No. 733,315. PATENTED JULY 7, 1903.

F. L. DODGSON.

ELECTROPNEUMATIC VALVE.

APPLICATION FILED OCT. 25, 1901.

NO MODEL.

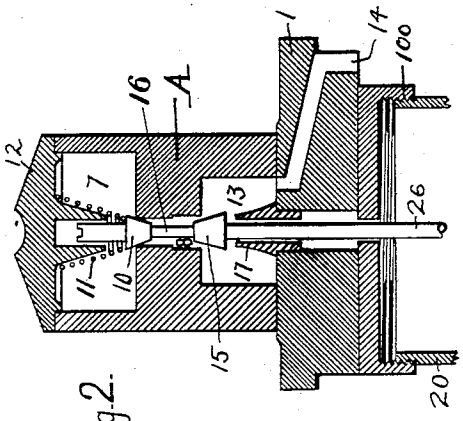

Fig.2.

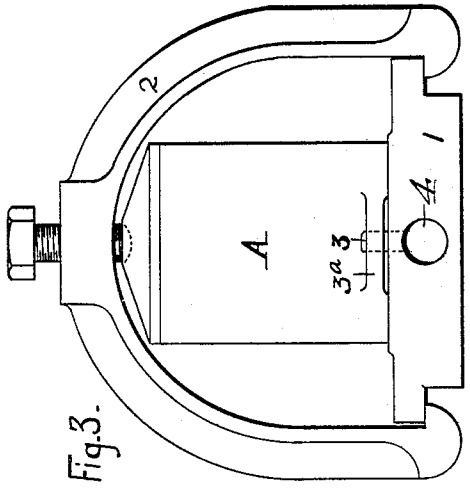

Fig.3.

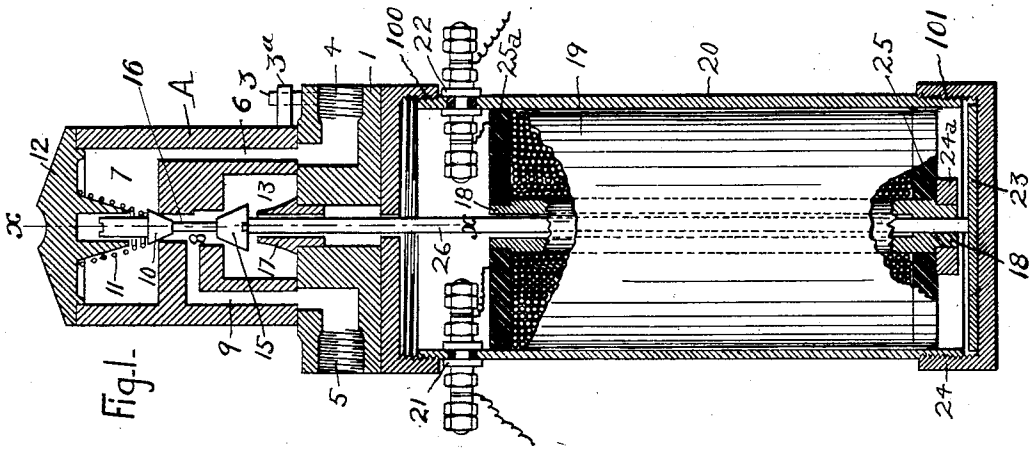

Fig.1.

WITNESSES.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 733,315. Patented July 7, 1903.

UNITED STATES PATENT OFFICE.

FRANK L. DODGSON, OF ROCHESTER, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO PNEUMATIC SIGNAL COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

ELECTROPNEUMATIC VALVE.

SPECIFICATION forming part of Letters Patent No. 733,315, dated July 7, 1903.

Application filed October 25, 1901. Serial No. 79,942. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. DODGSON, a citizen of the United States, and a resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Electropneumatic Valves, of which the following is a specification.

This invention relates to an electropneumatic valve to be used in connection with railway signaling or with the operation of any part of a railway superstructure by means of fluid-pressure controlled by an electric current.

The objects of the invention are to produce a good construction, to construct the valve and its operating-magnet in such manner that all necessary adjustments may be provided, and also to provide against derangement by dirt particles or moisture carried by the air.

In the drawings, Figure 1 shows a section of the valve and its magnet. Fig. 2 shows a section on the line x x of Fig. 1, the magnet being omitted in this figure, and Fig. 3 shows the fastening of the valve-casing to the cap carrying the magnet.

The valve-casing A comprises a cap 1, carrying the magnet by means of a strap and set-screw 2 of a well-known construction in such a manner as to be easily detachable. It is held in position by the studs 3, which rest in sockets in lugs 3^a on the valve-casing. (See Fig. 3.) This cap 1 has two pipe connections 4 and 5. The supply or inlet pipe for supplying air or other fluid under pressure enters at the supply-port 4. At the outlet-port 5 the outlet-pipe which supplies the motor-cylinder is connected. Consequently when the valve is opened it allows air from the port 4 to enter through the port 5 into the cylinder. (Not shown.) For this purpose the valve-casing has a port 6, which connects with the supply-opening 4 and leads to the upper or supply chamber 7. The central or outlet chamber 8 has a port 9, which communicates in the same manner with the outlet 5. The valve for controlling these ports is a double-seated valve composed in the form herein shown of a pair of connected valves 10 and 15. The supply-valve 10 when closed upon its seat by the air-pressure in the supply-chamber 7, assisted by the spring 11, will shut off the supply from the outlet-port 9, and no air can therefore enter the motor-cylinder. This valve 10 has a stem guided in the cover 12. The lower valve-chamber or exhaust-chamber 13 communicates with the atmosphere through the port 14 in the cap, as shown in Fig. 2. The exhaust-valve 15 shuts off the communication between the exhaust and the central chamber, and consequently cuts off the exhaust from the cylinder when this valve is against its seat. When the valve 15 is open, the cylinder can exhaust through the ports and chambers 9, 8, 13, and 14. A stem 16, attached to the valve 15 and entering into the valve 10, keeps these two valves at a uniform distance apart, and as this distance is greater than that between the two valve-seats one valve will always be away from its seat and open when the other one is seated and closed. In other words, the valves are oppositely acting. Both the supply and exhaust valves are preferably made conical in shape, as shown. The cap 1 has a central conical projection 17. The upper diameter of this conical projection is less than that of the base of the valve 15 for a purpose which will be explained farther on. The cap 1 has an internal finely-pitched thread 100, which serves to attach the cap to the magnet. The magnet, which is of the usual iron-clad type, has the usual soft-iron core 18 and has the wire windings 19, which are surrounded by an iron casing 20, which may be a piece of tube threaded at both ends. Electrical connectors, such as the binding-posts 21 and 22, are attached to this tube, and connection is made on the inside of the tube with the magnet-wire and on the outside with the controlling-circuit wires, so that when current passes through this controlling-circuit the magnet is energized. The armature 23 of the magnet consists of a soft-iron plate loosely placed in a lower cap 24 and supported by it when the magnet is not energized. The cap 24 has internal screw-threads 101, and is thus adjustably attached to the magnet-casing 20. The core 18 has a reinforcement 24^a. A fiber or other insulating plate 25 is placed between this reinforcement

and the magnet-windings. Another plate 25ª, which may be an insulating-plate or may be provided merely with insulated blocks for the magnet-wire terminals, protects the top windings. Placed so as to slide freely in a longitudinal axial opening of the core 18 is a lifting-rod 26. This rod abuts at one end against the base of the valve 15 and at its other end rests upon the top surface of the armature 23. It is not otherwise fastened to either the valve or the armature.

The operation of the device is as follows: When current passes through the magnet, energizing it, the armature is attracted, carrying with it the lifting-rod, and thereby pushing up the valve 15 and with it the valve 10, so as to set said valve 15 against its seat and open the valve 10. Air from the supply-pipe can now pass from the upper chamber 7 through the central chamber 8, the port 9, and the outlet 5 into the cylinder whose piston is to be operated. As soon as the current has been cut off the magnet will become deënergized, the armature will drop, the valve 10 will shut off the supply by coming against its seat, and the valve 15 will open to exhaust.

The length of the lifting-rod 26 is such that when the supply-valve 10 is against its seat, cutting off the supply, and the armature rests in the bottom of the cap 24, this lifting-rod should just fill the space between the bottom of the valve 15 and the top of the armature and that when the armature is lifted and the valve 15 is against its seat the armature should not quite touch the magnet. It is therefore necessary to provide two adjustments to obtain this necessary relative position of the parts. If the lifting-rod itself were to be made adjustable, it would necessitate taking apart the magnet to get at the adjustment. With the present construction, however, both adjustments can be made with the greatest ease without disturbing any one of the component parts and without taking anything apart. To adjust the distance between the valve and the armature, the tube 20, carrying the entire magnet, is adjusted in the cap 1 by means of the screw-thread 100. To regulate the lift of the magnet, the cap 24 is adjusted on the casing 20 by the threads 101. Both of these adjustments can take place easily after all the parts have been assembled and can be carried out to any degree of nicety.

It was stated above that the upper diameter of the projection 17 is smaller than that of the base of the valve 15. The purpose of this construction is to prevent impurities or water carried by the air from reaching the magnet and possibly impairing its efficiency or clogging the movement of the armature or lifting-rod.

By the construction shown the valve 15 will act as a shed for the opening through which the lifting-rod passes. Water or any impurities will be carried along its sides into the chamber 13 and out through the exhaust and will be kept out of the lifting-rod opening and the magnet.

The valve-casing and the chambers 13 and 7 are made generous in size to act as dirt-collectors and to avoid the carrying along of impurities in the air into the cylinder.

What I claim is—

1. In an electropneumatic valve, an electromagnet having an armature, a double-seated valve, a valve casing having ports connecting a supply with an outlet through one valve-seat, and closing the exhaust when the armature is in one position, and a port connecting the outlet with the exhaust through the second valve-seat and closing the supply when the armature is in the other position, means for operating said valve by movement of said armature, and means for independently adjusting the distance between the armature and the valve and the distance between the armature and its magnet without disconnecting any parts of the mechanism or disturbing any other adjustments, substantially as set forth.

2. In an electropneumatic valve, an electromagnet having an armature, a double-seated valve, a valve-casing having ports connecting a supply with the outlet through one valve-seat, and closing the exhaust when the armature is in one position, and a port connecting the outlet with the exhaust through the second valve-seat and closing the supply when the armature is in the other position, means for operating said valve by movement of said armature but detached from both, and means for independently adjusting the distance between the armature and the valve and the distance between the armature and its magnet without disconnecting any parts of the mechanism or disturbing any other adjustments, substantially as described.

3. In an electropneumatic valve, a double-seated valve, a valve-casing therefor having ports connecting a supply with an outlet through one valve-seat and closing the exhaust when said valve is in one position and a port connecting the outlet with the exhaust through the second valve-seat and closing the supply when the valve is in the other position, an electromagnet, means for connecting said electromagnet with the valve-casing whereby said electromagnet is axially adjustable with reference to said valve-casing in the line of movement of said valve, an armature for said electromagnet, independent means for adjusting the position of said armature with reference to the magnet, and means for operating said valve by movement of said armature, substantially as set forth.

4. In an electropneumatic valve, a double-seated valve, a valve-casing therefor having ports connecting a supply with an outlet through one valve-seat and closing the exhaust when said valve is in one position and a port connecting the outlet with the exhaust

through the second valve-seat and closing the supply when the valve is in the other position, an electromagnet, means for connecting said electromagnet with the valve-casing whereby said electromagnet is axially adjustable with reference to said valve-casing in the line of movement of said valve, an armature for said electromagnet at the other end thereof, independent means for adjusting the position of said armature with reference to said electromagnet, and a rod extending from said armature to said valve but detached from both, substantially as described.

5. In an electropneumatic valve, a double-seated valve, a valve-casing therefor having ports connecting a supply with an outlet through one valve-seat and closing the exhaust when said valve is in one position and a port connecting the outlet with the exhaust through the second valve-seat and closing the supply when the valve is in the other position, an electromagnet, a magnet-casing therefor axially adjustable with reference to said valve-casing in the line of movement of said valve, an armature for said electromagnet, an adjustable cap on said magnet-casing and containing said armature and adapted to adjust the position of said armature with reference to said magnet, and a rod extending from said armature to said valve, substantially as described.

6. A conical valve, a valve-casing having a valve-chamber and suitable ports, a rod operated by an armature and passing into the valve-chamber and adapted to press said valve to its seat, a projection into said valve-chamber adjacent to said valve when open and having an opening through which the rod passes, said projection having a smaller diameter at the top than the lower base of the conical valve, so that impurities carried by the air will be deflected and cannot pass out of the valve-chamber through the lifting-rod opening, an electromagnet, and an armature therefor for operating said rod, substantially as described.

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Witnesses:
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F. BISSELL.