whose degree would be limited only by the proper actuating the piston 11, whereas the effect of any such neglect on the part of the operator is wholly avoided by the presence of the valve 16 which under the condition stated will open upon the creation of a gas-pressure beyond the predetermined limit and relieve the same, the excess of gas-pressure passing below the valve 15 and finally preventing the inlet valve 12 from opening, under which condition the pump may continue in operation without damage. The valve 16 thus serves to control the maximum degree of gas-pressure which may be created in the chamber 27 and discharge line by the compressor, any excess of such pressure being relieved by the opening of said valve thereby.

The operation of the compressor will be largely understood from the foregoing description. The supply-gas will be admitted to the chamber 19 in the piston 11, and during each down or suction stroke of the piston the valve 12 will open and permit a proper charge of the gas to pass upwardly through the ports 25 to the space above the piston. During each up-stroke of the piston 11 the charge of gas above it will be compressed against the pressure valve 15, which elevating from its seat will permit the compressed gas to enter the annular chamber 30, chamber 27 and discharge pipe 14. Any excess of pressure or pressure beyond the predetermined limit in the pipe 14 and chamber 27 will open the valve 16 and be relieved thereby. The gas in the supply chamber 19 is sealed at the upper and lower ends of the piston by the rings 17, 18. A very important advantage derived from the location of the chamber 19 intermediate the ends of the piston 11 and sealing the same by the rings 17, 18 is that any gas leaking downwardly around the upper end of the piston will return to said chamber and enter the supply-gas for immediate use and not pass downwardly below the lower end of the piston into the usual casing there provided for the piston-driving mechanism. The piston 11 is in effect a two-ended piston and the supply-gas and leakage-gas enter and are confined between the upper and lower ends of the same. The lower rings 18 also tend to prevent the lubricant in the usual

lower casing for the driving mechanism from being carried upwardly into the suction-chamber 19. It may also be mentioned that the supplying of the gas through the piston 11 enables the gas to reach the compression chamber or space between the piston and pressure valve in as cool a state as possible, whereas in the constructions in which the supply-gas passed downwardly through the pressure or discharge valve the gas became more or less heated by the heat generated by the discharge pressure.

What we claim as our invention and desire to secure by Letters-Patent, is:

1. In a pump of the character described, a cylinder, a pressure-valve controlling the discharge, an automatic independently operative valve for relieving abnormal discharge pressures by opening a passage, under said pressures, leading to the compression side of said pressure-valve, a piston in said cylinder packed at both ends and having a gas supply chamber between said ends, and a suction-valve in said piston; substantially as set forth.

2. In a pump of the character described, a cylinder, a pressure-valve controlling the discharge, an automatic independently operative valve for relieving abnormal discharge pressures by opening a passage, under said pressures, leading to the compression side of said pressure-valve, a piston in said cylinder, a suction-valve in said piston, and means for supplying gas to the passage normally closed by said suction-valve; substantially as set forth.

3. In a pump of the character described, a cylinder, a pressure valve controlling the discharge and formed with an annular encompassing chamber and upper and lower flanges containing passages for the gas to said annular chamber and the chamber above said valve, a spring normally holding said valve on its seat, an independently operative pressure control or relief valve seated in said pressure valve, a spring normally holding said control valve on its seat, a piston in said cylinder, a suction-valve in said piston, and means for supplying gas to the passage normally closed by said suction-valve; substantially as set forth.

Signed at New Brunswick, New Jersey, this 26th day of September, 1907.

RICHARD WHITAKER.
ELMER LOWE.

Witnesses:
FRED M. JOINER,
F. E. FISHER.