F. E. NORTON.

AIR AND GAS COMPRESSOR.

APPLICATION FILED SEPT. 13, 1907.

912,975.

Patented Feb. 16, 1909.

3 SHEETS—SHEET 1.

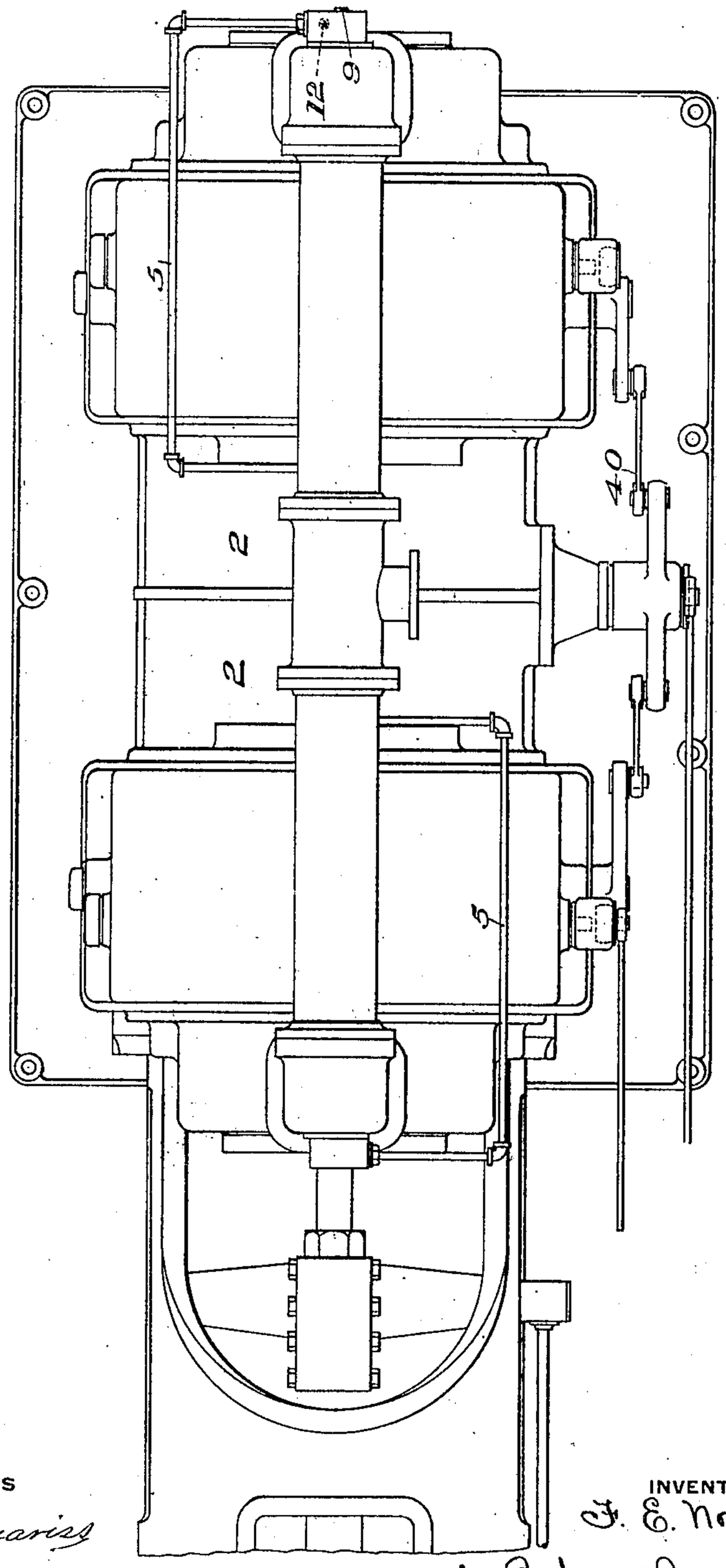

Fig. 1.

WITNESSES

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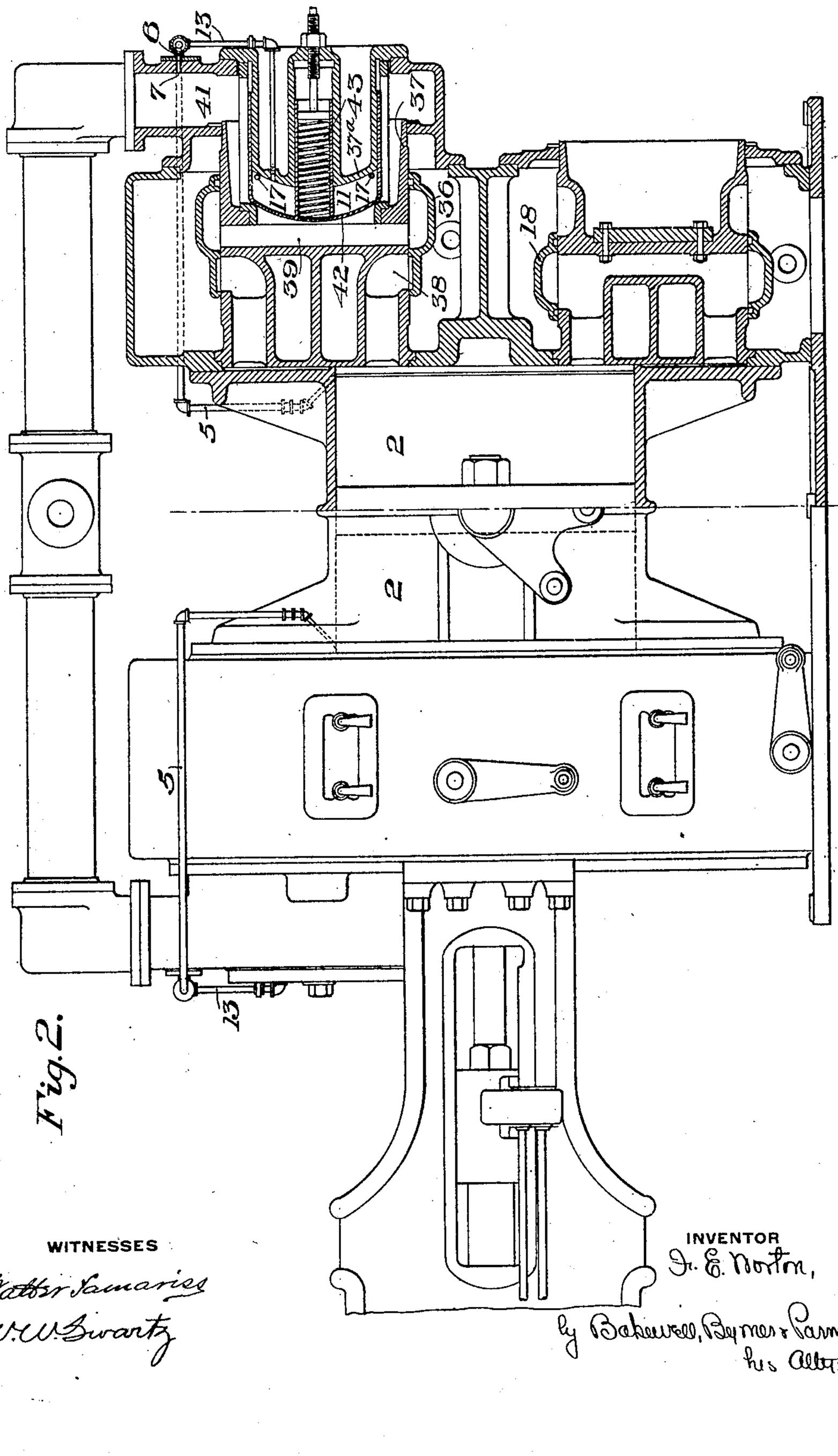

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

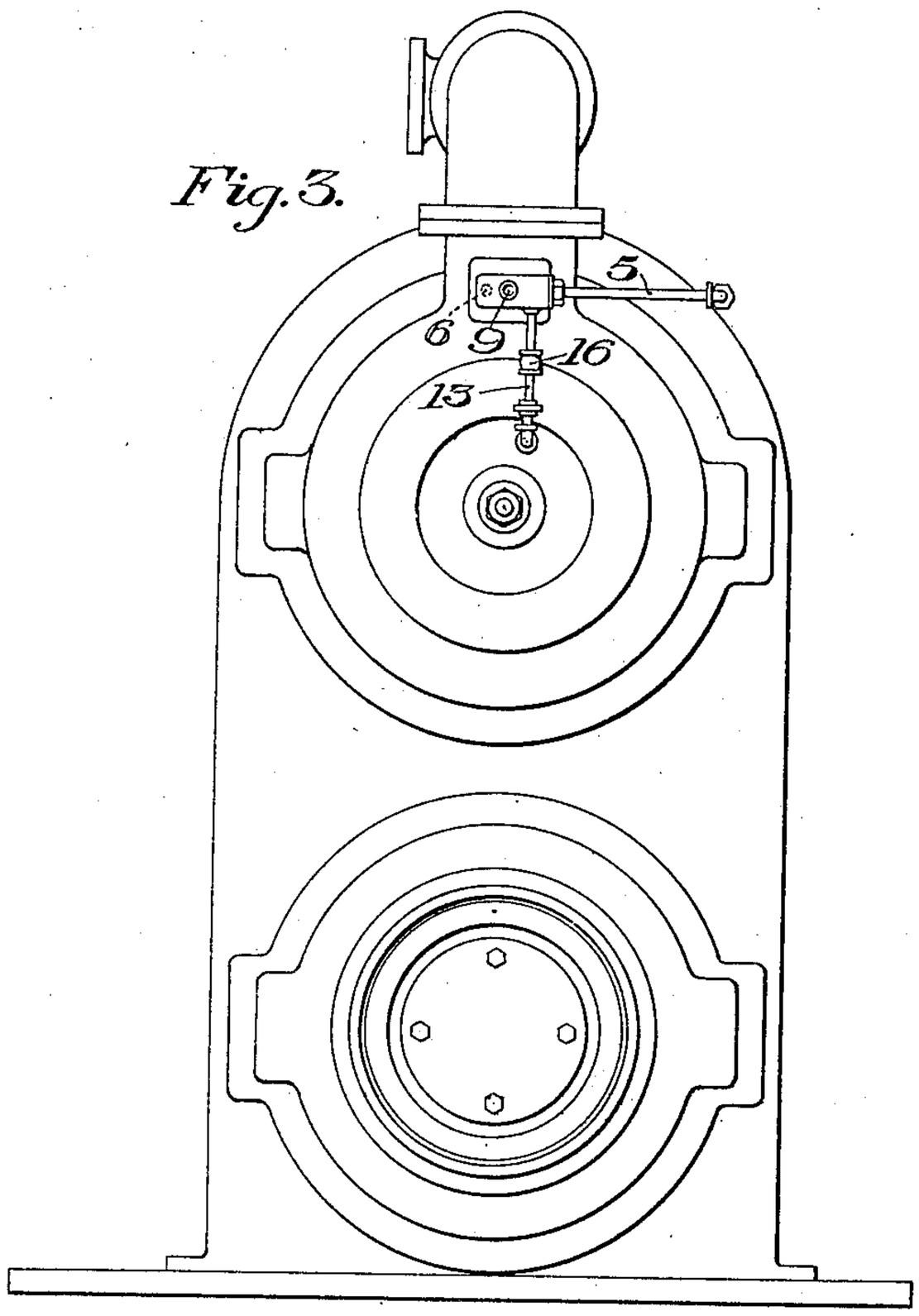


Fig. 4.

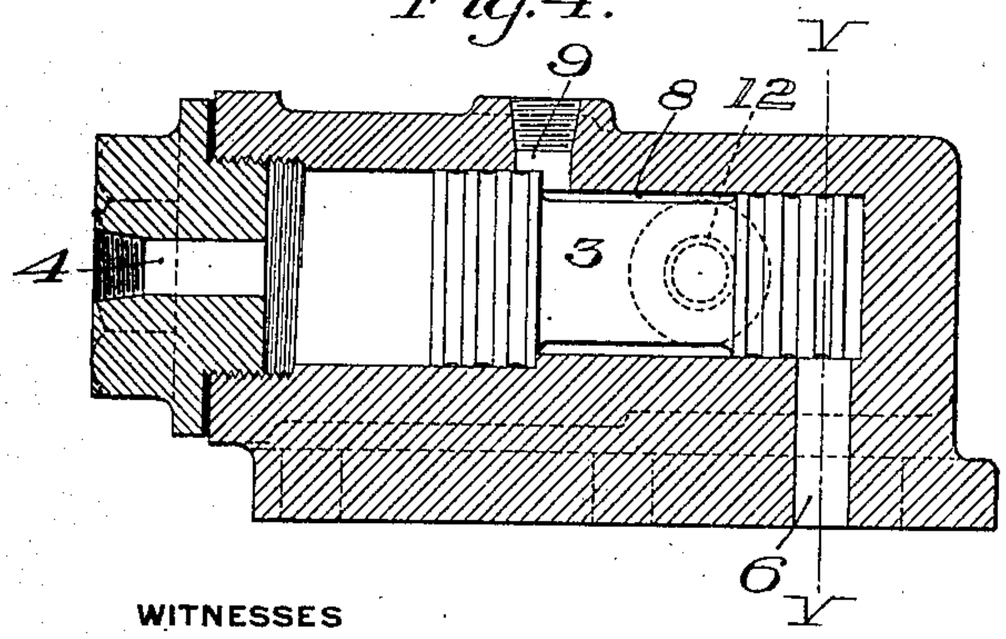
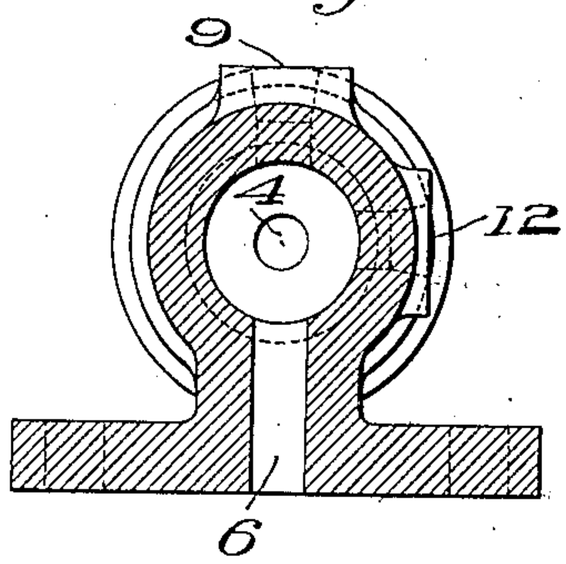


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRED E. NORTON, OF YOUNGSTOWN, OHIO.

AIR AND GAS COMPRESSOR.

No. 912,975. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed September 13, 1907. Serial No. 392,672.

To all whom it may concern:

Be it known that I, FRED E. NORTON, of Youngstown, Mahoning county, Ohio, have invented a new and useful Improvement in Air and Gas Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of a portion of a compressor embodying my invention; Fig. 2 is a side elevation of the same, showing the valves at one end of the cylinder in vertical section; Fig. 3 is an end view of the compressor; Fig. 4 is an enlarged vertical longitudinal section of the differential valve for controlling the operation of the auxiliary discharge valve; and Fig. 5 is a section on the line V—V of Fig. 4 with the valve piston removed.

The present invention is an improvement upon the automatic regulator described and claimed in my prior patent No. 852,976, dated May 7, 1907, and relates more particularly to means for controlling the operation of the auxiliary discharge valve shown in said patent, the improvement consisting in the means employed for controlling the opening and closing of the said auxiliary discharge valve.

The precise nature of my invention will be best understood by reference to the accompanying drawings in which I have illustrated one form or embodiment thereof, it being premised, however, that various changes may be made therein by those skilled in the art without departing from my invention, as defined by the appended claims.

Referring to these drawings, the numeral 2 designates the compressor cylinder.

36 designates the main inlet valve for one end of the cylinder. This valve is of cylindrical form, and is arranged to slide longitudinally upon a barrel 37 so as to control the cylinder admission port 38. This valve also controls the communication between the cylinder and the exhaust chamber 39 in such a manner that this communication is open near the beginning of the compression stroke of the engine piston, and is closed at the end of the compression stroke, while the port 38 is open near the beginning of the suction stroke, and is closed near the end of such stroke. The valve 36 is operated by any suitable connection 40 with an eccentric on the main shaft, as in my patent above referred to, said eccentric having a fixed travel relatively to the movement of the compressor piston. The valve 36 is a combined inlet and outlet valve having a definite movement relatively to the piston motion. This valve positively opens the communication with the exhaust chambers 39, but the discharge of the air or gas into the discharge chamber 41 cannot take place until the opening of a supplemental valve 42 which controls the communication between the chambers or discharges 39 and 41. In the present instance, I have shown the valve 42, as being a pot valve, but it may be of any other suitable type. This valve has a closing spring 43, and is arranged to be controlled by means of a valve which is shown in detail in Fig. 4. This valve consists of a casting having therein a differential piston 3, the larger end of which is in communication with the end of the cylinder 2 by means of a port 4 and a pipe 5. The smaller end of the valve communicates with the discharge space 41 by means of the port 6 and the connecting passage 7 leading therefrom into said discharge chamber. The annular space 8 between the heads of the differential piston 3 is always in communication with the atmosphere by means of the port 9.

The space 11 within the valve 42 may be put in communication with the atmosphere through the port 12, the pipe 13 and the port 9, when the differential valve is in the position shown in Fig. 4, or at its right hand limit of movement. The valve piston 3 will be held at the left hand limit of its travel by the discharge pressure in the chamber or passage 41 acting upon its smaller head, until such time as the pressure on its larger head, due to the compression in the cylinder 2, is sufficient to overcome the friction and inertia of the valve. The annular space 8 being always in communication with the atmosphere, the proportions of the two heads of the differential valve may be made such that the valve will be moved entirely over to its right hand position, before the pressure in the cylinder 2 is equal to the pressure in the discharge passage 41. In practice, the relative areas of the two heads or ends of the valve 3 are such that at the average speed of the compressor, the valve is thrown full to its right hand position, just at the time the pressure in the cylinder becomes

equal to the pressure in the discharge chamber 41. This places the space 11 of the outlet valve in connection with the atmosphere through the port 9, and permits the valve 42 to open. A small valve 16 may be placed in the pipe 13, for the purpose of regulating the discharge of air pressure, so as to cushion the valve 42 by regulating the escape of air from the space 11.

At the end of the compression stroke, the piston valve 36 closes the outlet passages 38 and 39, and shortly thereafter opens the inlet passage through the port 38. The pressure on the large end of the differential valve is then reduced to inlet pressure, causing said valve to move to the left, and thus close off the communication between the space 11 and the atmosphere. The valve 42 is provided with small holes 17 which permit the air pressure inside and outside of the valve to equalize; and this valve is also preferably loosely fitted on the stationary bonnet 37ª, so that considerable leakage will take place at this point, to more quickly equalize the pressures inside and outside of the valve. The spring 43 being constantly compressed, acts to return the valve 42 to its seat. The time required to thus seat the valve may be considerably greater than with compressors of ordinary construction, it being that required for the compressor to make its suction stroke. The spring 43 may thus be made light, and the movement of the valve 42 can be made as slow as desired, by regulating the size of the holes 17. Since ample time may thus be taken for the closing movement of the valve 42, its adjustment may be made once for all, although it is evident that the space 11 might be put in constant communication with the space 41 through an adjustable opening, so as to vary the speed of the closing movement. The arrangement shown is preferred, however, since it has been found in practice that all spaces in communication with the compressed air must be carefully drained in order to prevent the accumulation of water in them when the compressor is in operation.

18 designates an auxiliary inlet valve of the character and for the purpose described and claimed in my said patent.

It will be understood that the valve arrangement described is the same at each end of the cylinder 2.

The advantages of my invention result from the control of the auxiliary discharge valve by means of a pressure controlled valve in the manner described, in combination with a combined inlet and outlet valve.

What I claim is:—

1. In valve mechanism for compressors, the combination of a cylinder having a piston, a combined inlet and outlet valve, a spring-loaded auxiliary valve having an interior cushion chamber, and means for controlling the flow of fluid into and out of said cushion chamber at each stroke of the piston; substantially as described.

2. In valve mechanism for compressors, the combination of a cylinder having a piston, a combined inlet and outlet valve, an auxiliary spring-loaded pot valve having an interior cushion chamber, and a differential valve for controlling the flow of fluid into and out of the cushion chamber at each stroke of the piston; substantially as described.

3. In valve mechanism for compressors, the combination of a cylinder having a piston, a combined inlet and outlet valve, a spring-loaded valve forming an auxiliary discharge valve and having an interior cushion chamber communicating with the discharge chamber or passage leading to the receiver of the compressor, and a differential valve having communication with said chamber and also with the compressor cylinder, said differential valve also having an exhaust opening arranged to be put in communication with said chamber through the said connection at each stroke of the piston; substantially as described.

4. In valve mechanism for compressors, the combination of a cylinder having a piston, an auxiliary discharge valve located in the discharge passage of the compressor, and having an interior cushion chamber, a spring for seating said valve, and a fluid pressure valve controlled by the cylinder and discharge pressures and controlling the flow of fluid into and out of the cushion chamber of the auxiliary valve at each stroke of the piston; substantially as described.

5. In a valve mechanism for compressors, the combination of a cylinder having a piston, a positively operated inlet and outlet valve, an auxiliary pressure controlled discharge valve between the outlet valve and a receiver, and means to exhaust the pressure controlling said valve at each stroke of the piston when the pressure in the cylinder reaches the pressure in the receiver, substantially as described.

6. In a valve mechanism for compressors, the combination of a cylinder having a piston, a positively operated inlet and outlet valve, an auxiliary pressure-controlled discharge valve between the outlet valve and a receiver, a differential valve in connection with the cylinder and the receiver, and means controlled by said valve to supply and exhaust the pressure from the auxiliary valve at each stroke of the piston, substantially as described.

In testimony whereof, I have hereunto set my hand.

FRED E. NORTON.

Witnesses:
E. E. MILLER,
CHENOWETH HOUSUM.