(No Model.) 3 Sheets—Sheet 1.

S. H. HARRINGTON.

RAILROAD SIGNALING APPARATUS.

No. 515,469. Patented Feb. 27, 1894.

FIG. 1.

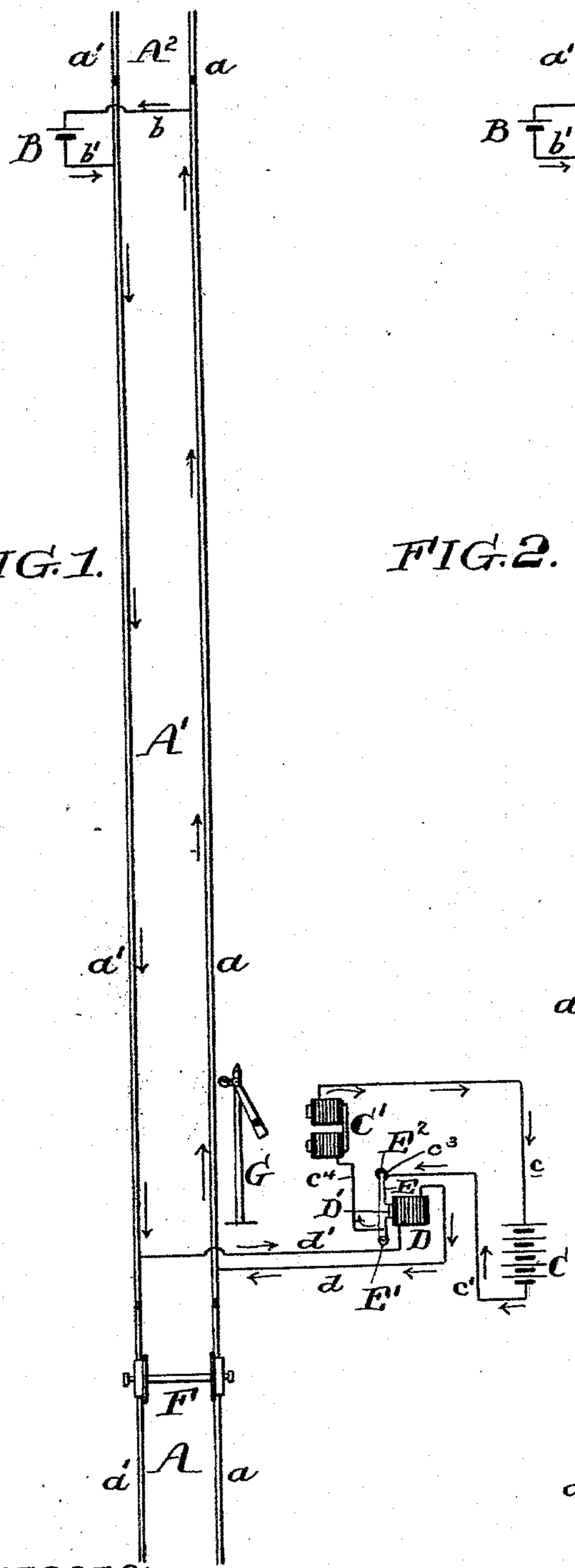
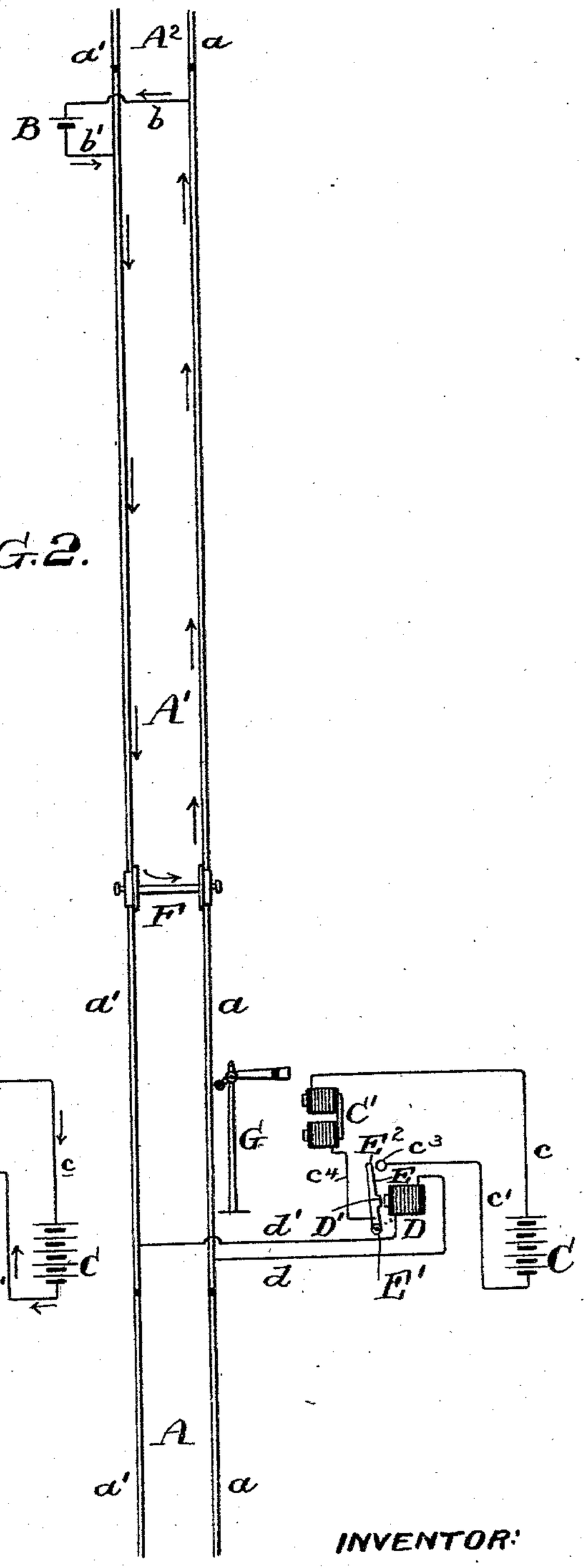


FIG. 2.



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(No Model.) 3 Sheets—Sheet 2.

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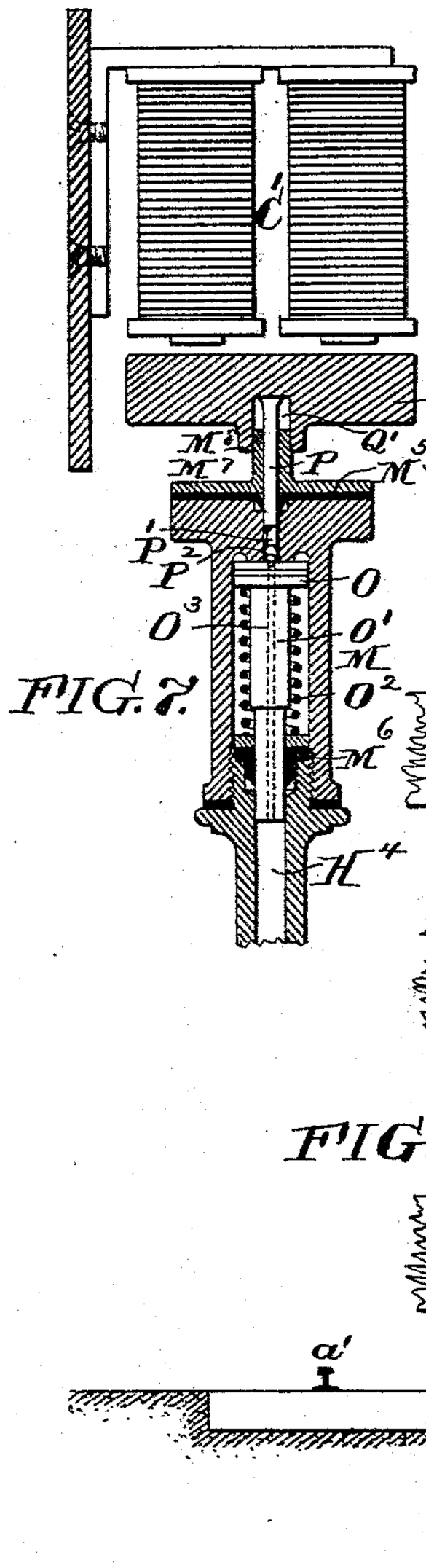

FIG. 7.

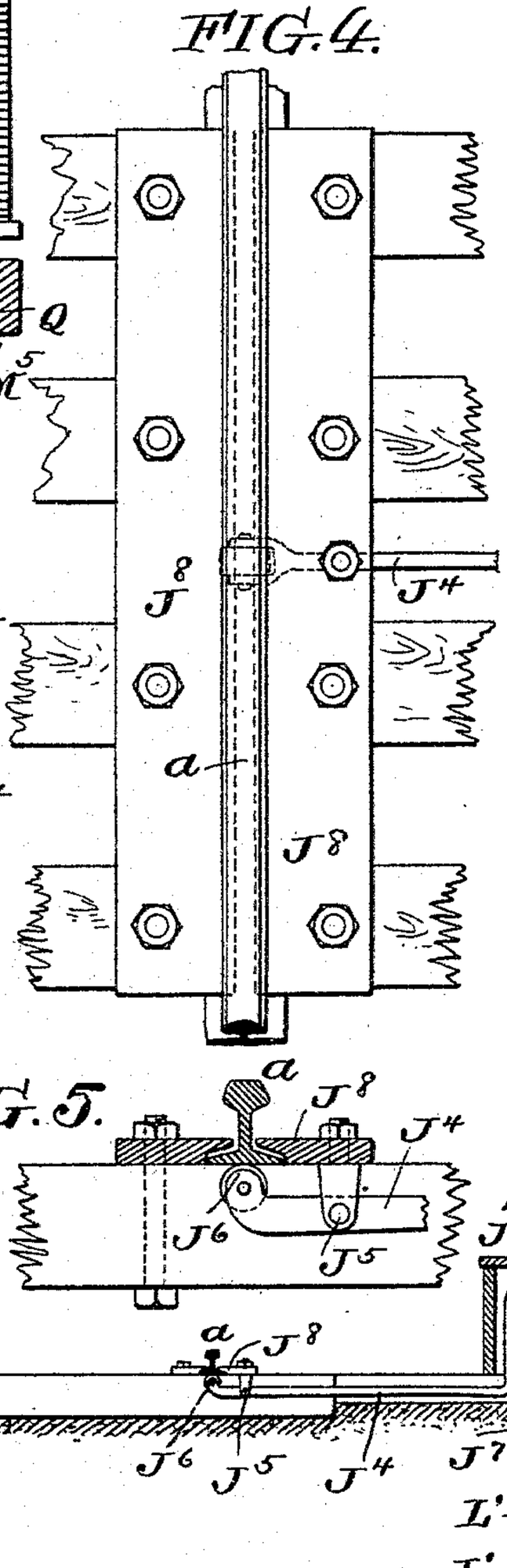

FIG. 4.

FIG. 5.

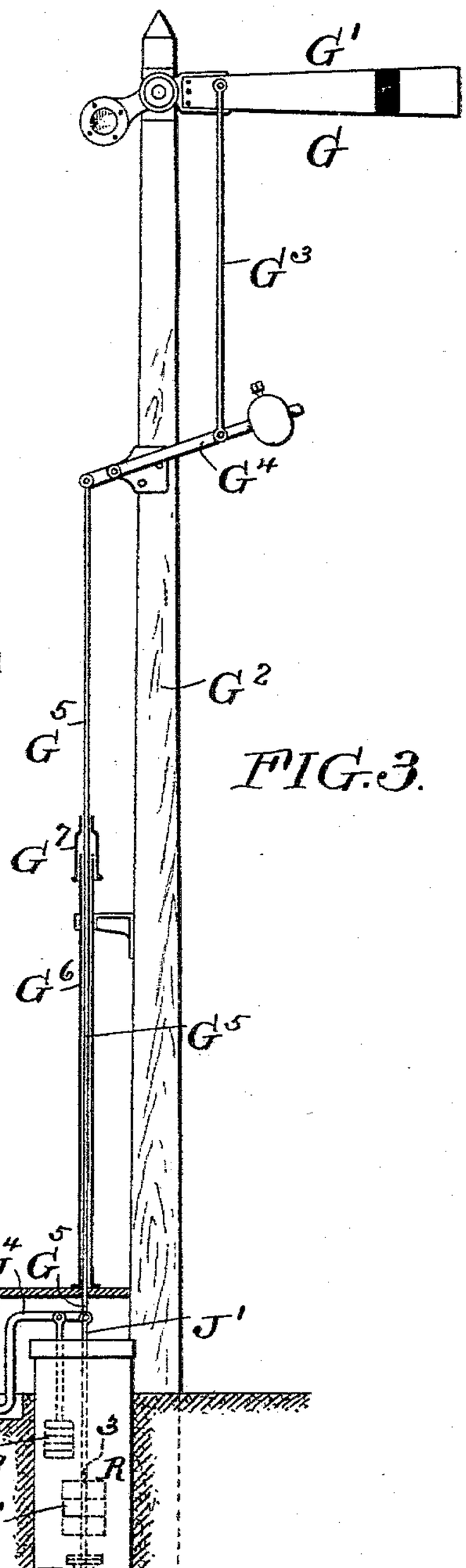

FIG. 3.

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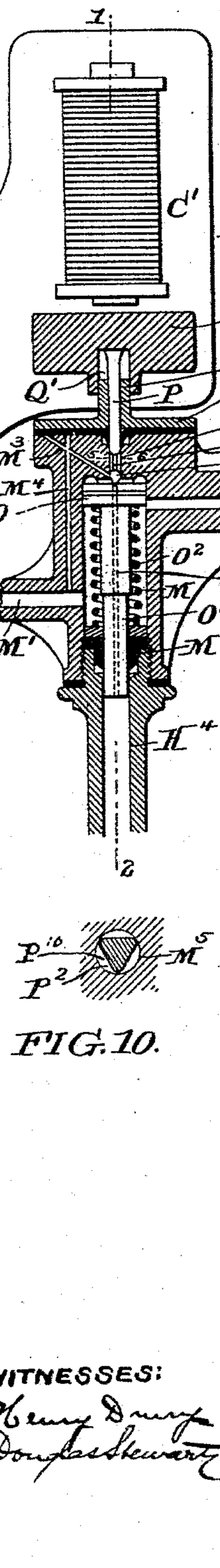
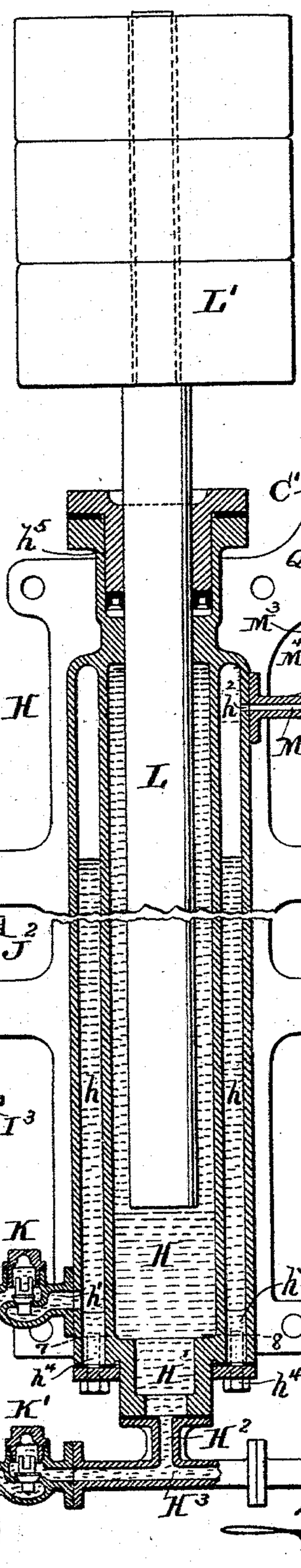


FIG. 8.

FIG. 10.



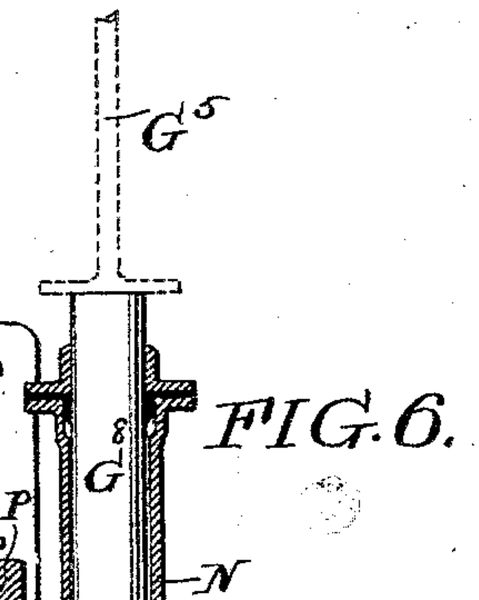


FIG. 6.

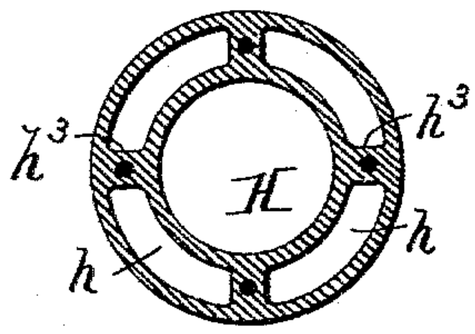


FIG. 9.

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SAMUEL H. HARRINGTON, OF EASTON, PENNSYLVANIA.

RAILROAD SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 515,469, dated February 27, 1894.

Application filed January 31, 1893. Serial No. 460,245. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL H. HARRINGTON, of Easton, county of Northampton, State of Pennsylvania, have invented a certain new and useful Improved Railroad Signaling Apparatus, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the construction of apparatus by which a signal is actuated through the action of fluid under pressure and is particularly adapted for an automatic block signal system, in which the fluid acting upon the signal is controlled by electrical connections with the track.

The object of my invention is to provide a simple and inexpensive apparatus for the general purpose above mentioned, and the nature of my improvements will be best understood as described in connection with the drawings in which they are illustrated, and in which—

Figure 1 is a diagram showing one block of a railroad track with portions of the adjoining blocks, and showing also the electrical connections used in actuating my signals in the positions they occupy when the block controlled by them is empty. Fig. 2 is a similar diagram illustrating the position of the electrical connections when a car is upon the block. Fig. 3 is an elevation showing a semaphore signal and its immediate connections, showing also the railroad track and the mechanism by which my apparatus is actuated by a passing train and also the casing containing the signal actuating mechanism, with such mechanism partly indicated therein. Fig. 4 is a plan view of a portion of one track, and Fig. 5 a cross-sectional view of the same portion illustrating the action of what I may call the track instrument with the rail. Fig. 6 is a sectional view of my apparatus. Fig. 7 is a sectional view taken on the line 1—2 of Fig. 8; Fig. 8 an enlarged sectional view on the same section line as that indicated in Fig. 6. Fig. 9 is a sectional view of the reservoir H and Fig. 10 a cross section on the line 5—6 of Fig. 8.

Referring first to the diagrams of Figs. 1 and 2, A, A′ and A^2 indicate electrically insulated blocks or sections of the track; the one rail being indicated by a and the other rail by a'.

B, is a track battery, the poles of which are connected as at b and b' with the tracks a and a'. From said tracks a and a' lead also electric connections d and d' which are connected through the electro-magnet or relay D.

E, is a pivoted switch lever having secured to it an armature D′ lying in front of the magnet D normally tending to move away from said magnet. This switch lever is pivoted at E′ and is connected through a wire c^4 through the coils of an electro magnet C′ to a wire c connected with one pole of the battery C; the other pole of said battery connecting through a wire c' with a contact point c^3 lying in the path of the lever E with which it is in contact when said lever is raised or attracted toward the magnet D. The magnet C′ above mentioned may be called the prime mover of my signal apparatus and its function will be hereinafter described.

F, indicates a pair of wheels and connecting axle running on the tracks a and a' and G indicates a semaphore signal.

When the block A′ is empty the current from the track battery B forms a circuit through the magnet or relay D, attracting the switch lever E to said magnet and closing the circuit from the battery C through the magnet C′ as indicated in Fig. 1. When, however, a car is standing upon the track section A′ the current from the battery B is short circuited through the wheels and axle, and the magnet D is cut out of the circuit, permitting the lever E to move away from the magnet and opening the circuit of the battery C, thus throwing the magnet C′ out of operation as indicated in Fig. 2.

All of the above described arrangement is old and well known in connection with various kinds of signaling apparatus, but I have shown and explained it here, because it is peculiarly adapted for use with the mechanism which I am about to describe, and because the action of said mechanism apart from these electrical connections might not otherwise be clearly understood.

Referring now to Fig. 6, H, indicates a reservoir for fluid under pressure, and is particularly adapted for a liquid. In connection with this reservoir or chamber H I use a plunger L weighted to the proper amount as at L′ and constantly acting upon the fluid con-

tained in the chamber H, moving up when additional fluid is forced into the chamber and moving down when any portion of the fluid is permitted to escape. In connection with this chamber I employ a reservoir chamber *h* preferably of considerably greater capacity than the chamber H, and preferably also formed as shown, of the same casting and in the form of an annular surrounding chamber to the chamber H. In connection with these two chambers I provide a pump, the cylinder of which is indicated at I, and the plunger of which is indicated at J. The cylinder I is connected through a passage I′ with a passage *h′* leading from the lower part of the reservoir chamber *h*, said passage containing a valve as indicated at K which opens to permit the passage of fluid from the reservoir chamber to the pump cylinder. The lower part of the cylinder I is connected through an opening I^2 with a passage H^2 leading to the chamber H, the connection being made through a conduit H^3 and having in it a valve K′ which permits the passage of fluid from, but not to the pump cylinder. Disregarding for the present the extension of the pipe H^3 it is obvious that when the piston J is operated, it will draw fluid from the reservoir *h* and force it into the chamber H. The piston J is normally forced and held above the entrance port I′ as by means of a spring J^3 acting against a flange I^3 of the cylinder I and a flange J^2 at the head of the piston, that is to say, when no counteracting force pushes the piston into the cylinder it is lifted and held by the spring in the position shown in Fig. 6. While this is true, I will explain here that except during the intervals when a train is passing the spring is compressed and the piston forced down into the cylinder by the action of a weight, which weight is the power I rely upon to accomplish the work of pumping.

To explain more in detail, J′ is the piston rod which is connected with a lever J^4 which said lever is pivoted as at J^5 to a plate J^8 resting on the ties near one of the rails; the shorter end of the lever J^4 resting against the base of the rail as indicated at J^6. Arranged in some way to bear down upon the piston J, and conveniently attached to the long end of the lever J^4 is weight J^7, the amount of which should be amply sufficient to press the piston J down into the cylinder I against the resistance of the weight L′, operating through the plunger L in the chamber H.

The operation of this device can be readily followed. A train passing over the track above the point where the end J^6 of the lever J^4 rests against it will depress that end raising the longer end of the lever and the weight connected therewith, and permitting the spring J^3 to force the piston J up; as soon as the weight of the truck is removed from the lever it will fall to its normal position, the weight J^7 then forcing the piston down into the cylinder I and forcing the fluid which has been sucked in through the opening I′ out through the opening I^2 and into the reservoir H lifting of course the plunger L and its attached weight. I have found that an ample supply of fluid under pressure, indeed, an excessive supply, is attainable by this device and it will be noticed, that as the energy used in forcing the fluid into the reservoir is only that of the weight J^7, there is no danger of an excessive pressure; in fact, when the reservoir is filled and the upward movement of the plunger L stops, the plunger J will simply remain in its uppermost position, the weight J^7 being insufficient to force it down. In connection with the casting H^5 I will here note that h^5 indicates a stuffing box through which the plunger L works, and that the lower ends of the chambers H and *h* are open, but connected by means of webs h^3 into which bolt holes are tapped, and an end plate or head H′ secured in place by means of bolts h^4.

N, (Fig. 6) is a cylinder in which works a piston G^8 to which is attached a rod G^5 which said rod (see Fig. 3) extends up out of the casing R through a pipe G^6 and is connected with one end of a counterweighted lever G^4 a cap G^7 being attached to the rod G^5 and extending over the mouth of the pipe G^6 to prevent the entrance of water into said pipe. The lever G^4 is connected by a rod G^3 to a counterweighted semaphore blade G′ which said blade as well as the lever G^4 is pivoted on a post G^2. The weights of all the parts above mentioned are to be so balanced that the piston G^8 will normally tend to descend in the cylinder N carrying the signal G′ by the connections mentioned to the position indicating danger; indeed, the proper construction is one in which the counterweight proper of the signal blade will normally hold the blade to the position indicating danger so that in case of a breakage in any of the connections the signal will assume this danger position.

From the lower part of the cylinder N I provide connections, one as H^4 leading directly to the reservoir H and the other as M′ serving as an exhaust passage and preferably leading to an opening h^2 in the upper part of the reservoir *h*, and I provide mechanism in the nature of a controlling valve by which the cylinder N can be at will connected with the chamber H and cut off from the exhaust, or connected with the exhaust and cut off from the chamber H; obviously a connection with the chamber H permits the fluid under pressure to flow into the cylinder N and acting against the piston G^8 forces it up, through it forcing and holding the signal in the position indicating safety, which position is unchanged until the chamber H is cut off and the exhaust passage opened, when the fluid will be forced out of the cylinder N by the excess of weight acting through the piston G^8, and forced into the reservoir *h*. I prefer to actuate the valves for controlling the passages above mentioned by means of the electro magnet C′ already described, said electro magnet,

when the block is empty being energized and acting upon the valve system in such a way as to connect the chamber H and the cylinder N, and, when the block is occupied, being thrown out of action effecting a connection between the cylinder N and the exhaust.

To effect the changes in the connections of the cylinder N I prefer to use a chamber or cylinder M having a passage M^2 leading from a point below one end to the bottom of the cylinder N, and a passage N′ leading from near its other end to the reservoir *h*. In said chamber M I secure a piston O of a thickness which will permit it to pass between the mouth of the passage M^2 and the adjacent end of the cylinder, thus opening the passage M^2, M, M′, to the reservoir *h* and I make a connection above the piston into the upper part of the chamber M from the pipe H^4 leading from the chamber H, and provide a valve controlled by the electro magnet C′ which, when said magnet is energized, will open the said passage, and, when the said magnet is thrown out of circuit, will close the said passage. The piston O is normally held above the passage M^2 by a spring O^2 or any other force, but when the fluid under pressure is admitted, its upper face is forced down to a position intermediate between the passages M^2 and M′ permitting the fluid under pressure to pass into the cylinder N and closing the connection from said cylinder to the exhaust. Preferably I provide a by-pass M^3 M^4 leading from the upper part of the cylinder M to the exhaust passage for the purpose of permitting any fluid in the upper part of the cylinder M to be forced out through the by-pass into the exhaust, when the connection with the chamber H is closed and the counteracting power acting on the piston O forces it up. This by-pass should be provided with a valve which will close it when the fluid under pressure is admitted to the top of the chamber M.

The specific construction for effecting the operations above described which I have shown in my drawings and prefer to use include a plunger extension O′ extending down from the piston O through a stuffing box M^6 into the conduit H^4. This plunger serves as a movable valve or partition, preventing the entrance of the fluid under pressure into the chamber M below the piston O, but a channel O^3 is formed through the plunger and piston by which the fluid under pressure can pass to the top of the chamber M above the piston. In line with the top of this channel or perforation O^3 and extending through a passage M^5 in the top of the cylinder M I provide a valve spindle P having on its end a valve P^2 adapted to close the passage O^3. The spindle P is secured to an armature Q which is weighted sufficiently to hold the valve in position to close the perforation O^3 and which is arranged in relation to the electro magnet C′ so that it will be lifted, and will lift the valve P^2, when said magnet is energized, consequently, when a current is passing through the magnet the armature Q and the valve attached to it are drawn up opening the passage O^3 permitting the fluid under pressure to flow through the same to the top of the chamber M and acting against the piston O forcing it down against the pressure of the spring O^2, and against the pressure of the fluid on the base of the piston, until it passes below the passage M^2 through which the fluid under pressure enters the cylinder N, and, acting against the piston G^8, raises and holds the signal arm to the position indicating safety. On the other hand, as soon as the current through the magnet C′ is cut off the armature Q is permitted to fall bringing the valve P^2 into position to close the orifice O^3 thus cutting off the supply of fluid under pressure. At the same time the by-pass M^3 M^4 is open permitting the piston O to rise under the forces acting to lift it until it passes the mouth of the passage M^2 when the fluid in cylinder N will flow out to the exhaust or reservoir. In the plan shown, the upward motion of the piston O of course carries with it the valve and the armature connected with the valve bringing said armature into proper position to be acted on by the magnet when it is next energized. It will be noted that the portion M^3 of the by-pass M^3 M^4 is led out not directly from the top of the cylinder M, but from the channel M^5, a short distance above the top of the cylinder, and I form the valve P^2 in such a way that it will close the mouth of the passage M^5 when the cylinder O is in its uppermost position, and I recess the valve stem P as indicated at P^{10} so that when the valve moves down the channel is opened through the passage M^5 into the passage M^3. In this way it will be noticed the by pass is closed when the piston O is in its uppermost position and also while the magnet is in operation, but is opened when the magnet releases the armature and the piston is in its lower position.

The by-pass M^3 M^4 is conveniently formed as shown by boring two holes M^3 M^4 which cross each other and thus form a conduit from the passage M^5 to the inside M′; this passage may obviously be formed in the cylinder when it is cast.

In this application I have not claimed various details of my apparatus which may obviously be used in other connections than with a railroad signaling device, such, for instance, as the specific form and details of the chamber M, and the connection of the governing valve of this chamber to an electromagnet in the manner described; these I have claimed in an application filed by me on the 17th day of November, 1893, which bears Serial No. 491,097.

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

1. The combination of a reservoir for fluid under pressure with a pump arranged to force fluid into said reservoir, a pump actuating le-

ver arranged in position with respect to a railway track so as to be operated by the trucks of passing trains, a cylinder having connections to the reservoir containing fluid under pressure and to an exhaust, a valve system controlling both said connections so as to connect said cylinder alternately with the reservoir and exhaust and means operated by a passing train for actuating said valve system.

2. In a track signaling apparatus the combination with a source of fluid under pressure, of a cylinder having a plunger therein which tends to take a definite position in said cylinder, a signal operated by said plunger, a passage connecting the cylinder with the source of fluid supply and with an exhaust opening, a valve system arranged to alternately connect the cylinder with the source of fluid supply and with the exhaust and means operated by a passing train for controlling said valve system.

3. The combination in a railway signaling apparatus of a source of supply of fluid under pressure, a cylinder having a plunger therein which tends normally to take a definite position in said cylinder, a signal actuated by said plunger, a passage connecting the cylinder with the source of fluid supply, and with an exhaust opening, a valve system arranged to alternately connect the cylinder with the source of fluid supply and with the exhaust a conductor for an electric current which is adapted to be short-circuited by a passing train and means for actuating said valve system arranged to be operated by the electric current.

4. In a railroad signaling apparatus the combination with an accumulator and a reservoir connected therewith, of a pump arranged to force liquid from the reservoir into the accumulator, a cylinder having a plunger therein which tends normally to take a definite position in said cylinder, a signal actuated by said plunger, connections uniting the cylinder both with the reservoir and the accumulator, a valve system arranged to alternately connect the cylinder with the reservoir and accumulator and means actuated by a passing train for actuating said valve system.

5. The combination of a hydraulic accumulator and a reservoir connected therewith, with a pump arranged to pump liquid from the reservoir into the accumulator, a pump-actuating lever arranged in position with respect to a railway track so as to be operated by the trucks of a passing train; a cylinder and plunger moving in said cylinder and normally tending to take a definite position therein; a signal actuated by said plunger, connections uniting the cylinder both with the reservoir and the accumulator; a valve system arranged to alternately connect the cylinder with the reservoir and accumulator, and means operated by a passing train for actuating said valve system.

6. In combination with a reservoir for fluid under pressure and a signal-actuating cylinder connected therewith as described, a valve system operated automatically by a passing train to control the connections between the cylinder and reservoir, a pump cylinder I connected to the reservoir, a plunger J working in said cylinder, means as spring J^3 operating to normally force the plunger out of the cylinder, and a pump-actuating lever J^4 arranged with one end so placed with regard to a railway track that it will be depressed by the trucks of a passing train and having its other end so connected with plunger J as to normally force it down into the cylinder, said end being raised and the plunger permitted to move out by the action of a train on the opposite end of the lever.

7. The combination with an accumulator chamber H and a reservoir chamber *h* enveloping the accumulator chamber and formed of a single casting, of a pump connected with the reservoir and accumulator chamber as described and operating to pump fluid from the reservoir into the accumulator chamber, a signal actuating cylinder N, connection from the cylinder to the chambers and a valve system operated by a passing train adapted to control the connections from the signal operating cylinder to the accumulator and reservoir chambers, all operating substantially as described.

8. The chamber M having a passage M^2 leading therefrom at some distance from one end, and an exhaust passage M′ near the other end in combination with a piston O and means for normally holding the same above passage M^2 so as to connect passages M^2 M′ through chamber M; a reservoir of fluid under pressure and a conduit leading therefrom to the chamber M on the upper side of piston O; a valve arranged to control said conduit, and a signal actuating cylinder and piston connected with passage, M^2.

9. The chamber M having a passage M^2 leading therefrom at some distance from one end, and an exhaust passage M′ near the other end in combination with a piston O and means for normally holding the same above passage M^2 so as to connect passages M^2 M′ through chamber M, a by-pass M^3 M^4 leading from the top of chamber M to the exhaust passage; a reservoir of fluid under pressure and a conduit leading therefrom to the chamber M on the upper side of piston O; a valve arranged to control said conduit, and the by-pass as described, and a signal-actuating cylinder and piston connected with passage M^2.

10. The combination of a reservoir of fluid under pressure, a cylinder N and a signal-actuating plunger moving in said cylinder and normally tending to return and remain in one position therein, with a chamber M a connection M^2 from the cylinder leading thereto intermediate of its ends, a connection H^4 to said chamber from the reservoir and an exhaust passage M′ leading from said chamber, a plunger O′ having a perforation O^3

working in said chamber and having a piston-head O fitting in the same; a valve P^2 arranged to normally close the passage through perforation O^3 and cut-off the supply of fluid from the reservoir; a by-pass M^3 M^4 from the head of chamber M opened by the downward movement of valve P^2 beyond a certain line but normally closed by said valve, and an electro-magnet arranged to lift and hold the valve P^2 away from its seat, all substantially as described and so as to alternately connect the cylinder N with the reservoir and the exhaust by the movement of piston O below and above passage M^2.

11. In a railroad signaling apparatus the combination with a reservoir for fluid under pressure, of a signal actuating cylinder connected therewith as described, a valve system operating to control the connection between the cylinder and reservoir, a pump cylinder I connected to the reservoir and having a plunger J, means as the pivoted lever J^4 connected at one end to the plunger and normally operating to force the plunger into the cylinder I by means of a weight and having its other end so placed relatively to a railroad track that it will be depressed by the weight of a passing train, the whole operating to raise the plunger out of the cylinder by the action of the train and to permit it to be forced therein by a suitable weight.

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