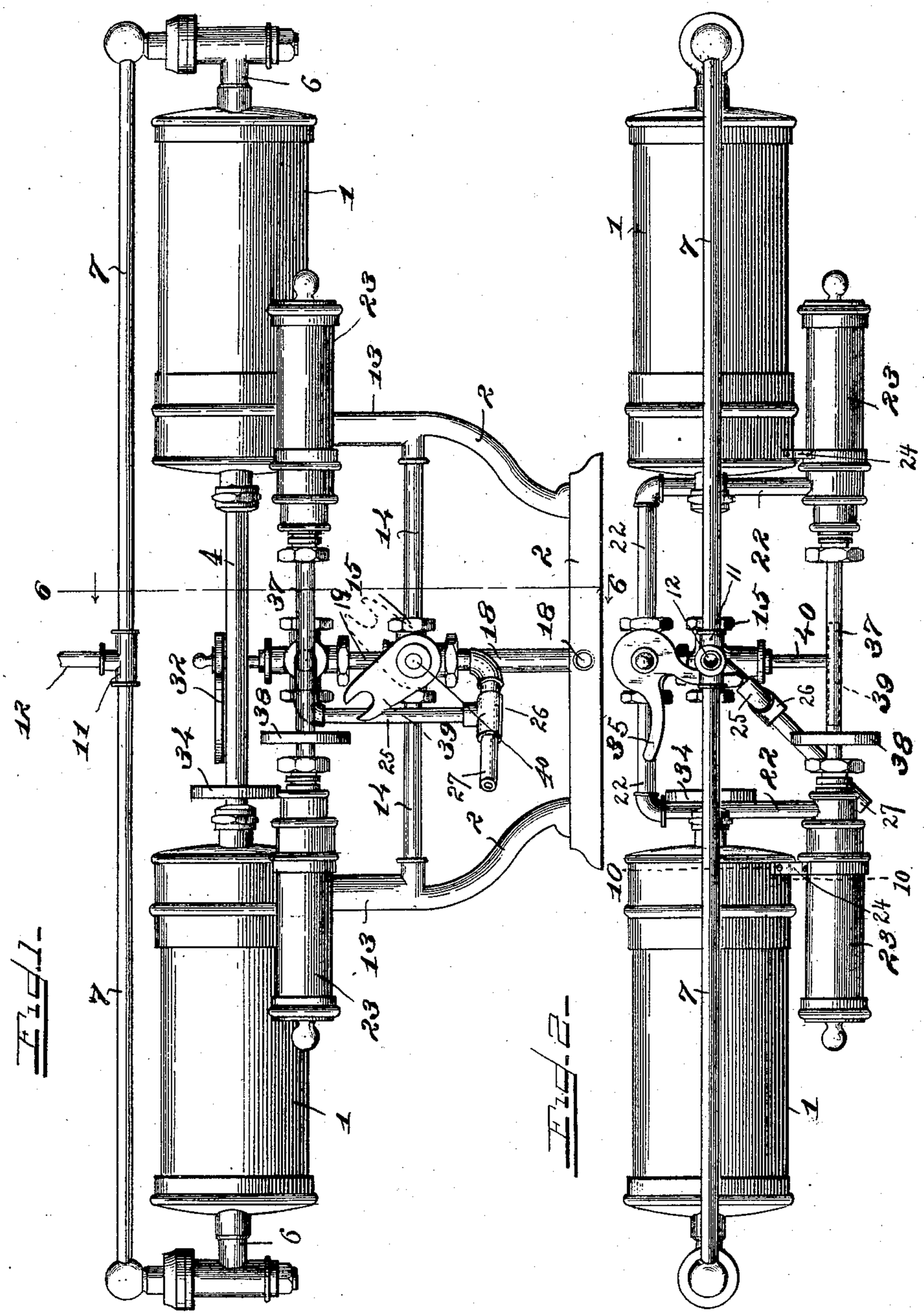
No. 711,703. Patented Oct. 21, 1902.

F. W. GRUSCHOW.

AIR COMPRESSOR.

(Application filed Mar. 19, 1900. Renewed Aug. 25, 1902.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses
J. B. Weir
Ira M. Perry

Inventor
Frank W. Gruschow
by Henry H. Roth
Atty

No. 711,703. Patented Oct. 21, 1902.

F. W. GRUSCHOW.

AIR COMPRESSOR.

(Application filed Mar. 19, 1900. Renewed Aug. 25, 1902.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

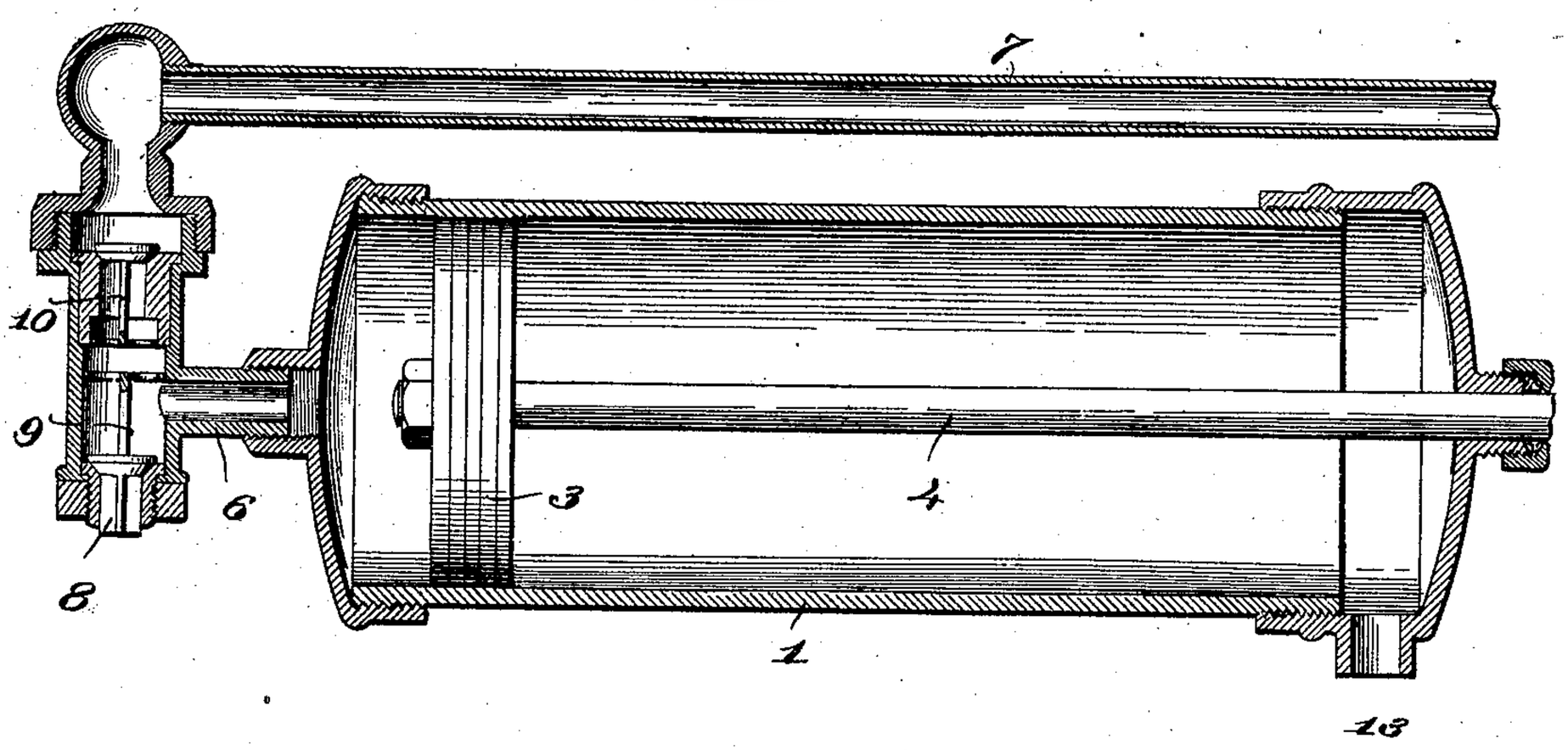


Fig. 4.

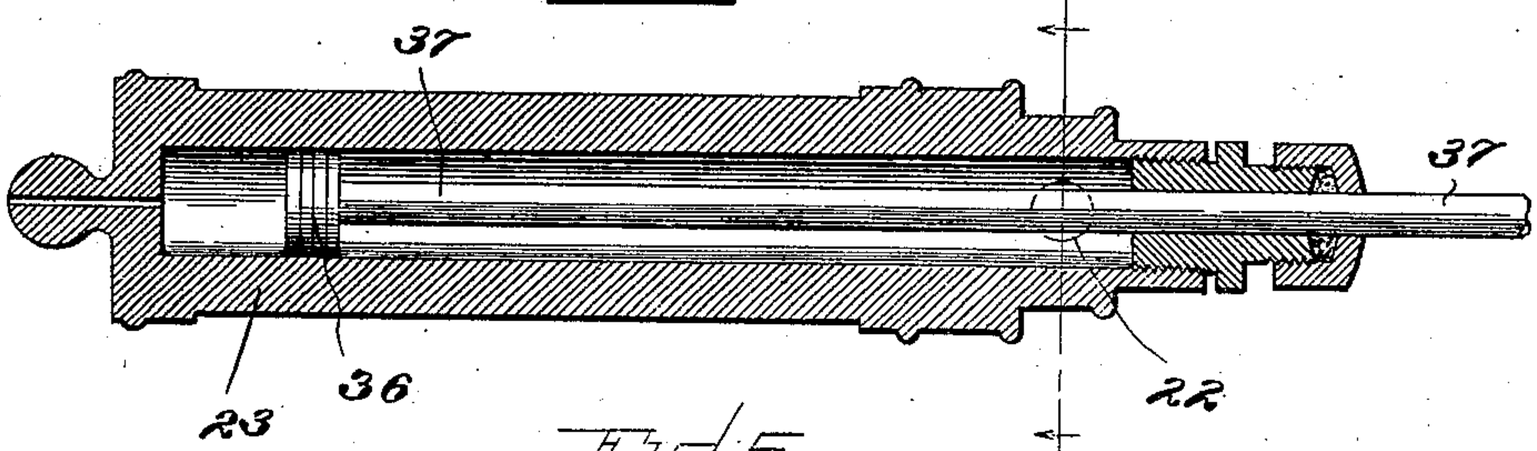
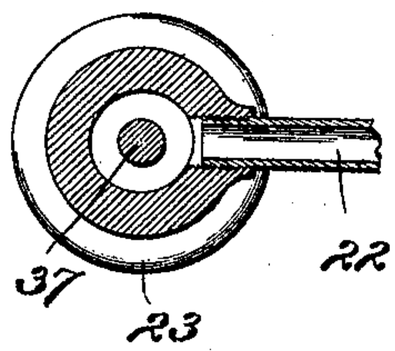


Fig. 5.



Witnesses
J. B. Weir
Jno. L. Perry

Inventor
Frank W. Gruschow
by Henry H. Carter
Atty

No. 711,703. Patented Oct. 21, 1902.

F. W. GRUSCHOW.

AIR COMPRESSOR.

(Application filed Mar. 19, 1900. Renewed Aug. 25, 1902.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

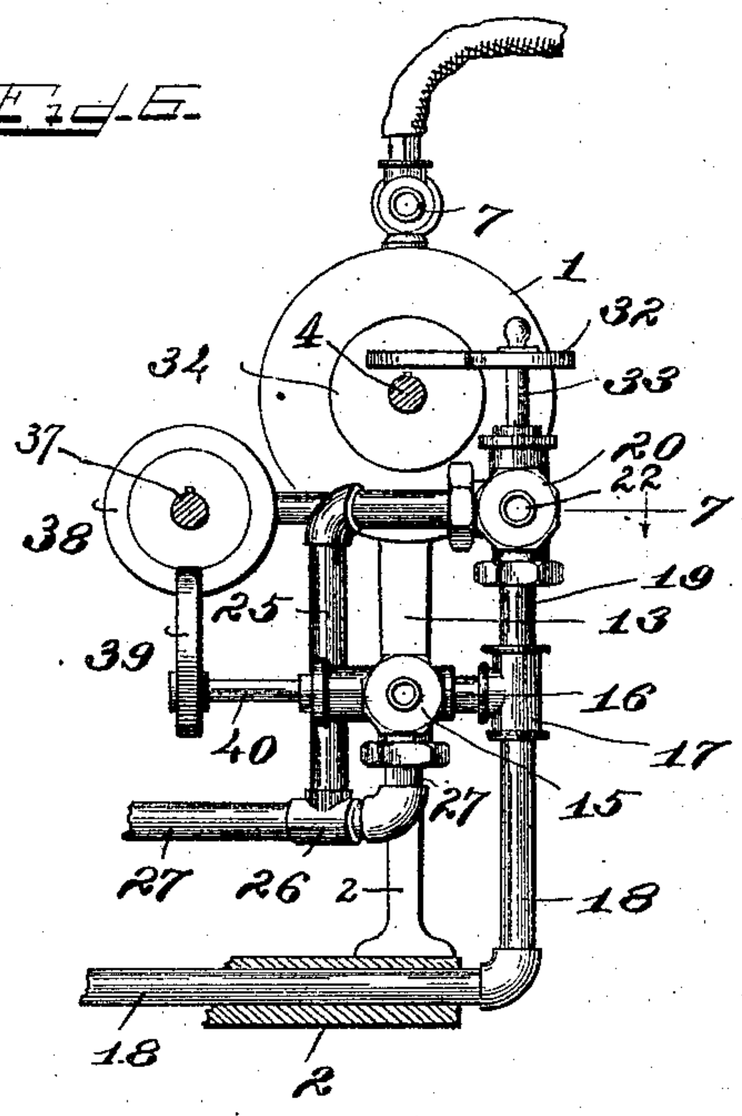


Fig. 7.

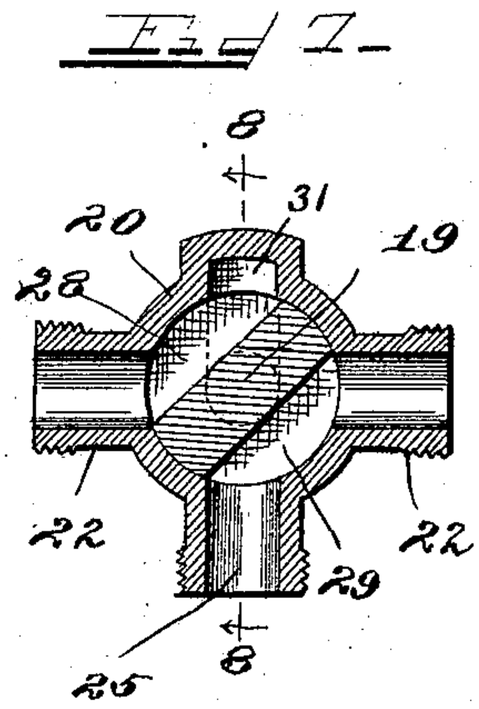


Fig. 8.

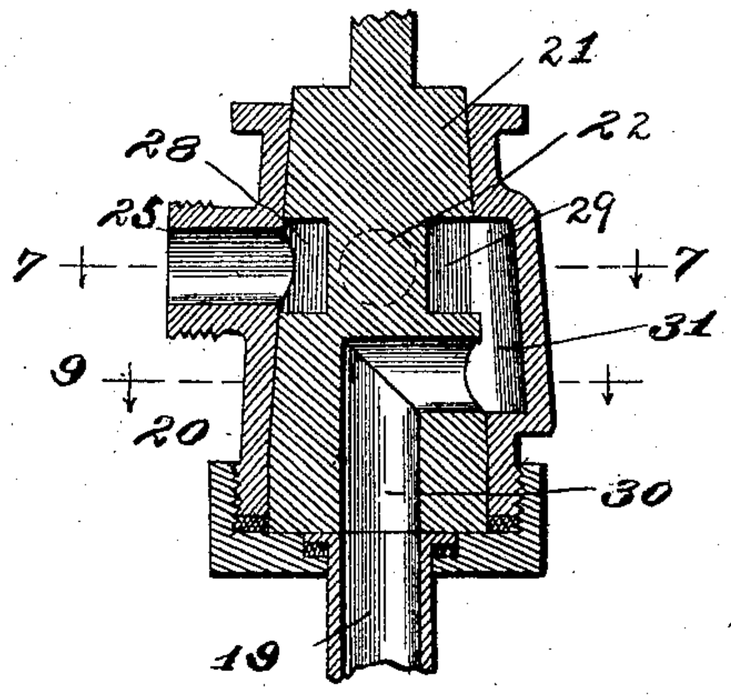


Fig. 9.

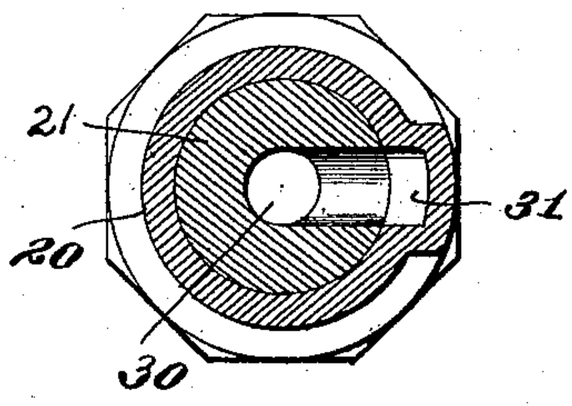
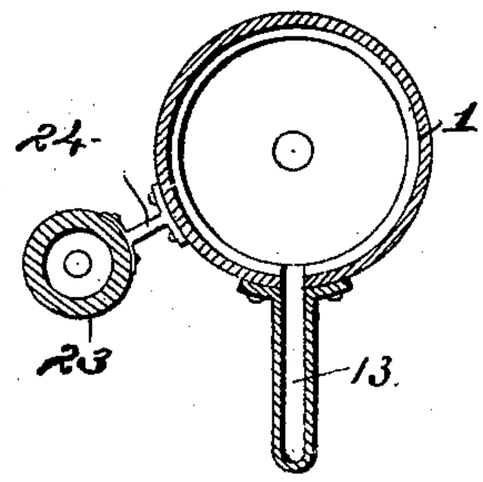


Fig. 10.



Witnesses
Geo. Neil
Ira L. Perry

Inventor
Frank W. Gruschow
by Henry Orth
Atty

UNITED STATES PATENT OFFICE.

FRANK W. GRUSCHOW, OF KOKOMO, INDIANA, ASSIGNOR TO CHARLES T. BYRNE, OF CHICAGO, ILLINOIS.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 711,703, dated October 21, 1902.

Application filed March 19, 1900. Renewed August 25, 1902. Serial No. 120,961. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. GRUSCHOW, a citizen of the United States, residing at Kokomo, Indiana, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to improvements in pumps, and more particularly to that class of such machinery which is designed for supplying air under pressure for use in drawing beer or other beverages, although it will be understood that the essential features of the novel pump construction shown may be employed in other connections and for pumping other fluids besides air, if so desired.

The invention consists in the matters hereinafter set forth, and particularly pointed out in the appended claims, and will be fully understood from the following detailed description when taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of an air-compressing pump embodying my improvement in one form. Fig. 2 is a top plan view thereof. Fig. 3 is a longitudinal section taken through one of the compression-cylinders and through the adjacent air-valves connected therewith. Fig. 4 is a similar view taken through one of the auxiliary cylinders. Fig. 5 is a transverse detail taken on line 5 5 of Fig. 4. Fig. 6 is a transverse sectional elevation taken on line 6 6 of Fig. 1. Fig. 7 is a sectional detail taken on line 7 7 of Figs. 6 and 8. Fig. 8 is a sectional detail taken on line 8 8 of Fig. 7. Fig. 9 is a sectional detail taken on line 9 9 of Fig. 8. Fig. 10 is a sectional detail taken on line 10 10 of Fig. 2.

In said drawings, 1 designates the two compression-cylinders of the pump, which are mounted end to end at some distance apart upon a standard or base 2.

3 designates the pistons within the cylinders 1, and 4 a common connecting-rod, to the opposite ends of which the pistons 3 are secured. A T-connection 6 leads out from the outer end of each cylinder 1 and is connected at one end with an air-outlet pipe 7, while its other end forms an air-inlet 8, suitable inlet and outlet valves 9 and 10 being provided in the connection to properly control the flow of air therethrough. The pipes 7 for the two cylinders are herein shown as connected by a T 11, from which a common air-outlet pipe 12 leads off to any suitable point of discharge.

The inner end of each cylinder 1 is provided with a water connection 13, which in this instance is formed by the hollow upper ends of the supporting standard or base 2. These are joined by pipes 14 to a three-way valve 15, the supply-port of which is connected by a short pipe or nipple 16 to a T 17 in a water-supply pipe 18. A continuation 19 of this supply-pipe leads upward to a second three-way valve 20, from the side ports of which water-pipes 22 lead to the inner ends of a pair of small auxiliary cylinders 23, that are supported from the cylinders 1 by brackets 24. A discharge-pipe 25 leads from the inner side of the valve 20 down to a T 26, which unites it with a discharge-pipe 27, leading from the under side of the valve 15, this pipe 27 being conducted off to any suitable point of discharge desired. The working portion of the valve 20 consists of a rotary plug 21, having ports 28, 29, and 30, which in connection with a port 31, recessed in the side of the valve-casing, serves to put one connecting-pipe 22 in open communication with the supply-pipe 19 and the other pipe 22 into open communication with the discharge-pipe 25, or vice versa, according to the position into which said plug is rotated. This rotation of the plug is controlled by a forked arm 32 on the upper end of a valve-stem 33, that rises rigidly from the plug, which forked arm is arranged to be engaged in each reciprocation of the pistons 3 by an operating lug or collar 34 on the piston-rod 4, one of the forks 35 of said arm being engaged by said collar 34 when the pistons move in one direction and serving to oscillate the plug, so as to bring the other fork 35 in position to be struck by the collar when the pistons move in the other direction. The movement of the main pistons thus control the flow of water to and its discharge from the small auxiliary cylinders 23, which latter are also provided with pistons 36, secured upon the ends of a common piston-rod 37. This piston-rod carries a rigidly-attached operating lug or collar 38, which is similar to the collar 34 and which as the pistons 36 reciprocate oscillates a forked arm 39 on the valve-

stem 40 of the valve 15, the latter being provided with a rotary valve-plug which is similar to that of the valve 20 and which operates in a similar manner to alternately throw one of the pipes 14, leading to the cylinders 1, into communication with the inlet-pipe 18 and the other pipe 14 into communication with the discharge-pipe 27, or vice versa. The working of the apparatus will then be as follows: Water is admitted through the inlet-pipe 18, and will pass thence through one of the connections 14 13 into the inner end of one of the main cylinders 1, and will force the piston 3 in said cylinder to the outer end of its stroke. During this movement the collar 34 on the piston-rod will engage the forked arm 32 of valve 20 and admit water to that auxiliary cylinder 23 remote from the main cylinder 1 to which water is being admitted. Then as the main pistons approach the end of their stroke in one direction the auxiliary pistons will commence a movement in the opposite direction, and in the course of this movement the collar 38 will strike the forked arm 39 on the valve-stem 40 of the valve 15 and shift said valve to cut off the water-supply from that cylinder 1 into which water has been flowing and admit it to the other cylinder 1 and to simultaneously throw the first cylinder into open communication with the exhaust-pipe, while it cuts off the second cylinder from communication therewith. This will start the main pistons and piston-rod in the opposite direction from their first movement and by the operation of the collar 34 on the forked arm 32 of the valve 20 will reverse the water and exhaust connections of the auxiliary cylinders so as to start the pistons of the latter on their return movement as the main pistons approach the end of their return stroke. Such return movement of the auxiliary pistons will then in turn again shift the valve 15 and reverse the water and exhaust connections of the main cylinders, and thus again reverse the movement of the main pistons, and in this manner the operation will be continuous so long as the water-pressure is sufficient to overcome the load, each pair of pistons serving to control the water and exhaust connections of the other cylinders. The outward stroke of each main piston 3 will compress the air which has previously entered its cylinder 1 and force it out through valve 10 and pipe 7 into the outlet-pipe 12, the other main piston 3 operating during this time to draw a fresh charge of air into the other cylinder through the inlet-valve 8 ready to force it out in turn through its valve 10 and pipe 7 when the piston motion is reversed. The auxiliary pistons 36, on the other hand, are herein shown as purely single-acting, the outer ends of their cylinders 23 being left open to the atmosphere. Obviously, however, if supplied with the proper air-valves they could also be utilized for the air-compressing work. It will also be understood that the same principles of construction and operation might apply in a pump for forcing or supplying water or other fluid instead of air or in one driven by air or other fluid than water or that one end of the pump could be wholly devoted to the airwork while the water end accomplished the actuating impulse in both directions; also, that various changes may be made in the details of the construction shown without departing from the broad spirit of the invention claimed.

I claim as my invention—

1. A pump comprising a pair of main cylinders arranged end to end, a piston in each cylinder, a piston-rod connecting the two pistons, water-pipes connected to the inner ends of the cylinders, and inlet and outlet valved air-passages connected to the outer ends of the respective cylinders, a valve controlling said water-pipes, a pair of auxiliary cylinders supported adjacent to the main cylinders and arranged end to end, connected pistons in these auxiliary cylinders, water-pipes connected to the inner ends of the auxiliary cylinders and a valve controlling the admission of water to these pipes, a forked arm connected to each of said valves, a device on the main piston-rod operating the forked arm attached to the valve controlling the auxiliary cylinders, and a device on the auxiliary piston-rod adapted to operate the forked arm attached to the valve controlling the water-pipe of the main cylinders, as and for the purposes set forth.

2. A pump comprising a pair of main cylinders, connected pistons within said cylinders, inlet and outlet air-passages at one end of each of the cylinders, valved water-passages at the other end of each of the cylinders, a pair of auxiliary cylinders, connected pistons within said auxiliary cylinders, means connected with the main pistons controlling the valved passages of the auxiliary cylinders, and means connected with the auxiliary pistons for controlling said valved passages of the main cylinders, substantially as described.

3. A pump comprising a pair of main cylinders arranged end to end, pistons within said cylinders connected by a common piston-rod, air connections at opposite ends of the cylinders, valved water connections at the other ends of the cylinders, a pair of auxiliary cylinders arranged end to end, pistons within said auxiliary cylinders connected by a common piston-rod, and means on each piston-rod between the ends of each pair of cylinders for controlling the valve movement of the other cylinders, substantially as described.

4. A pump comprising a pair of main cylinders, connected pistons within said cylinders, inlet and outlet air-passages at the opposite ends of the respective cylinders, a pair of auxiliary cylinders, connected pistons within said auxiliary cylinders, three-way valves 15 and 20, a main supply-pipe leading into three-way valves 15 and 20, pipes leading from the valve 15 into the inner ends of the respective main cylinders, pipes leading from the valve

20 into the inner ends of the auxiliary cylinders, an exhaust-pipe leading from each of said valves, means connected with the auxiliary pistons for actuating the valve 15 and means connected with the main piston for actuating the valve 20, substantially as described.

5. A fluid-actuated pump, comprising a pair of main cylinders arranged end to end and provided with water-pipes for admitting and exhausting the actuating fluid and with inlet and outlet valved passages for admitting and discharging the pumped fluid, a piston in each cylinder, a piston-rod connected to the pistons, a valve controlling said water-pipes, a pair of auxiliary cylinders supported adjacent to the main cylinders and arranged end to end, a piston in each auxiliary cylinder and a piston-rod connecting these two pistons, a water-pipe connected to one end of each auxiliary cylinder for admitting and exhausting the actuating fluid, a valve controlling these water-pipes, the other ends of said auxiliary cylinders being open to the atmosphere, means on the main piston-rod controlling the valve of the water-pipes connected to the auxiliary cylinders, and means on the auxiliary piston-rod controlling the valve of the main cylinders.

6. A fluid-actuated pump comprising a pair of main cylinders arranged end to end and provided with water-pipes for admitting and exhausting the actuating fluid and with inlet and outlet valved passages for admitting and discharging the pumped fluid, a piston in each cylinder, a piston-rod connecting the two pistons, a valve controlling the water-pipes, a pair of auxiliary cylinders, supported adjacent to the main cylinders and arranged end to end, a piston in each auxiliary cylinder, a piston-rod connecting the two auxiliary pistons, and water-pipes connected to one end of each auxiliary cylinder for admitting and exhausting the actuating fluid, a valve controlling said water-pipes, the other ends of said auxiliary cylinders being open to the atmosphere, an operating-arm connected to each of said valves, a part on the main piston-rod adapted to engage and swing the operating-arm on the valve of the auxiliary water-pipes, and a part on the auxiliary piston-rod adapted to operate the arm on the main valve, for the purpose set forth.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two subscribing witnesses, this 12th day of March, A. D. 1900.

FRANK W. GRUSCHOW.

Witnesses:
EMMA LEGG,
WM. C. PURDUM.