D. A. BURR.

PNEUMATIC SWITCH SIGNAL.

No. 183,487. Patented Oct. 24, 1876.

Fig: 1

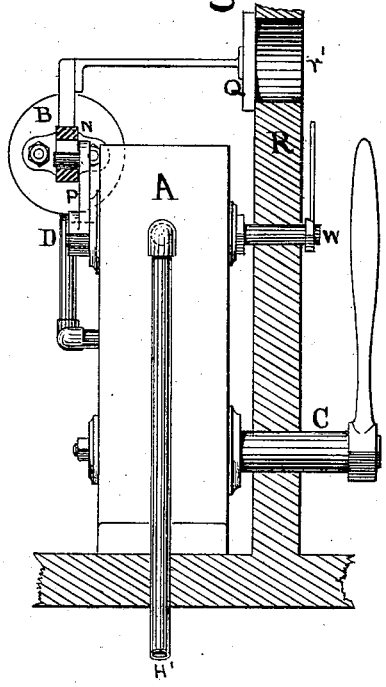


Fig: 2

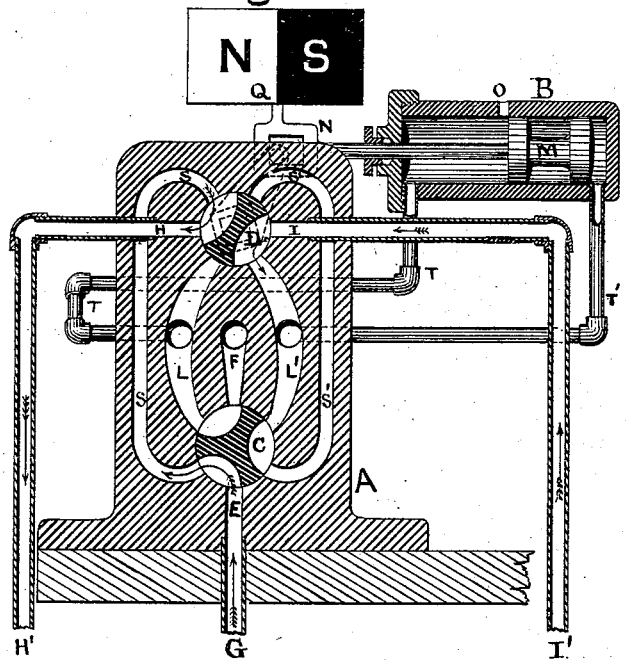
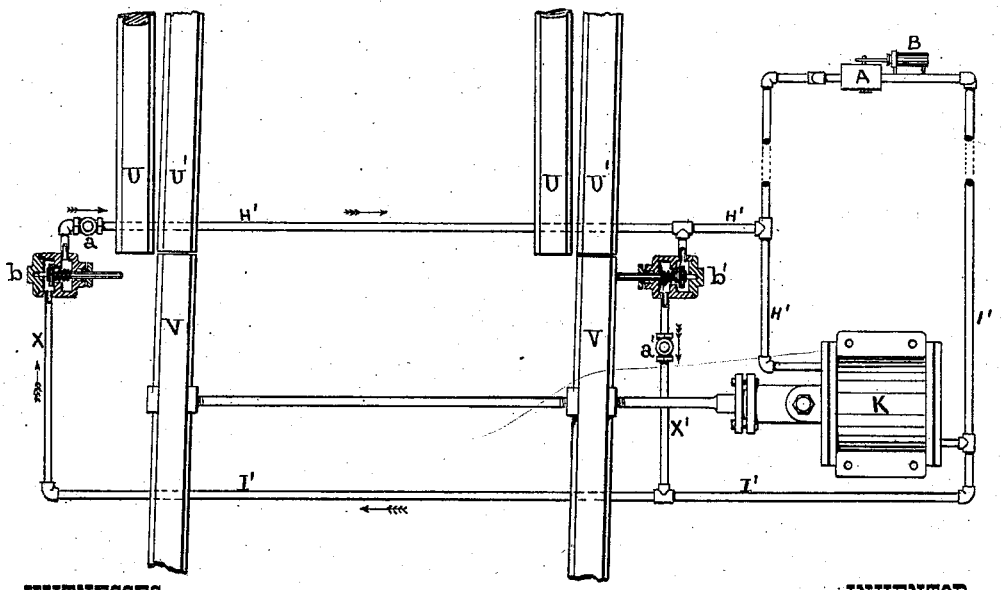


Fig: 3



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IMPROVEMENT IN PNEUMATIC SWITCH-SIGNALS.

Specification forming part of Letters Patent No. **183,487**, dated October 24, 1876; application filed May 22, 1876.

To all whom it may concern:

Be it known that I, DAVID A. BURR, of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Indicating Apparatus for Pneumatic Switch-Movements, which is fully set forth and described in the following specification and accompanying drawings.

This invention is designed to secure an accurate indication, in a signal-tower or other station from whence a railway-switch is moved by means of compressed air, of the changes made in the position of the switch so soon as its movement in either direction is completed.

It consists, first, in combining with the supply-pipe delivering compressed air to the switch apparatus, and with the main pipes conveying air from said supply to the opposite ends of the piston actuating the switch, two cocks, the one (or main cock) to be moved by hand, at the pleasure of the switch-operator, as required, and the other (the indicating-cock) to be moved automatically by means of a secondary piston, actuated in opposite directions by a return of air from the cylinder of the switch-piston at the completion of its stroke, the position of the secondary piston, as indicated by a pointer or slide on a suitable board, serving to denote the position to which the switch has been moved. The ports in these cocks are so arranged, and the main air-pipes to the switch and secondary pistons are so connected therewith, as that by a movement of the main cock air will be admitted from the supply-pipe through connected ports in both cocks, and through one of the main pipes, to one end of the switch-piston, and thence, when the piston has completed its stroke, back through the opposite main pipe and other ports in the two cocks to one end of the secondary piston, so as to produce a movement thereof. This movement of the secondary piston will operate to turn the indicating-cock, and thereby close and cut off connection with the air-supply pipe, and simultaneously open exhaust-vents for the escape of air from all the connecting-pipes.

It consists, second, in combining with the indicating-piston, either directly with its piston-rod or indirectly with the stem of the cock operated thereby, an indicating-slide, or a pointer, as its equivalent, whose movement, indicated upon or through a dial-board, shall correspond with and be produced by the movement of said piston.

It consists, third, in coupling together the main air-pipes leading from the main cock to a pneumatic switch-piston by means of two cross-pipes, each of which will afford direct communication between said main pipes, and in determining and controlling the flow of air in the cross-pipes by means of valves or cocks, arranged and operating to allow the air to pass through each pipe in one direction only, this flow of air through either pipe being dependent upon the opening of the valve or cock by the action thereon of the switch in coming to its normal position at the completion of its movement. The combination of the valves or cocks and cross-pipes is such as that the opening of the valve or cock in either pipe by a movement of the switch will permit the air which has actuated the switch-piston and produced this movement to pass into and return through the opposite main pipe back to the indicating-piston to actuate it.

In the accompanying drawings, Figure 1 is a side elevation of the case containing the main and indicating cocks, including an end view of the indicating-piston cylinder and a transverse section of the indicating-board; Fig. 2, a central vertical section transversely through the cocks and longitudinally through the indicating-piston cylinder, illustrating the arrangement of ports and pipe-connections; and Fig. 3, a plan view, illustrating, on a reduced scale, the combination and arrangement of the main and indicating cocks and piston, with the switch-piston and cylinder, the cross connecting-pipes, and the movable rails of a switch, the controlling-valves in cross-pipes being shown in section.

A is a metallic block or casing, in which are formed suitable seats for the main and indicating cock keys C and D, and also air-passages for connecting the ports of the cocks with each other or with outer pipe-connections. The inner perimeter of each of the key-seats is pierced with six equal ports, arranged at equal distances apart. The opposite ports in the one seat are arranged in planes at right angles to opposite ports in the other seat. In the form of

casing illustrated in the drawing, the opposite ports for the indicating-cock are formed in a horizontal, and for the main cock in a vertical, plane. The opposite ports E F of the main cock C, arranged in a vertical plane, extend outwardly through the casing A, the one, E, being connected with a pipe, G, for supplying compressed air to the apparatus, and the other, F, opening freely outward, to form an exhaust-vent. The opposite ports H and I of the indicating-cock D extend also outwardly, and are connected, respectively, with the main pipes H′ and I′, leading to the two ends of the switch-piston cylinder K, Fig. 3. The two lateral upper ports of the cock C are connected directly with the two lower ports of the cock D by means of passages L L′, formed wholly in the casing-block, and the two lower lateral ports of the cock C are connected directly with the two upper ports of the cock D by means of like passages, S S′.

The key of the cock D is provided with two equal abutments, arranged to cut off any two opposite ports and establish communication between the two adjacent ports remaining on either side thereof, as shown in Fig. 2. The key of the cock C is provided with three equal abutments, each wide enough to cover and close a port, the intervening recesses being wide enough to establish free communication between any two adjacent ports, as shown in Fig. 2.

B is a cylinder, inclosing a double piston, M, whose rod extends outwardly through a suitable stuffing-box at one end thereof. This rod terminates in a plate, N, slotted to engage the pin of a small crank, P, (see Fig. 1, and dotted lines, Fig. 2,) secured upon the end of the cock D, so as to turn the latter. The crank T is so adjusted upon the key of the cock D, with reference to the engaging-slot N, as that when the piston has completed its stroke in one direction, communication shall be established between the ports H and S and I and L′, and in the other between the ports H and L and I and S′, respectively, the ports L and S′ in the one case, and S and L′ in the other, being thereby closed. O is a vent formed centrally in the cylinder B, to permit a free exhaust of air from the cylinder at the completion of the stroke of its piston in either direction. Q is a slide, connected with, and secured to, the rod of the piston M, so as to move therewith. This slide is arranged to move behind a board, R, over a dial-aperture, *r*′, pierced therein. The aperture is of such size as that one half or division only of the slide may be seen through it, and the slide is painted in two different colors, or with different letters or symbols, one of the colors or letters, as it appears through the aperture *r*′, indicating a given position of the piston, and the other its opposite position. W is a pointer, secured to the end of the key of the cock D, which is made to project out through the board R to receive it. This pointer will serve as an equivalent device for the slide Q, to indicate on the face of the board the position of the cock-key, and consequently of the piston M, which has actuated it. T T′ are pipes, connecting the opposite ends of the indicating-piston, respectively, with the air passages and ports L and L′. U U′ U U′ are the fixed rails, and V V the movable rails, of a railway-switch operated by means of a pneumatic piston, K. X X′ are cross-pipes, connecting directly with each other the main pipes H′ and I′, which lead from the main and indicating cocks to the opposite ends of the switch-piston K. *b b′* are valves, interposed in the cross-pipes X X′, to control the flow of air through them, and which are, respectively, so placed therein as that the direction in which the air may flow through one cross-pipe shall be invariably opposed to that in which the air may flow through the other.

Each valve *b b′* is arranged to be closed by a spring of such power as shall keep the valve closed against any degree of air-pressure which it is contemplated to use in the working of the apparatus, but which will readily yield to the superior pressure of the switch when moved against the valve-stem to open it. The valve-stems are guided in suitable bearings, and extend outwardly through suitable stuffing-boxes. The valves *b b′* and cross-pipes X X′ are so located on opposite sides of one or both of the movable rails V V of the switch as that when the movement of the rails is completed in either direction, the stem of the valve *b* in that side shall be struck thereby and the valve forced open, its spring operating to close it automatically so soon as the stem is relieved from contact with the rail, and to keep it closed and prevent any flow of air through the pipe until again forced open by the switch.

Check-valves *a a′* may, however, be placed in each of said cross-pipes X X′, on that side of the governing-valve *b* or *b′* from which the air must arrive to pass through the valve, as an auxiliary device, to prevent the latter from opening if its spring becomes weak; or, instead thereof, I contemplate substituting for the spring-actuated puppet-valves *b b′*, illustrated in the drawings, as an equivalent therefor, either simple slide-valves or ordinary cocks; these slide-valves or cocks to be each closed automatically, either by the power of a suitable spring arranged to be compressed by the opening of the valve, or else by the reverse movement of the switch itself, operating against a stop or catch upon an extension of the valve-stem, or of the cock-rod.

It is evident, also, that the valves *b b′*, instead of being separated and kept apart, as illustrated, may be combined to control two ports in one casing, with which the pipes X X′ are separately connected, the valves in such case being both operated by means of a single rod engaging one of the movable rails V of the switch.

The cocks C and D may be each constructed independently of the other, and interconnected,

substantially as described, by means of separate pipes and fittings, instead of the air-passages illustrated in the drawing, Fig. 2.

In the use of this apparatus, the casing A, with its cock and the indicating-piston cylinder B, and the indicating devices, are placed in a railway-station or tower, and connected by pipes, as described, with the cylinder and piston for operating a switch upon the railroad.

The operation of this apparatus is as follows: If the switch be thrown, for instance, to the north, (in which case its position will be indicated by the letter N through the dial-opening *r* of the indicating-board R, or otherwise, by the pointer W turned and pointing to the corresponding letter painted upon said board,) and it is required to move it over to its south position, the operator, by turning the handle of the main cock C, Fig. 1, one-sixth of a revolution, (its further movement being arrested by suitable stops,) will admit a flow of air from the main G to the passage S, and thence through the open ports in cock D to the main pipe H′, and out to the switch-piston cylinder, its passage into the opposite main pipe I′ through the cross-pipes X X′ being prevented by the closed valves *b b′*. The admission of air to one end of the switch-cylinder will instantly operate to force its piston over, carrying with it the switch-rails V. So soon, however, as the rails have been forced over, the stem of the valve *b′*, which has prevented a flow of air through the cross-pipe X′, will be struck thereby and the valve *b′* be thrown open, allowing the air to pass from the pipe H′ directly to the pipe I′. The air thus admitted to the second main pipe I′ will pass back through the open port in the cock D to the passage L′, and thence through the pipe T′, and, bearing against the indicating-piston, will force it over, changing thereby the position of the slide Q, so that the letter S will appear at the dial-opening *r′*, instead of the letter N, and, simultaneously turning the cock D one-sixth of a revolution, will not only close the communication between the supply-passage S and the main pipe H, and thus cut off a further supply of air from G, but will also open an outward vent from the pipe H, through passage L and port in cock C, to the exhaust-opening in passage F, and from pipe I, through passage S′ and port in cock C, to passage L′, pipe T′, and exhaust-opening in cylinder B, the change in position of the cock D being indicated by the movement of the pointer W from letter N to letter S on the face of the board R.

By means of this apparatus an unerring and exact indication is given in the signal-station, from whence the movement of a switch is directed, of the change produced in the position of the switch, so soon as the change is fully and properly accomplished, but not otherwise; and a pressure of air directly from the air-supply pipe and compressing machinery is maintained upon the switch-piston until the switch has moved fully home, and is not cut off until this fact has been indicated in the station.

I claim as my invention—

1. The cocks C and D, combined with each other and with a pneumatic piston operating a railroad-switch, a second piston actuating said cock D, an air-supply main, exhaust-vents, and suitable connecting-pipes, all substantially in the manner and for the purpose herein set forth.

2. In combination with the cock D and its actuating-piston M, and with the cock C and switch-piston K, a dial-board, R, and pointer W, arranged to indicate the position of said switch by the movement of the cock D, substantially as herein set forth.

3. In combination with the movable rails of a railway-switch, and with cross-pipes X X′, directly connecting the air-supply pipes H′ and I′ of a pneumatic piston operating said switch, valves *b b′*, controlling said cross-pipes, and arranged to determine the direction of the air-currents therein, and opened, respectively, by the movable switch-rails, when thrown to their normal position in the one direction or the other, substantially as and for the purpose herein set forth.

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