S. COOK.

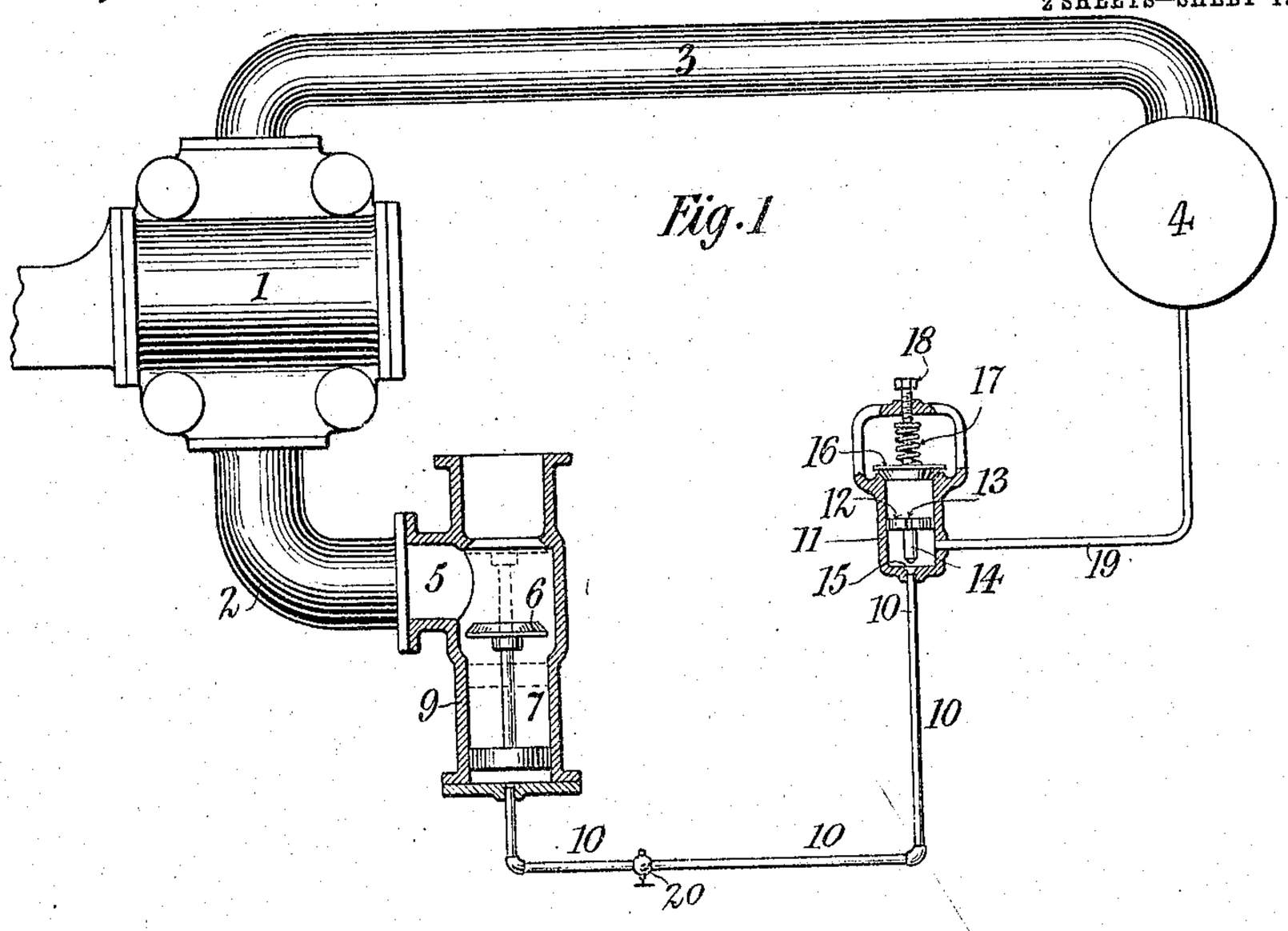
APPARATUS FOR CONTROLLING THE FLOW OF FLUIDS.

APPLICATION FILED AUG. 28, 1903.

930,843. **Patented Aug. 10, 1909.**

2 SHEETS—SHEET 1.

Fig. 1



Witnesses:
Thos. D. Brown, Jr.
George H. Stockbridge

Inventor
Samuel Cook
by Charles A. Dana — Att'y.

S. COOK.

APPARATUS FOR CONTROLLING THE FLOW OF FLUIDS.

APPLICATION FILED AUG. 28, 1903.

930,843.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 2.

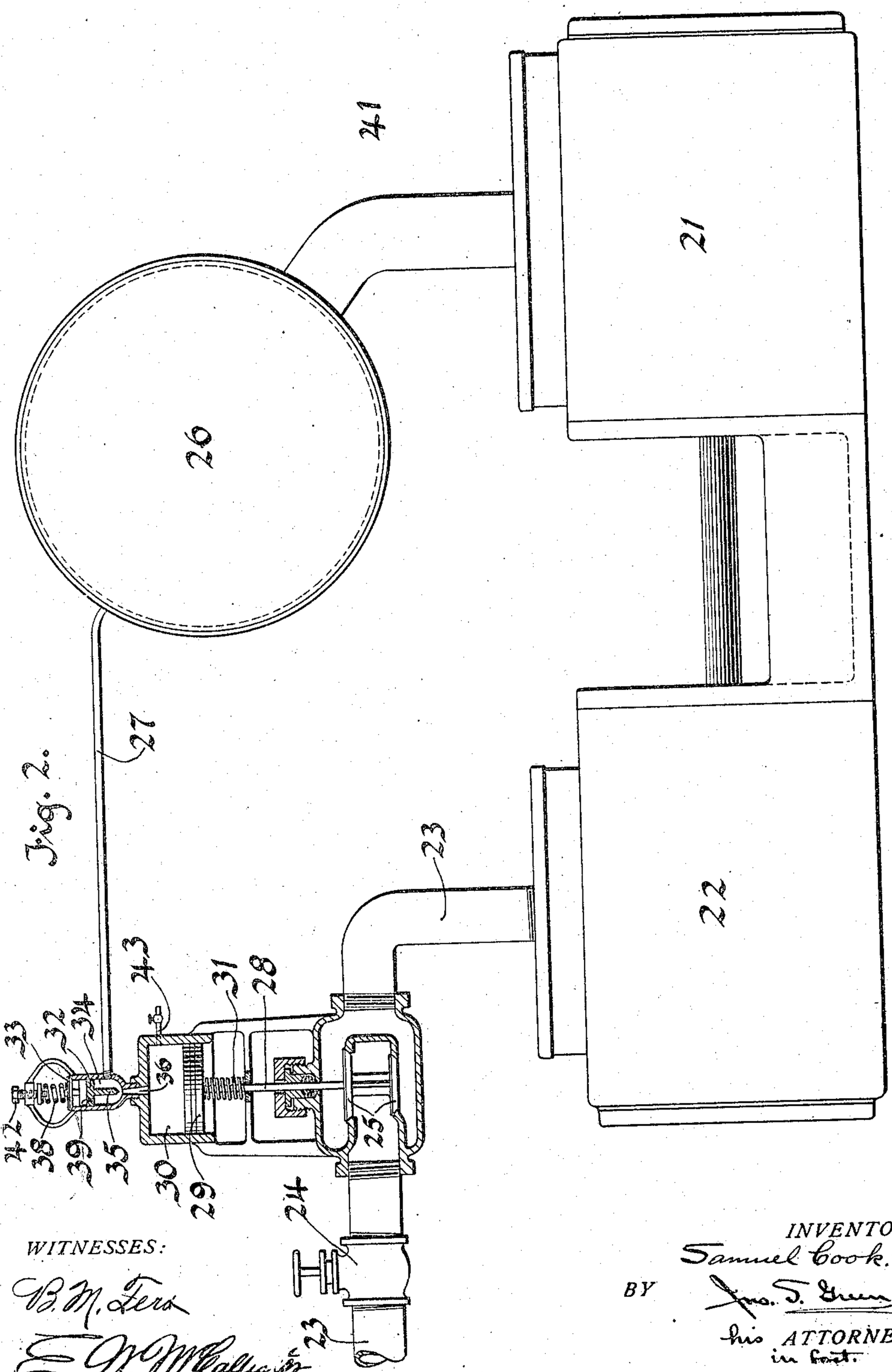


Fig. 2.

WITNESSES:

B. M. Lera

E. F. McCallister

INVENTOR.

Samuel Cook.

BY Jno. J. Green

his ATTORNEY in fact.

UNITED STATES PATENT OFFICE.

SAMUEL COOK, OF WILMERDING, PENNSYLVANIA, ASSIGNOR TO GEO. WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR CONTROLLING THE FLOW OF FLUIDS.

No. 930,843. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed August 28, 1903. Serial No. 171,056.

To all whom it may concern:

Be it known that I, SAMUEL COOK, a citizen of the United States, and a resident of Wilmerding, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Controlling the Flow of Fluids, of which the following is a specification.

My invention consists of a device for controlling the flow of a fluid either gaseous or liquid along a pipe by opening or closing a valve included in said pipe.

It is particularly adapted for controlling the supply of air to the compression cylinder of an air compressor or the steam supply to the engine driving the air compressor.

The accompanying two figures of the drawings illustrate apparatus constructed in accordance with my invention.

Referring to Figure 1, 1 is the cylinder of an air compressor of any convenient type which is supplied through pipe 2 with air which is discharged through pipe 3 into a receiver 4. 5 is a chamber opening to the atmosphere and connected to pipe 2 and in this chamber a valve 6 is located which in its upward position would close chamber 5 from the atmosphere. Valve 6 is connected by a stem 7 to a piston 8 and operates in cylinder 9. Pipe 10, 10, connects cylinder 9 with cylinder 11 in which operates a piston 12 which is provided with a leakage groove 13 extending therethrough and with a stem 14 projecting from its under side and arranged to close a port 15 connecting with pipe 10. Above piston 12 is a pop-valve 16 adjustable by means of a spring 17 and set-screw 18 to blow off at any desired pressure. Pipe 19 connects receiver 4 and cylinder 11 at a point below piston 12, and leakage groove 13 serves to equalize the air pressure above and below piston 12 but inasmuch as the area of the under side of piston 12 is less than the area of the upper side, owing to the projecting stem 14 piston 12 is forced downward and port 15 is closed. Whenever the pressure in receiver 4 reaches the point at which pop-valve 16 has been set the pop opens and there results a reduction of pressure on the top of piston 12, inasmuch as pop 16 can relieve the air pressure much faster than it can be supplied by small leakage groove 13. Consequently piston 12 rises, opening port 15 and permitting air under pressure to pass through pipe 10, 10, and under piston 8 in cylinder 9 forcing valve 6 upward to its seat and closing the supply of air to chamber 5, thus cutting off the air supply to the compressor cylinder. When the pressure in receiver 4 has fallen to such a point that pop-valve 16 closes, air pressure will accumulate above piston 12, causing it to move downward and close port 15. The weight of piston 8, stem 7 and valve 6 being sufficient to cause valve 6 to open, the air in cylinder 9 below piston 8 escapes through a small cock 20^a arranged for that purpose. In practice I find that the operation of this apparatus is such that valve 6 moves backward and forward or pulsates thereby controlling the supply of air to compression cylinder 1 in exact accord to the demands made upon receiver 4 for air.

Referring to Fig. 2: an air compressor cylinder 21 is connected in tandem to a steam cylinder 22, which is supplied with steam through piping 23. The piping 23 is provided with a hand operated controlling valve 24 and an automatically-actuated double beat valve 25, which is actuated by the fluid head or pressure delivered by the compressor cylinder 21 to a receiver 26. The receiver pressure is transmitted through a pipe 27 to an automatically-actuated controlling device of the valve 25. The valve 25 is mounted on a stem 28, which is provided at its upper end with a piston 29 which operates in a cylinder 30. A spring 31, surrounding the valve stem, operates to hold the valve 25 open and fluid pressure, which is delivered by the controlling device to the cylinder 30 above the piston, operates in opposition to the spring to close the valve. The automatic controlling device consists of a piston 32, which closes communication between the receiver 26 and the cylinder 30, and a pop or blow-off valve 33, which relieves the receiver of excess pressure and which also controls the operation of the piston 32. The piston 32 operates within a cylinder 34 and is provided with a downwardly projecting stem 35 which closes a port 36 leading into the cylinder 30. The pipe 27 communicates with the cylinder 34 and the top of the cylinder is closed by means of the pop valve 33. The pop valve comprises a disk, which is held on a seat formed on the wall of the cylinder by a spring 38 and which is exposed on its lower face to the pressure within the cylinder 34. A leakage

groove or orifice 39 extends through the piston 32 and serves to equalize the pressure above and below the piston and also to transmit the receiver pressure to the lower face of the disk 33 of the pop valve. Inasmuch as the end of the stem 35, which closes the port 36, is exposed to the pressure of the cylinder 30 when the port is closed, the piston 32 is held downwardly by the unbalanced fluid pressure with sufficient force to close the port 36 and prevent fluid leakage therethrough.

The operation of the apparatus is as follows: Steam is admitted to the cylinder 22, which comprises the steam end of the compressor, through the piping 23, the hand operated valve 24 and the automatically-operated valve 25, which is, under ordinary conditions, held open by the spring 31. The air cylinder 21 of the compressor delivers compressed air to the receiver 26 through a pipe 41 and the pressure in the receiver is transmitted, through the pipe 27, to the cylinder 34 of the controlling device, where it operates against the disk 33 of the pop valve in opposition to the spring 38 and also operates against the piston 32 to close the port 36. The spring 38 is so designed, and may also be so adjusted by an adjustable screw 42 that when the pressure in the receiver 26 reaches or exceeds a predetermined pressure, the pressure in the cylinder 34 will lift the disk 33 and permit air to escape from the cylinder 34. The leakage passage or orifice 39 is of such size, relative to the port of the puppet valve and to the sectional area of the pipe 27, that the flow of fluid through it is restricted. When the puppet valve 33 is open the pressure above the piston 39 is reduced since the puppet valve can discharge air faster than the orifice 39 can supply it and consequently the piston 32 is raised by the air pressure below it and the port 36 is opened, thereby admitting air under pressure to the cylinder 30. The air pressure admitted to the cylinder 30, operating against the piston 29, compresses the spring an amount corresponding to the degree of air pressure and partially or wholly closing the valve 25. The valve 25 controls the flow of steam to the cylinder 22 and consequently the operation of the compressor is automatically controlled by the air pressure within the receiver 26. After the pressure in the receiver 26 has fallen below the predetermined pressure, the pop valve 33 is closed by the spring 38, the pressure in the cylinder 34 is equalized on each side of the piston 32 by means of the orifice 39 and the piston 32 is moved downwardly by its own weight and closes the port 36 where it is held in position by the unbalanced pressure, as before described. The piston 29 is then forced upwardly by the spring 31, the air in the cylinder 30 being discharged through a small orifice 43 and the valve 25 is again opened a maximum amount. The pop valve 33, during its operation, pulsates and consequently causes the piston 32 to periodically open and close the port 36, which causes the valve 25 to pulsate. The pulsations of the valve 33 are caused by the restricted flow of fluid through the port 39.

It will be seen that the air pressure in the receiver 26, through the agency of the controlling device and the valve 25, automatically controls the operation of the compressor. The pressure admitted to the cylinder 30 through the port 36 will hold the valve in different positions which correspond to the amount of pressure in the receiver.

What I claim as new and useful and desire to secure by Letters Patent is:

1. In combination with a compressor, a receiver receiving fluid therefrom, a blow-off valve for said receiver, a fluid-actuated supply valve controlling the delivery of fluid to said compressor, a normally balanced controlled valve controlling the delivery of actuating fluid to said supply valve and provided with means whereby it is unbalanced and caused to deliver actuating fluid to the supply when said blow-off valve is opened.

2. In combination with a compressor, a receiver, a fluid-actuated receiving valve controlling the delivery of fluid to said compressor, a blow-off valve responsive to receiver pressure, and a valve controlling the delivery of actuating fluid to one of said valves.

3. In combination with a compressor, a receiver, a fluid-actuated reciprocating valve controlling the delivery of motive fluid to said compressor, a blow-off valve responsive to receiver pressure, and a valve responsive to the operation of said blow-off valve for delivering actuating fluid to said reciprocating valve.

4. In combination with a compressor, a receiver, a fluid-actuated reciprocating valve controlling the delivery of motive fluid to said compressor, a blow-off valve responsive to receiver pressure, and a valve responsive to the operation of said blow-off valve for delivering actuating fluid to said reciprocating valve.

Signed at Pittsburg, in the county of Allegheny, and State of Pennsylvania, this 19th day of August A. D. 1903.

SAMUEL COOK.

Witnesses:
J. A. Adams,
H. C. Babbitt.