(No Model.) 2 Sheets—Sheet 1.

G. R. BARTHOLOMEW.

PNEUMATIC SWITCH THROWING MECHANISM.

No. 605,691. Patented June 14, 1898.

FIG. 1.

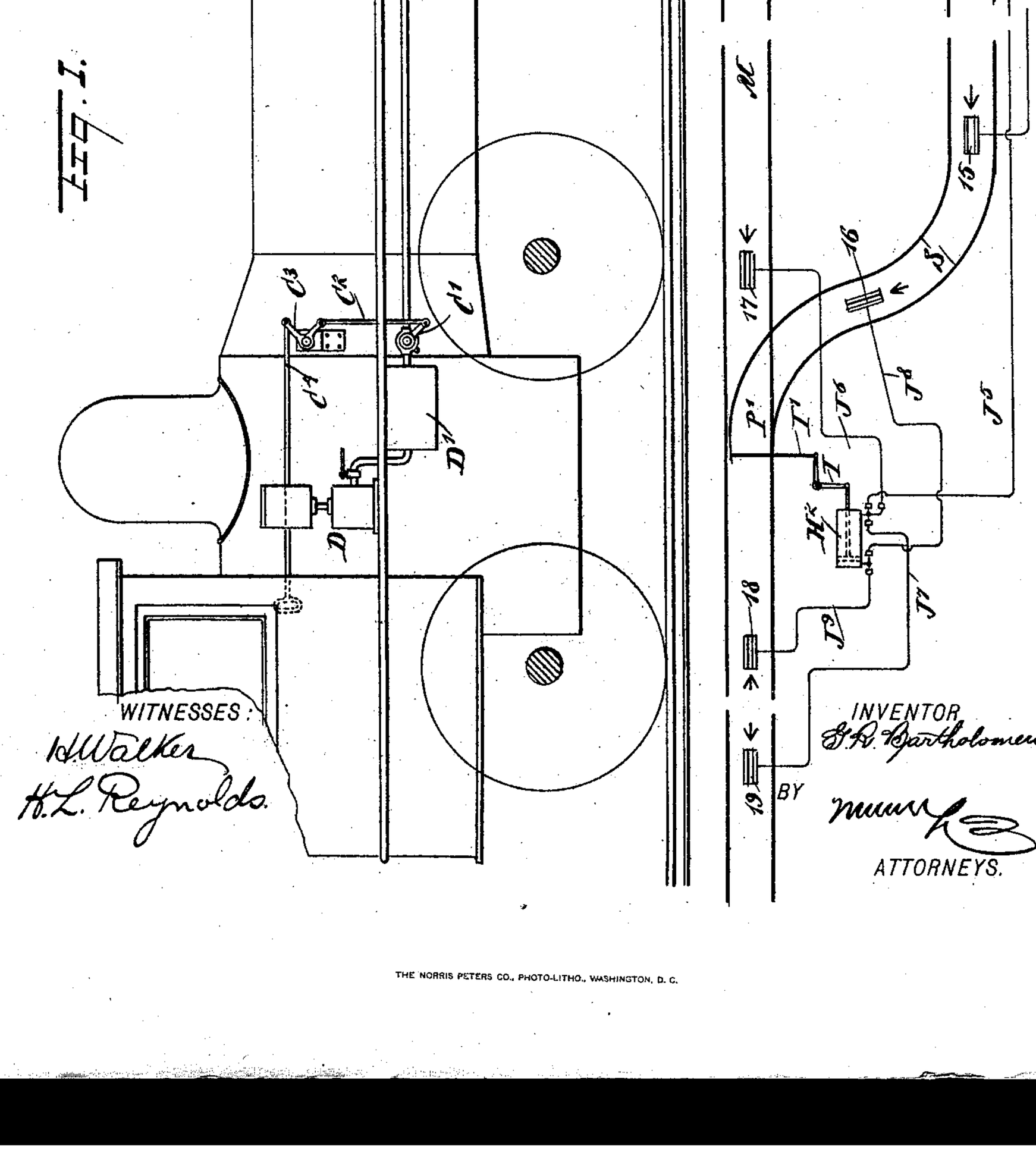

FIG. 2.

FIG. 3.

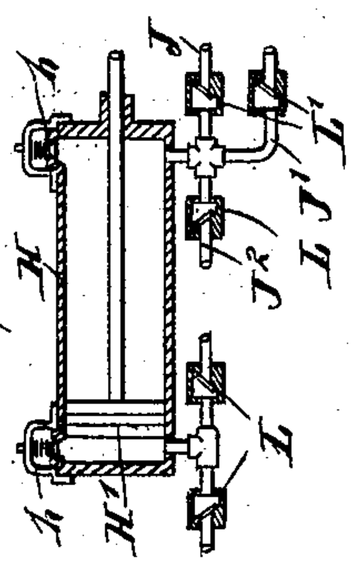

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Fig. 4.

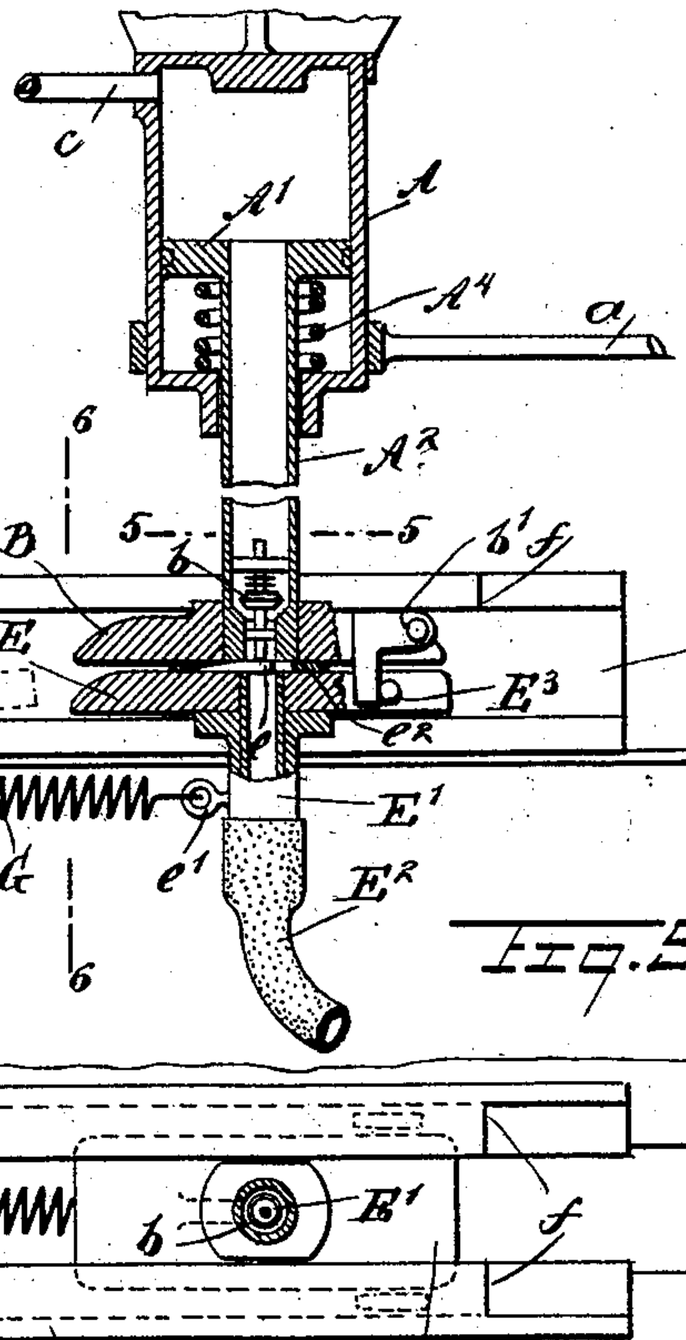


Fig. 6.

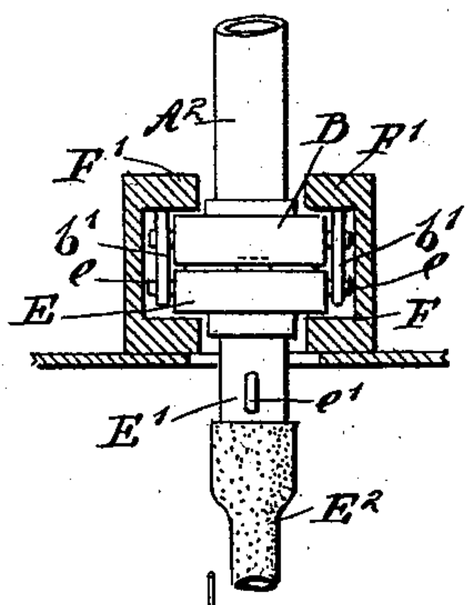


Fig. 5.

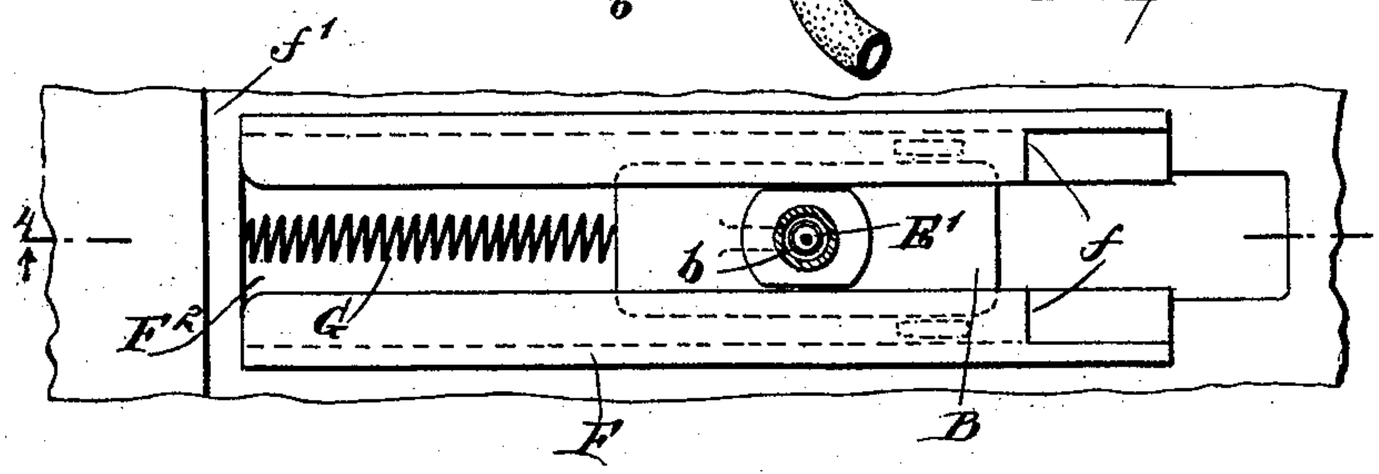


Fig. 7.

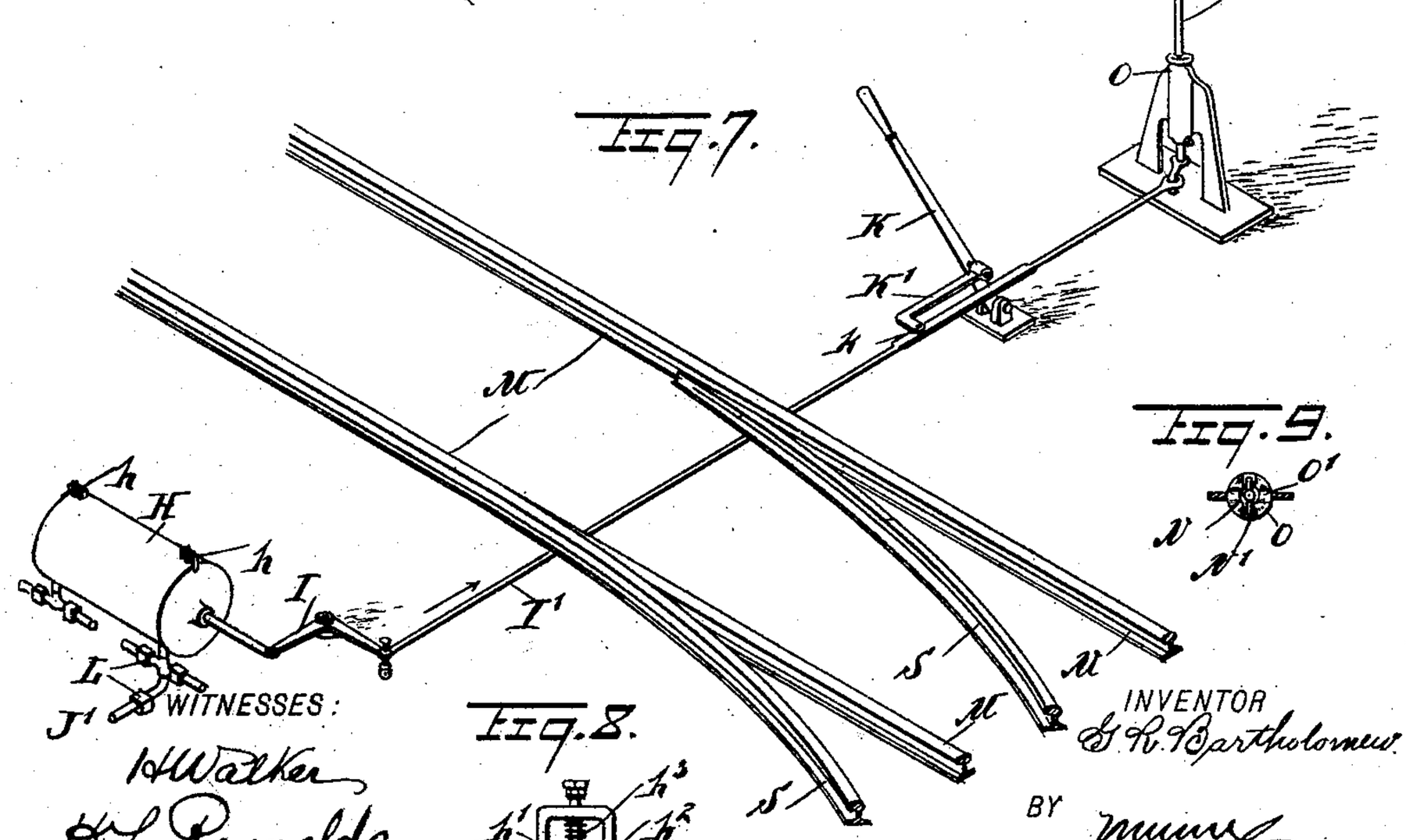
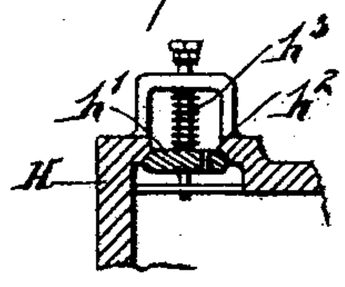


Fig. 9.

Fig. 8.



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GEORGE R. BARTHOLOMEW, OF RIDGE, PENNSYLVANIA.

PNEUMATIC SWITCH-THROWING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 605,691, dated June 14, 1898.

Application filed October 19, 1897. Serial No. 655,729. (No model.)

To all whom it may concern:

Be it known that I, GEORGE R. BARTHOLOMEW, of Ridge, in the county of Bucks and State of Pennsylvania, have invented a new and Improved Pneumatic Switch-Throwing Mechanism, of which the following is a full, clear, and exact description.

My invention relates to an improved mechanism for throwing railway-switches operated by compressed air and controlled by the engineer from a moving locomotive.

It comprises, first, a pneumatic switch-throwing mechanism, and, second, means for connecting the same with the moving engine.

It also consists of certain improvements and novel features which will be hereinafter described, and particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of an engine, showing my device as applied thereto. Fig. 2 is a diagram showing in plan the location of the parts for a side track. Fig. 3 is a sectional plan view through the pneumatic cylinder which controls the switch. Fig. 4 is a longitudinal sectional elevation through the device which makes the connection between the pneumatic cylinder and the engine substantially on the line 4 4 in Fig. 5. Fig. 5 is a plan view of the same on the line 5 5 of Fig. 4. Fig. 6 is a cross-sectional elevation on the line 6 6 of Fig. 4. Fig. 7 is a perspective view of a switch, showing the connection of the pneumatic cylinder and the ordinary switch-stand. Fig. 8 is a detail section showing the relief-valve of the pneumatic cylinder, and Fig. 9 is a detail plan showing the manner of locking the switch-stand to prevent its accidental turning.

My device is intended to be operated by the engineer without stopping the engine and to be constructed so that he may throw a switch in any direction desired before coming to the switch or after leaving the same, thus making it entirely unnecessary for brakemen to dismount from the train to throw the switch.

My device is divided into two parts—first, the switch-throwing mechanism, which comprises, essentially, a pneumatic cylinder the piston of which is connected by suitable mechanism to the switch-points and is operated by compressed air, and, second, means mounted partially upon the engine and partially at suitable points along the track by which a temporary connection may be made between a pipe leading from these points to the pneumatic cylinder and the supply of compressed air carried upon the engine.

The pneumatic switch-throwing mechanism is shown sectionally in Fig. 3 and in perspective in Fig. 7. This mechanism comprises a cylinder H, mounted adjacent to the rails and provided with a piston H′. The rod of this piston is connected to a bell-crank lever I, and this lever at its opposite end is connected to a rod I′, which extends across the track beneath the rails and is connected to the movable switch-points. The rod I′ may be extended byond the track and connected with a hand-operated switch-throwing mechanism, if desired. Such a connection is shown in Fig. 7. This mechanism may be constructed in the ordinary manner, but should be arranged so that it may be connected with or disconnected from the rod I′.

As shown in the drawings, this mechanism consists of a hand-lever K and link K′, pivoted thereto and connected at its opposite end to the rod I′ by a pin *k*, said pin being of such a nature that it may be easily removed. Normally it is preferred that the hand operating-lever be disconnected from the rod. The further extension of the rod I′ is connected to a crank upon the lower end of the vertical rod N of the switch-stand, so that when the switch is moved the rod N will be rotated in the usual manner. This rod is provided at its upper end with the usual target, which indicates by its position the condition of the switch. The construction of the cylinder is shown in detail in Figs. 3 and 8.

An air-supply pipe is connected to each end of the cylinder, so that the piston may be forced in either direction. This air-supply pipe after leaving the cylinder is divided into as many branches as necessary. As shown in Figs. 2 and 3, this pipe at one end of the cylinder is divided into three branches and at the other end into two branches. These branches each lead to a coupling device located at a suitable point along the track.

Each of the branches is provided with a check-valve L, which will permit the flow of air through the pipe into the cylinder, but will prevent air escaping from the cylinder. These branches, which are lettered J J′ J², &c., lead from the pneumatic cylinders to the couplings 10 11 12, &c., located along the main and side track at such points that the switches may be opened or closed by an engine approaching or leaving the switch on either the main or side track. The switch P may be closed—that is, set for a continuous main line—by an engine approaching it upon the main line from either direction by connection with either the coupling 11 or 12 and also by an engine which has run upon the side track from the main line by connection with the coupling 15, which is located in the side track near its opposite end or at a sufficient distance from the switch P to accommodate a train between the coupling and switch.

The switch P may be opened or set to connect with the main line by an engine approaching from the main line beyond the switch or one approaching upon the side track by connection with the couplings 10 or 13. Similarly the switch P′ may be closed by connection with the couplings 14, 17, and 19 and opened by connection with the couplings 16 and 18. The direction of motion of the engine at the time when these couplings are designed to be used to open or close the switches is indicated by the arrow-head located adjacent to each of the couplings. They are so placed that an engine approaching a switch may open or close it, as may be necessary, and so that the switch may be opened or closed after leaving the same. For each side track there is thus necessary a pneumatic cylinder controlling each of the switches and couplings arranged in both the main line and side track. The main line is indicated by the letter M in the drawings, and the side track by S. In the drawings a single side track only is shown; but it is evident the device may be applied to as many side tracks as necessary and also that the operative lever I may be connected to both switches of a cross-over, so as to throw them both at once.

The cylinder H is provided at each end with a relief-valve *h*. This valve is shown in detail in Fig. 8 and consists of a valve-body *h′*, placed within an opening in the cylinder and adapted to open inwardly. About the stem of this valve is placed a spiral spring h^3, which normally acts upon the valve to open it. The valve-body is also provided with a small leakage-opening h^2, connecting the interior of the cylinder with the outer air. The spring h^3 is made of such strength that it will resist a pressure slightly below the working pressure in the cylinder to open the valve. The pressure in the cylinder H is needed only for a very short time while the switch is being thrown. It is then desirable that the air shall escape very soon in order that the switch may be thrown in the opposite direction without too much delay. The small escape-orifice h^2 permits the air in the cylinder to escape until it is reduced to a pressure slightly below the working pressure and so that the spring h^3 exerts a greater opening effect upon the valve than the closing effect caused by the air-pressure within the cylinder. When this point is reached, the spring will open the valve and the air in the cylinder will be permitted to rapidly escape. This leaves the cylinder in position for operating in the opposite direction in a very short time.

The pipes J, leading from the cylinder to the various couplings, terminate in a short section of hose E^2, which is connected to a moving shoe E, forming one-half of the coupling. The coupling comprises the shoes E and B and the mechanism directly connected therewith. The shoe E is mounted within a guide formed by the flanged plates F. These plates have a central slot at top and bottom through which the stems of the shoes E and B pass. To the stem E′ of the lower shoe is fixed a staple or eye *e′* or other suitable device, by which a spring G may be connected thereto. This spring is preferably a spirally-coiled spring and extends beneath the flanged guide F, and is connected at one end to a cross-bar *g* or other convenient device and normally draws the shoe to one end of the flanged guides, the shoe occupying the position shown in dotted lines in Fig. 4 with one end resting against the slight ledge *f′*. This end of the guides is placed to face the direction from which the engine which is to operate the device approaches. It is to be understood that one of these devices is to be used only from one direction, and that the couplings which are to be operated by the engines approaching in opposite directions are reversed in position. The preferable location of these couplings is centrally between the rails, although the device might be constructed so as to locate these couplings at one side of the rail, if desired.

The entrance end of the flanged guides is slightly flared, as shown at F^2, so as to better insure the entrance of the shoe B, which is mounted upon the engine. The lower shoe E has projecting pins or lugs E^3 located upon the end opposite the entrance end of the flanged guides. The shoe B, which is mounted upon the engine, has a catch *b′*, which is made in the form of a bell-crank lever and is pivoted to the shoe B by the outer end of one branch of the lever. This catch is free to pivot upon the shoe B and when not in use will hang downward therefrom. The shoe B, forming one-half the coupling proper, is mounted upon the lower end of the hollow piston-rod A^2 of the piston A′

The piston A′ is within a cylinder A, which is mounted upon the lower side of some member of the locomotive-framework. This preferably, as shown in the drawings, is a buffer-beam A^3. The cylinder A is rigidly secured

to this beam and centrally of the track. The cylinder A is connected by means of a pipe C with an air-reservoir D′, mounted upon the engine. Interposed between the cylinder and the air-reservoir is a three-way valve C′, having a lever connected to a link C^2. The link C^2 is connected to a bell-crank lever C^3, and the bell-crank lever is operated by a rod C^4, which extends within the engine-cab convenient to the engineer. By operating this rod air may be admitted to the cylinder A, so as to force downward the piston and with it the shoe B, so as to exhaust the air from the cylinder A. The piston A′ is normally held in a raised position by the spiral spring A^4, located within the cylinder and surrounding the rod A^2.

The air-reservoir D′ is connected to the air-pump D and is kept supplied therefrom with air under pressure. This air-reservoir may be the ordinary reservoir used for surplus air and mounted upon the locomotive. Within the lower end of the rod A^2 of the piston is fixed a valve *b*, which is normally closed and prevents the escape of air through the hollow piston-rod. The stem of the valve extends slightly below the lower surface of the shoe B when the two shoes are not coupled. The lower shoe is provided with a plate *e*, located in such a position as to engage the lower end of the valve-stem *d* to raise the valve when the two shoes are coupled. This permits the escape of air through the hollow piston-rod A^2 and thus into the hollow stem E′ of the lower shoe and into the pipe leading to the pneumatic cylinder H.

When the engine is approaching a switch which it is desired to throw, the engineer will, after reaching the required point, admit air to the cylinder A. This will force the piston and the shoe B carried thereby down to such a point that it will engage the flaring end of the flanged guides F. The points of the shoe at each end are sloped somewhat, so as to insure greater certainty of entrance within the flanged guides. The shoe in entering the flanged guides will engage the upper surface of the shoe E. The downwardly-projecting catches *b*′ will pass along the side edges of the shoe E until they engage the projecting pins E^3. They will then be thrown into the position shown in Fig. 4, in which one leg of the catch is vertical and the other is horizontal. The upper surface of the horizontal leg bears against the under surface of the flange F′ and prevents it swinging farther. This will lock the two shoes together and cause the shoe E to travel with the shoe B until the catch *b*′ passes beyond the notch *f* at the farther ends of the guides. At this point the flange is cut away so that it no longer forms a support for the upper side of the catch, and the catch is free to swing and release the lower shoe. When this is done, the shoe is then drawn back to its normal position by the spiral spring G. As the two shoes come in contact the stem of the valve *b* engages the small raised plate *e* upon the lower shoe, thus opening the valve *b*′ and permitting the air to flow through.

A packing-ring e^2, of rubber or suitable material, is placed upon one or both of the shoes surrounding the opening therein and thus forming a tight joint to prevent undue escape of the air. The lower or movable shoe E is connected with the pipes leading to the pneumatic cylinder by a section of hose E^2 in order that it may have the desired movement without breaking connection.

At the entrance to the flanged guides a plate F^2, which extends back some distance, is provided to insure a better entrance of the shoe B within the guides. It is of course intended that the speed of the locomotive in operating the switch shall be reduced to a reasonable amount. When this is done, the temporary connection lasting while the engine is moving through the length of the flanged guides will be sufficient to furnish all the air that is necessary for operating the switch. A momentary connection only is needed, as the switch being once thrown it is immaterial whether the pressure is retained for a time or not. In fact, it is preferable that the pressure should be released in a short time.

My mechanism may be adapted for use in connection with any kind of a railway, although I have herein shown it only as applied to an ordinary steam-railway. It is evident also that the parts may be located somewhat differently without changing the principle of the invention, the central point of which is the moving shoe forming one-half of a coupling made from the engine while in motion. The cylinder A should be firmly fixed to the framework of the engine, so that it is not liable to be displaced when in use. To strengthen this, a rod *a* may be fastened to the lower end of the cylinder and extend forward and be connected to the pilot or any other suitable point. In connecting the switch-throwing mechanism to an ordinary switch-stand it is necessary that the switch-stand should be constructed so that the cylinder may be able to overcome resistance and throw the switch, and yet it is desirable that it should be provided with some means for holding the switch against accidental displacement. In Fig. 9 I have shown one means by which such a result may be obtained. In this the central stem N of the switch-stand is provided with a cross-pin N′, and the stand O within which it turns is provided upon its upper end with notches O′, within which the cross-pin normally rests. These notches serve to hold the rod N from turning, except when a considerable effort is made. When this occurs, the stem will be turned, the pin N′ riding over the projections between the notches. This furnishes sufficient resistance to prevent accidental displacement of the switch and yet permits it to be turned when the power is applied to the cylinder.

The location of the various couplings in the track is shown by the numbers 10 to 19, inclusive. The exact operation of all of these has not been described in detail. Each of these consists of mechanism illustrated in Figs. 4, 5, and 6. The direction in which they are to be operated is noted by the arrow-heads placed adjacent thereto.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two halves adapted to be temporarily connected while the engine is moving, one half mounted on the engine and having a valve normally closed and the other half mounted along the track, one of said halves having movement on its support lengthwise the track, and means for automatically opening said valve when the two halves are connected, substantially as described.

2. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two halves, one half mounted on the engine and having a valve normally closed, the other half mounted along the track, means for controlling the engine-coupling to engage the track-coupling, one of said halves having movement upon its support lengthwise the track, and means for automatically opening said valve when the two halves are connected, substantially as described.

3. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine comprising a coupling in two halves, one half mounted on the engine having a valve normally closed and the other half mounted along the track, one of said halves having movement upon its support lengthwise the track, a lock upon the two halves of the coupling adapted to hold them together temporarily, and means for automatically opening said valve when the two halves are connected, substantially as described.

4. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two halves, one half mounted on the engine and having a valve normally closed, the other half mounted along the track, and means for projecting the engine-coupling to engage the track-coupling, one of the said couplings having movement upon its support lengthwise the track, a lock upon the two halves of the coupling adapted to temporarily lock them together, and means for automatically opening the valve when the two halves are connected, substantially as described.

5. The combination with a pneumatic switch-throwing mechanism, of a coupling in two halves, one half connected with a compressed-air supply upon the engine and the other with a pneumatic switch-throwing mechanism, and means for automatically connecting the two halves while the engine is passing, substantially as described.

6. The combination with a pneumatic switch-throwing mechanism of a connecting coupling between the same and the engine comprising two parts, one part mounted upon the engine and one alongside the track, the engine-coupling being movable to engage the track-coupling and one part of the coupling being movable upon a support along the track when in contact, substantially as described.

7. The combination with a pneumatic switch-throwing mechanism, of a connecting-coupling between the same and the engine, comprising two parts, one part mounted upon the engine and one alongside the track, the engine-coupling being movable to engage the track-coupling, one part of the coupling being movable upon a support along the track when in contact with the track, and a valve connected to the engine-coupling, and means for opening said valve while the two parts of the coupling are connected, substantially as described.

8. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two parts, one part mounted upon the engine and the other along the track, a valve in the engine-coupling, normally closed and having a projecting opening-pin, a bar on the track-coupling adapted to engage said pin when the two parts of the coupling are connected, and means for temporarily connecting the two parts of the coupling as the engine passes, substantially as described.

9. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two parts, one part mounted upon the engine and the other along the track, a valve in the engine-coupling, normally closed and having a projecting opening-pin, a bar on the track-coupling, adapted to engage said pin when the two parts of the coupling are connected, locking projections upon the track-coupling, and pivoted catches upon the engine-coupling, adapted to temporarily lock the two together, substantially as described.

10. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two halves, one half mounted on the engine and having a valve normally closed, the other half mounted along the track, one of said halves having movement upon its support lengthwise the track, locking projections upon the track-coupling, and catches upon the engine-coupling, adapted to temporarily lock the two together, substantially as described.

11. The combination with a pneumatic switch-throwing mechanism, of a connecting means between the same and a moving engine, comprising a coupling in two parts, one part mounted upon the engine, and the other along the track, a guide having overhanging flanges for the track-coupling to slide in, a valve in the engine-coupling, normally closed and having a projecting opening-pin, a bar on the track-coupling, adapted to engage said pin when the two parts are connected, locking projections upon the track-coupling, and pivoted catches upon the engine-coupling, adapted to engage the guiding-flanges to temporarily lock the two together, substantially as described.

12. The combination with a pneumatic switch-throwing mechanism, of a flanged guide located lengthwise the track, a shoe movable therein and forming one part of the coupling, a support for returning said shoe to its normal position, a shoe mounted upon the engine and connected to the air-supply and forming the other half of the coupling, means for projecting said shoe to enter beneath the flanges of the guide, and means for locking the shoes forming the coupling while in the guide, substantially as described.

13. The combination with a pneumatic switch-throwing mechanism, of a flanged guide located lengthwise the track, a shoe movable therein and forming one part of a coupling, a spring for returning said shoe to its normal position, a shoe mounted upon the engine and connected to the air-supply and forming the other half of the coupling, a valve in said latter half of the coupling which is normally closed, a valve-opening pin adapted to open the valve when the two shoes forming the coupling are locked together, and means for locking said shoes together while in the flanged guide, substantially as described.

14. The combination with a pneumatic switch-throwing mechanism, of a flanged guide located lengthwise the track, a shoe movable in said guide and forming one part of a coupling, a spring for returning said shoe to its normal position, a shoe mounted upon the engine and connected to the air-supply and forming the other half of the coupling, a pneumatic piston mounted upon the engine and carrying the shoe forming the engine-coupling, said piston having a hollow rod and a normally-closed valve in the same, and means for locking the two coupling-shoes together and for opening said valve, substantially as described.

15. A pneumatic switch-operating mechanism, comprising an air-cylinder connected to the switch-points to operate them in either direction, pipes connecting the same with coupling members located along the track, and a complementary coupling member mounted upon the engine and adapted to be momentarily connected with the fixed coupling member at will, while the engine is in motion, substantially as described.

16. A pneumatic switch-operating mechanism, comprising an air-cylinder connected to the switch-points to operate them in either direction, a piston connecting the mechanism with coupling members located along the track, a check-valve between the cylinder and each of said coupling members, a releasing-valve in said air-cylinder, set to open at a pressure below the working pressure and to close by the working pressure, said valve having a small air-escape or leakage opening, and means whereby the connection may be temporarily made from an air-supply on the engine to the pipes leading to the cylinder, substantially as described.

17. A cylinder for pneumatic switch-throwing mechanism, having a releasing-valve provided with a small leakage-hole, a spring acting on the valve to open it and set to permit closing under working pressure, a check-valve preventing backflow in the supply-pipe, and means for connecting the cylinder with an air-supply, substantially as described.

18. A releasing-valve for pneumatic cylinders, consisting of an inwardly-opening valve having a small leakage-orifice, and a spring or similar constantly-acting means, acting upon said valve to open it when the internal pressure is reduced below a certain point, substantially as described.

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