J. S. JOHNSTON.

AIR OPERATED AND CONTROLLED MECHANISM.

APPLICATION FILED FEB. 26, 1908.

909,907. Patented Jan. 19, 1909.

2 SHEETS—SHEET 1.

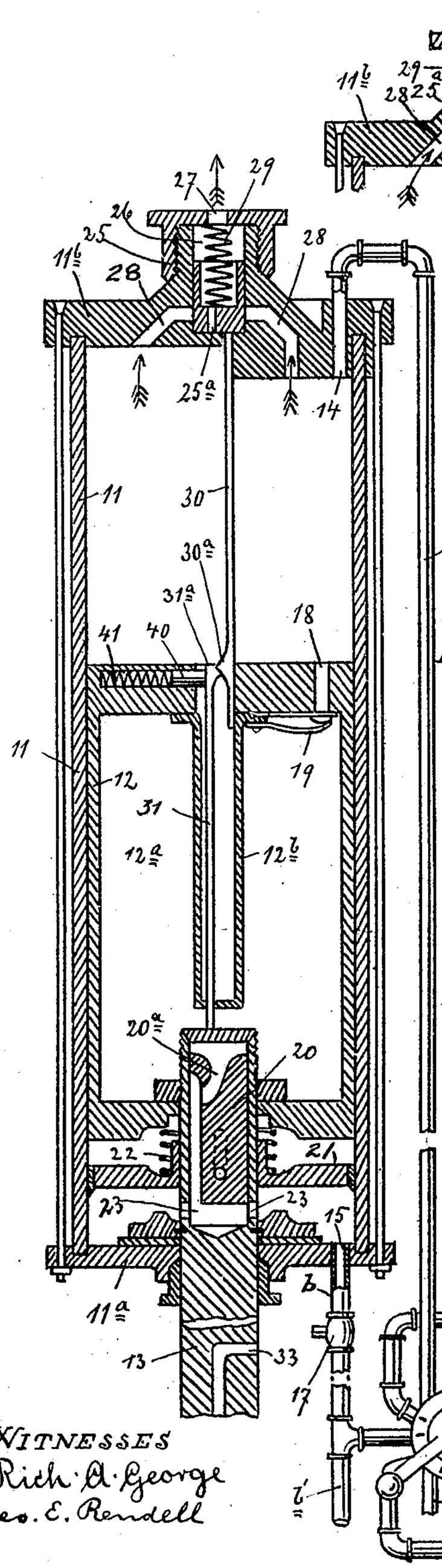

Fig. 1

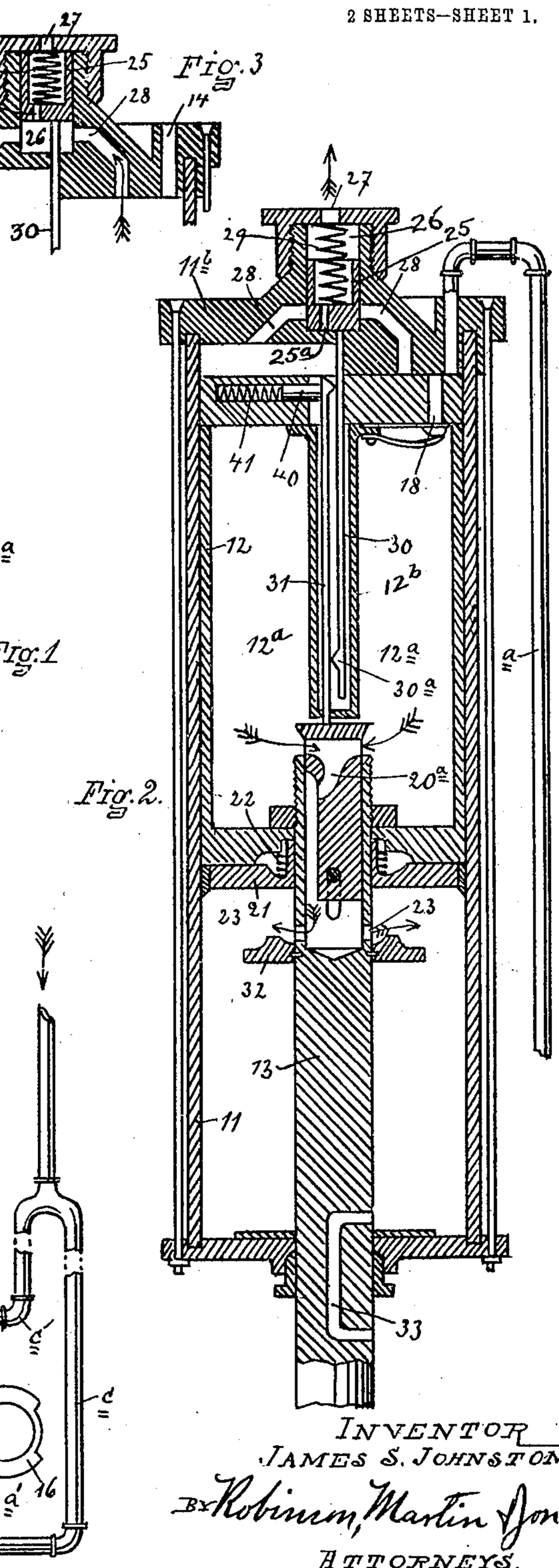

Fig. 2.

Fig. 3

WITNESSES

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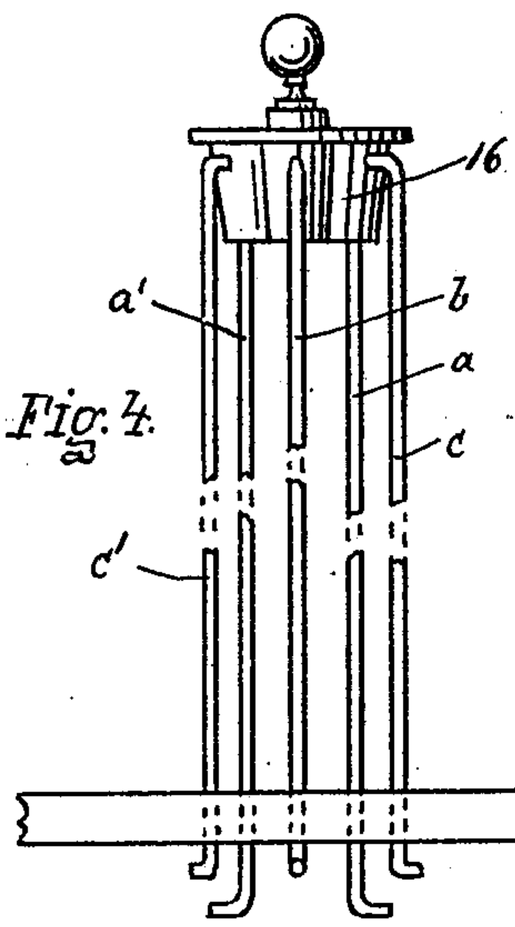

Fig. 4.

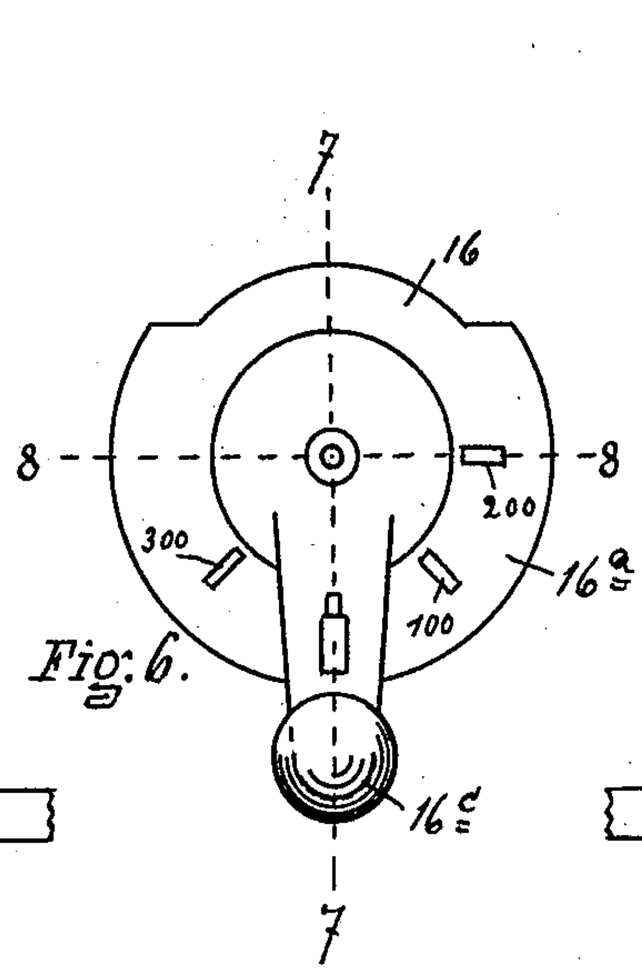

Fig. 6.

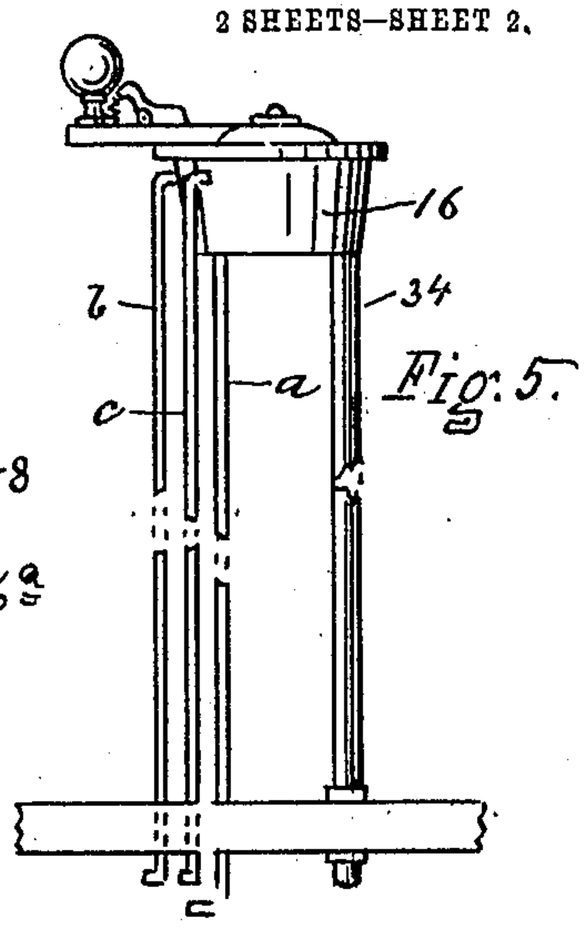

Fig. 5.

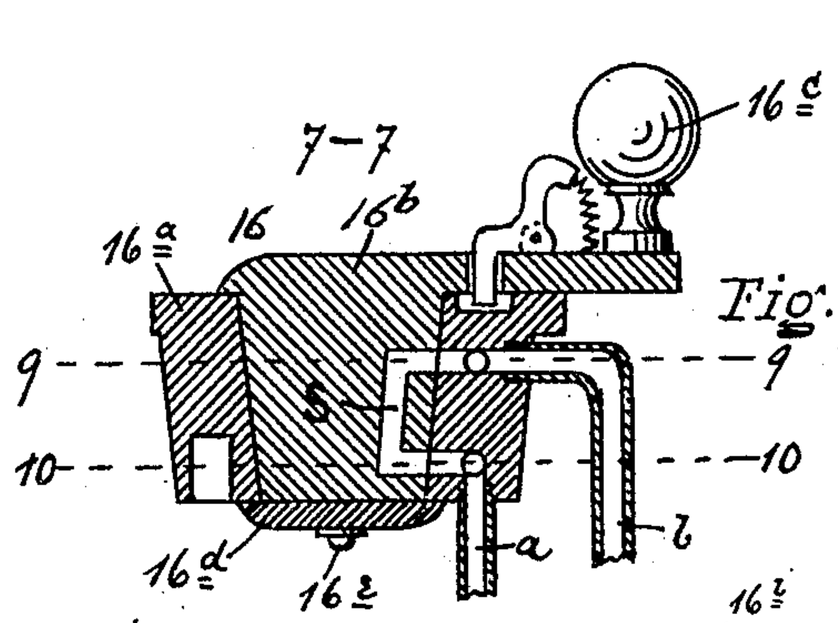

Fig. 7

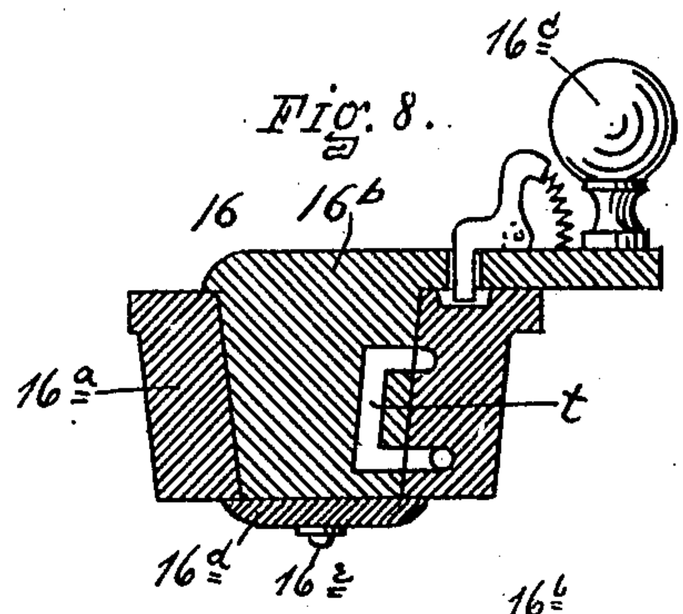

Fig. 8.

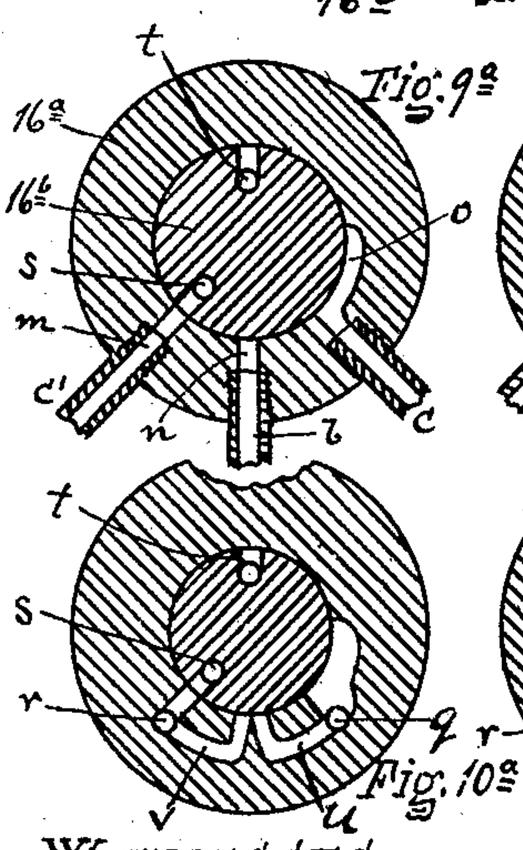

Fig. 9a. Fig. 10a.

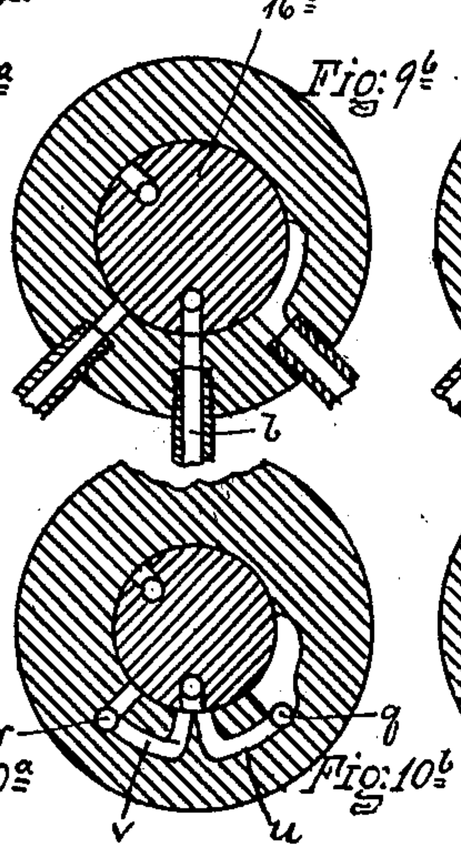

Fig. 9b. Fig. 10b.

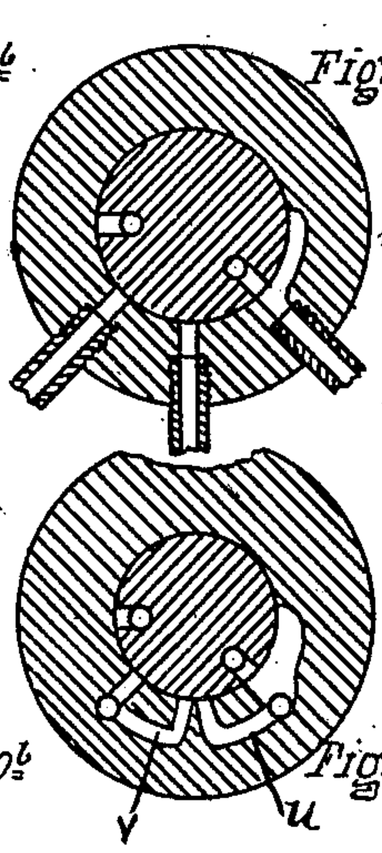

Fig. 9c. Fig. 10c.

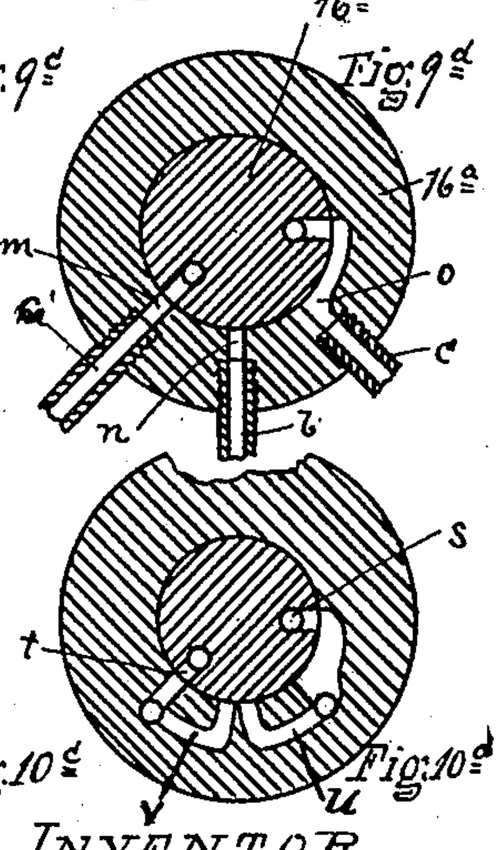

Fig. 9d. Fig. 10d.

WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES S. JOHNSTON, OF UTICA, NEW YORK.

AIR OPERATED AND CONTROLLED MECHANISM.

No. 909,907. Specification of Letters Patent. Patented Jan. 19, 1909.

Application filed February 26, 1908. Serial No. 417,874.

To all whom it may concern:

Be it known that I, JAMES S. JOHNSTON, of Utica, in the county of Oneida and State of New York, have invented certain new and Useful Improvements in Air Operated and Controlled Mechanism; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

The object of my present invention is to provide an actuating and controlling mechanism operated by compressed air and adapted to sundry uses, as, for instance, the control of contact shoes for electric third rails, or the operation of brakes, and which mechanism is simple in construction and efficient in operation.

Figure 1 is a longitudinal sectional view of the cylinder portion of the device with its piston and appurtenances, and in connection with a diagrammatical view of the controller and parts of the pipe connections. Fig. 2 is a similar longitudinal sectional view of the cylinder, with the piston and parts in the position at the opposite limit of movement from that shown in Fig. 1. Fig. 3 is a detailed section of one end of the cylinder showing particularly the outlet valve in open position. Fig. 4 shows the controller in connection with the several pipes connected therewith in front elevation. Fig. 5 shows the same in side elevation. Fig. 6 shows a plan view of the controller on an enlarged scale from that in which it is shown in the other figures. Fig. 7 shows a vertical sectional view of the same taken on line 7, 7 of Fig. 6. Fig. 8 is a similar section taken on line 8, 8 of Fig. 6, when the handle and rotatable core is rotated, so that the handle is in the plane of line 8, 8. Figs. 9^a, 9^b, 9^c and 9^d, show sections taken on line 9, 9 of Fig. 7, with the movable core adjusted to the several positions which it is adapted to assume in operation. Figs. 10^a, 10^b, 10^c and 10^d are several corresponding sections taken on line 10, 10 of Fig. 7.

Referring to the reference letters and figures in a more particular description, 11 indicates a cylinder closed at each end by heads 11^a and 11^b respectively within which is fitted the reciprocating piston 12. The piston 12 is hollow, affording a compressed air tank or receiver 12^a, and is securely attached to the piston rod 13 which passes out through the head 11^a. The outer end of the piston rod is connected to the mechanism (as brakes or shoes, for instance) to be controlled and operated by the mechanism herein described. The ends of the cylinder are provided with inlet openings 14 and 15 respectively connected by pipes *a* and *b* respectively with the controller 16, the pipe *b* having a check valve 17 provided therein. An inlet opening 18 is provided in one end of the piston 12 through which the tank 12^a is filled, and this opening is closed against outward passage from the tank 12^a by a valve 19. The end of the piston rod 13, which is attached to the piston, is chambered to receive the valve 20. The valve 20 is connected to the piston disk 21, fitting the cylinder 11 and sliding on the piston rod 13. The valve 20 is arranged to be operated to open position by air pressure on the disk 21 and to closed position by a spring 22 confined between the disk and the end of the piston. The valve 20 is provided with passageways 20^a, which, when the valve is in open position, place the tank 12^a in communication with the space in the cylinder between the piston and the head 11^a through the openings 23.

In the cylinder head 11^b is provided the exhaust valve 25. This valve is mounted in a cylindrical chamber 26 for reciprocating movement. From the valve chamber 26 there is an outlet opening 27, while the valve 25 is provided in its head with a small opening 25^a. Opening into the sides of the valve chamber 26 from the cylinder are one or more passages 28 of relatively large capacity. The valve 25 is operated to closed position by a spring 29, provision for which is made in its compressed position in the chambered end of the valve. For operating the valve 25 to open position it is provided with a stem 30 having a tooth or inclined face projection 30^a. The stem 30 is extended to the piston 12 in its furthest removed position from the head 11^b, and the piston is provided with an elongated pocket 12^b to provide for or receive the stem 30 when the piston is moved to its position adjacent to the head 11^b. For actuating the valve 30 there is also provided a finger 31 attached to the valve 20 and operating through a closely fitting opening in the head of the pocket 12^b

and provided with a toothed or inclined projection 31^a adapted to engage with the projection 30^a on the valve stem. The piston rod 13 is provided with a bumper 32 adapted to strike the inner end of the cylinder and limit the movement in one direction of the piston and particularly protect the piston disk 21.

The piston rod 13 is provided with an exhaust passage 33, which is adapted to provide an outlet from one end of the cylinder when the piston is moved to the end of the cylinder next to the head 11^b.

The controller 16 consists of a shell 16^a having an opening receiving the rotatable plug 16^b, which is of a truncated conical form and provided with a handle 16^c by means of which it may be manually operated. The plug may be retained in position in the shell by a plate 16^d and screw 16^e. The controller will preferably be supported by a standard 34. The controller shell is provided in an upper horizontal plane with three radial passages, *m*, *n* and *o*, extending from the core cavity or opening outwardly, and each of these passages is continued in pipes *c'*, *b* and *c* respectively.

In a lower horizontal plane the shell 16^a is provided with a number of passages which have connection through to the bottom, as indicated at *q* and *r*, and these passages *q* and *r* are continued in pipes *a* and *a'* respectively. The core is provided with two passages *s* and *t*, which terminate in the periphery of the core in the upper and lower planes before referred to, whereby the ends are adapted to register with the passages *m*, *n* and *o* in the upper plane and with the passages *q* and *r* in the lower plane. The controller 16 is adapted to operate two sets of cylinder mechanism like that shown in Figs. 1, 2 and 3. The connections of the pipes *a* and *b* between the cylinder and the controller are indicated in Fig. 1. The pipes *c* and *c'* are supply pipes. The pipes *a'* and *b'* may be extended to another cylinder mechanism, like that shown in Figs. 1 and 2, these pipes corresponding to the pipes *a* and *b* shown.

The operation of the device is as follows: The normal position of the piston 12 will be at the upper end as shown in Fig. 2 of the cylinder. The corresponding position of the controller handle 16^c is that shown in Fig. 6, while the corresponding position of the passages are those shown in Figs. 9^b and 10^b. In this position the compressed air supply pipes *c* and *c'* cut off when they reach the plug 16^b. If the handle 16^c of the controller be turned to the first position to the right, as shown in Fig. 6 and indicated by 100, the plug will be brought into the position shown in Figs. 9^c and 10^c. This admits compressed air from the pipe *c* through the port *o*, the passage *s* and the passage *q* through the pipe *a* to the upper end of the cylinder. The introduction of compressed air into the upper end of the cylinder will move the piston 12 to the lower end of the cylinder, and, at the same time, fill the chamber 12^a in the piston up to the pressure at which the compressed air is supplied. If the handle 16^c be then moved over further to the right to the position indicated by 200, compressed air will still be supplied to the upper end of the cylinder; as before suggested, but the passage *t* in the core will then register with the passages *m* and *r* and compressed air will be supplied through the pipe *c'* to the pipe *a'* and thence to the upper end of the other cylinder before mentioned, which will perform the same operation with the second cylinder. If the handle 16^c is now moved back to its normal position, the supply of compressed air through both of the pipes *c* and *c'* will be cut off and the passages *s* in the controller plub will be brought into register with the passage *n* in the upper plane and with the ends of two passages *u* and *v* in the lower plane of the controller. This will serve to connect the pipe *a*. If the handle 16^c has been moved over to the 200 position, whereby a supply of compressed air was stored in the second cylinder; the moving of the handle 16^c back to the normal position would also place the pipe *a'* from the second cylinder in communication with the pipe *b'* from the second cylinder. Of course, this is accomplished whether or not a charge of air has been introduced into the second cylinder through the pipe *a'*, but unless there is air stored therein the establishing of this connection effects no result. When the controller is placed in the position so as to place the pipe *a* in communication with the pipe *b*, the charge of compressed air in the upper end of the cylinder, as shown in Fig. 1, is allowed to pass to some extent into the lower end of the cylinder. This acting on the disk 21 forces the same toward the piston 12, and, overcoming the spring 22, opens the valve 20. This operation not only opens the valve 20, but, acting through the finger 31 and the valve stem 30, also opens the exhaust valve 25. When the valve 25 is open, the charge of compressed air in the upper end of the cylinder, as shown in Fig. 1, escapes through the valve 25. When the valve 20 is open the charge of air stored in the piston 12 has free passage from the piston tank into the lower end of the cylinder and its expansion serves to force the piston 12 toward the upper end. As the piston moves up the tooth 31^a on the end of the finger 30 rides over the tooth 30^a and is thence free to travel the limit of movement of the piston. When the valve 25 is moved to the open position through the medium of the stem 30 and the action of the piston disk 21, the ports 28 are uncovered and the

compressed air is supplied to the inner end of the valve chamber 26. The pressure of the air in this chamber will maintain the valve 25 in its open position against the tension of the spring 29 until such time as the pressure has been reduced to a point where it is of no further moment. When the compressed air is introduced into the left-hand end of the cylinder from the piston tank, its escape through the pasage 15 is prevented by the check valve 17 automatically closing. When the piston 12 has traveled to the upper end of the cylinder, as the device is shown in Fig. 2, the exhaust passage 33 is brought into operative position, which allows the air under pressure in the lower end of the cylinder to escape to the atmosphere and relieves the pressure from all the pipes except *c* and *c'*. In this normal position there is no air being supplied to the cylinder, the same being entirely cut off at the controller. When the controller is moved into the position indicated by number 300 and shown in Figs. 9ª and 10ª, the pressure will be applied from the source through pipes *c'* to pasage *s*, thence to *r* and pipe *a'*, which will then operate the piston connected with the other cylinder in the same manner as the piston 12 was operated when the controller valve was in the position shown in Figs. 9ᶜ and 10ᶜ.

It will be noted that sufficient compressed air is supplied to the cylinder at one time for accomplishing both the out and in movement of the piston. Under ordinary circumstances the controller will be mounted in the body of the car, while the cylinder 11 will be mounted on a truck of the car and necessarily connected in with flexible hose. By my arrangement of mechanism, the number of pipes extending to the truck and necessarily connected in by flexible hose are reduced to a minimum, and the air pressure is not maintained for any great length of time on any of the pipes.

It is evident that modifications and changes in and from the construction herein described may be made without departing from the spirit of my invention.

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

1. A controller consisting of a casing having a conical opening and a rotatable plug mounted in said opening in the casing, the casing having passages there through to the periphery of the plug arranged in upper and lower planes, and circumferentially extending grooves in the casing connecting with said passages and vertical passages in the plug terminating in openings in the side wall adapted to register with the upper and lower planes, respectively, of the openings in the casing. substantially as set forth.

2. The combination of a cylinder, a piston rod with piston arranged in the cylinder, the said piston being enlarged and made hollow to provide a storage tank, substantially as set forth.

3. The combination of a cylinder, a piston arranged in the cylinder and made hollow to provide the storage tank, a passage controlled by an inwardly opening valve through one end of the piston into the storage tank thereof, and a valve controlled passage through the other end of the piston from the storage tank into the cylinder, substantially as set forth.

4. The combination of a cylinder, a hollow tank piston mounted in the cylinder, a valve controlling a passage from the tank of the piston into the end of the cylinder, an independent piston disk fitting the cylinder and connected with said valve, substantially as set forth.

5. The combination of a cylinder, a reciprocating hollow tank piston mounted in the cylinder, a passage for charging the tank of the piston from the interior of the cylinder at one end, a passage for discharging the piston tank into the other end of the cylinder, valves controlling said two passages, mechanical means for operating the valve controlling the discharge passage, an exhaust valve from the cylinder and mechanical means for opening the exhaust valve, substantially as set forth.

6. The combination of a cylinder, a reciprocating tank piston mounted in the cylinder, inlet and outlet passages from the tank of the piston to the opposite ends of the cylinder, an automatic valve controlling the inlet passage, a mechanically operated valve controlling the outlet passage, an exhaust valve on the cylinder, and an operative connection between said outlet valve and said exhaust valve, substantially as set forth.

7. The combination of a cylinder, a reciprocating tank piston mounted in the cylinder, openings at each end of the cylinder, inlet and outlet openings from the tank of the piston into the opposite ends of the cylinder, an automatic valve controlling the inlet opening, an independent piston disk fitting the cylinder and connected to and controlling the outlet opening valve, an exhaust valve in the end of the cylinder, means for connecting the said piston disk with the outlet valve, and means for supplying compressed air to one end of the cylinder and the piston tank, and for placing the charged end of the cylinder in communication with the opposite end of the cylinder, substantially as set forth.

In witness whereof, I have affixed by signature, in presence of two witnesses, this 13th day of February, 1908.

JAMES S. JOHNSTON.

Witnesses:
GEO. E. RENDELL,
EMMA S. HESSE.