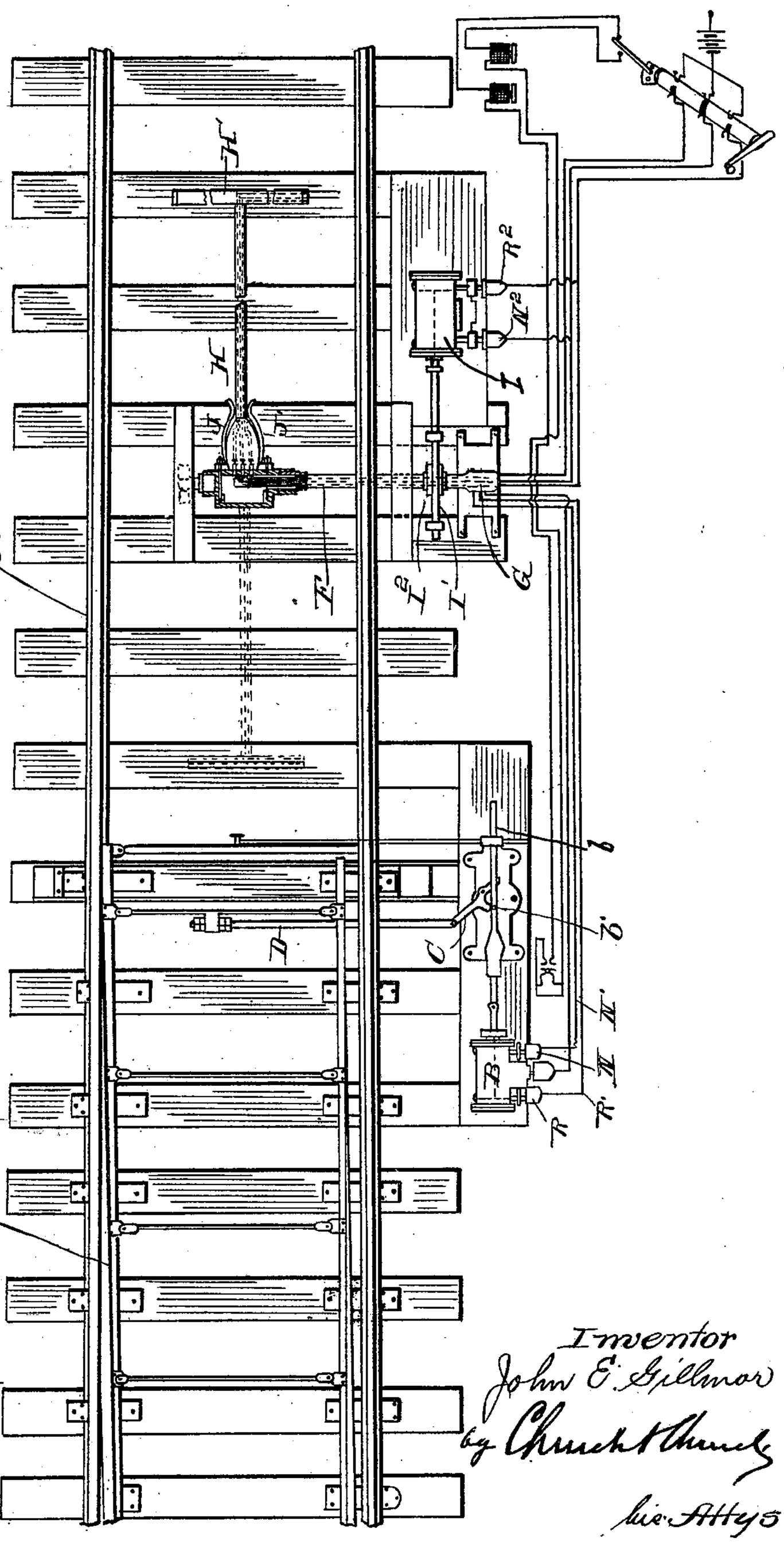
No. 665,428. Patented Jan. 8, 1901.

J. E. GILLMOR.

RAILWAY SWITCH AND SIGNAL CONTROLLING MECHANISM.

(Application filed Aug. 20, 1900.)

(No Model.) 6 Sheets—Sheet 1.



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(No Model.) (Application filed Aug. 20, 1900.) 6 Sheets—Sheet 2.

Fig. 2.

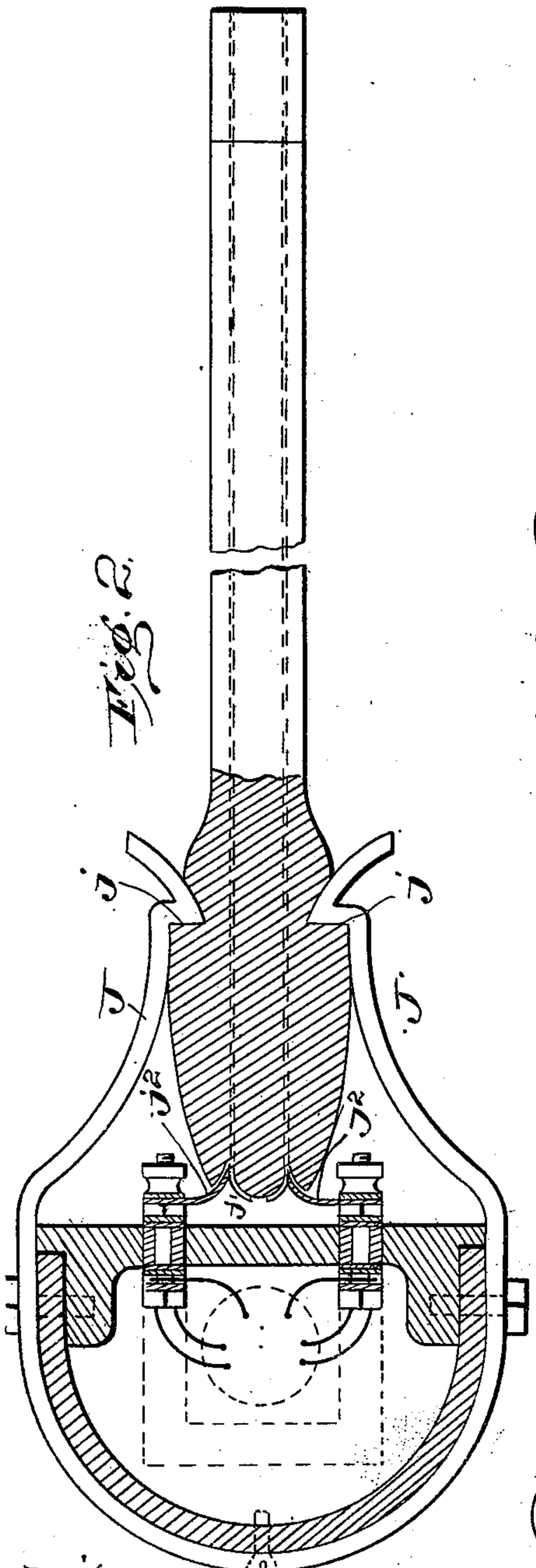
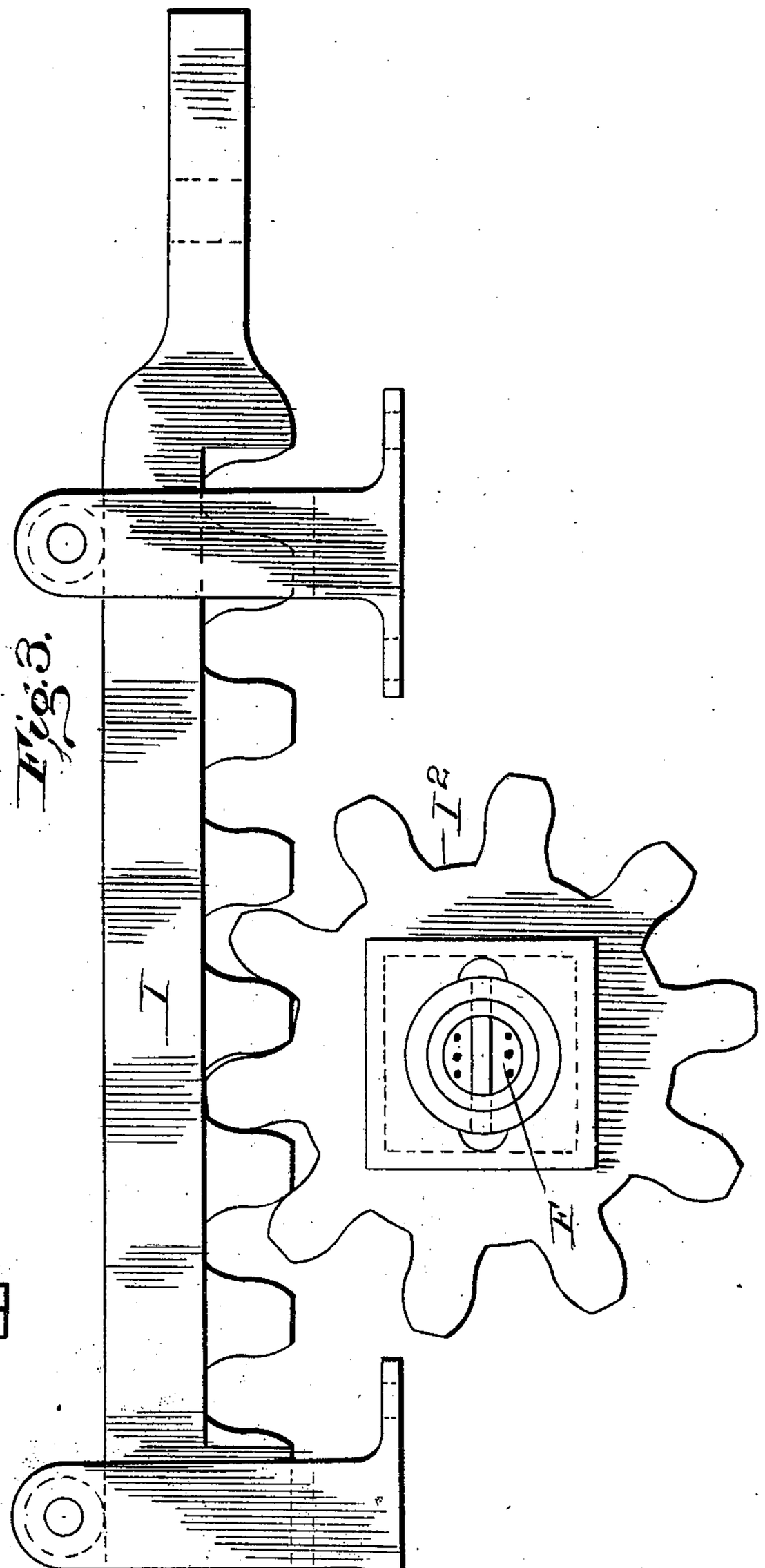


Fig. 3.



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(No Model.) 6 Sheets—Sheet 3.

Fig. 4a.

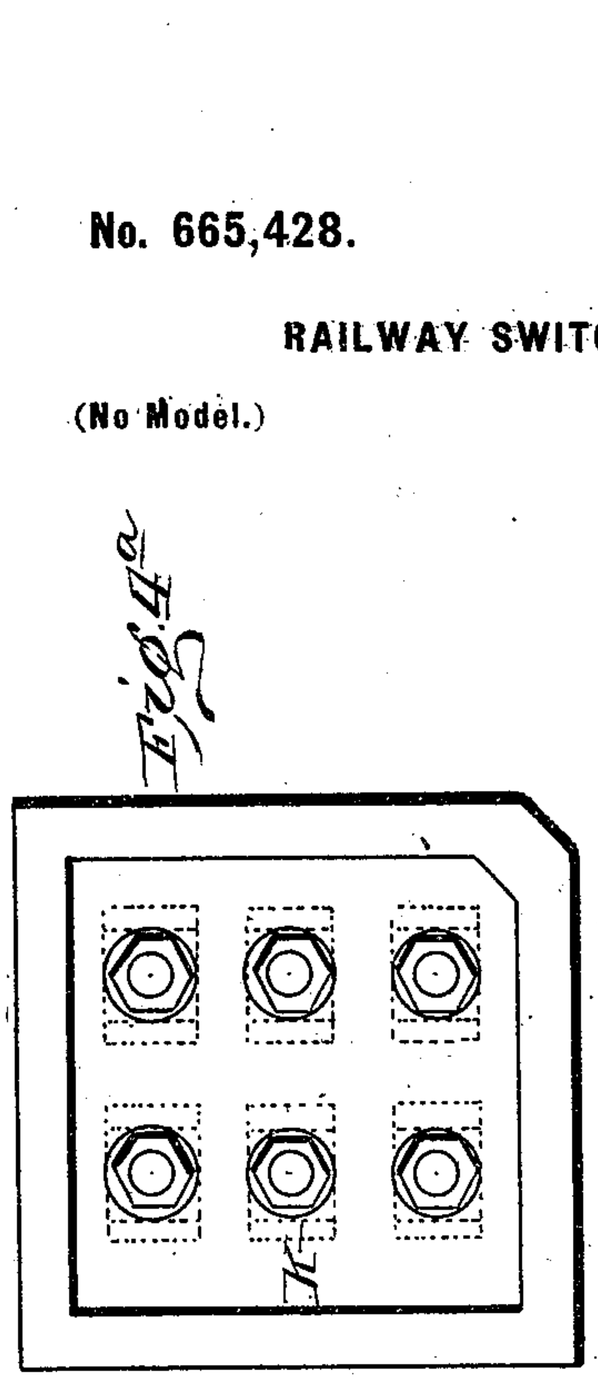
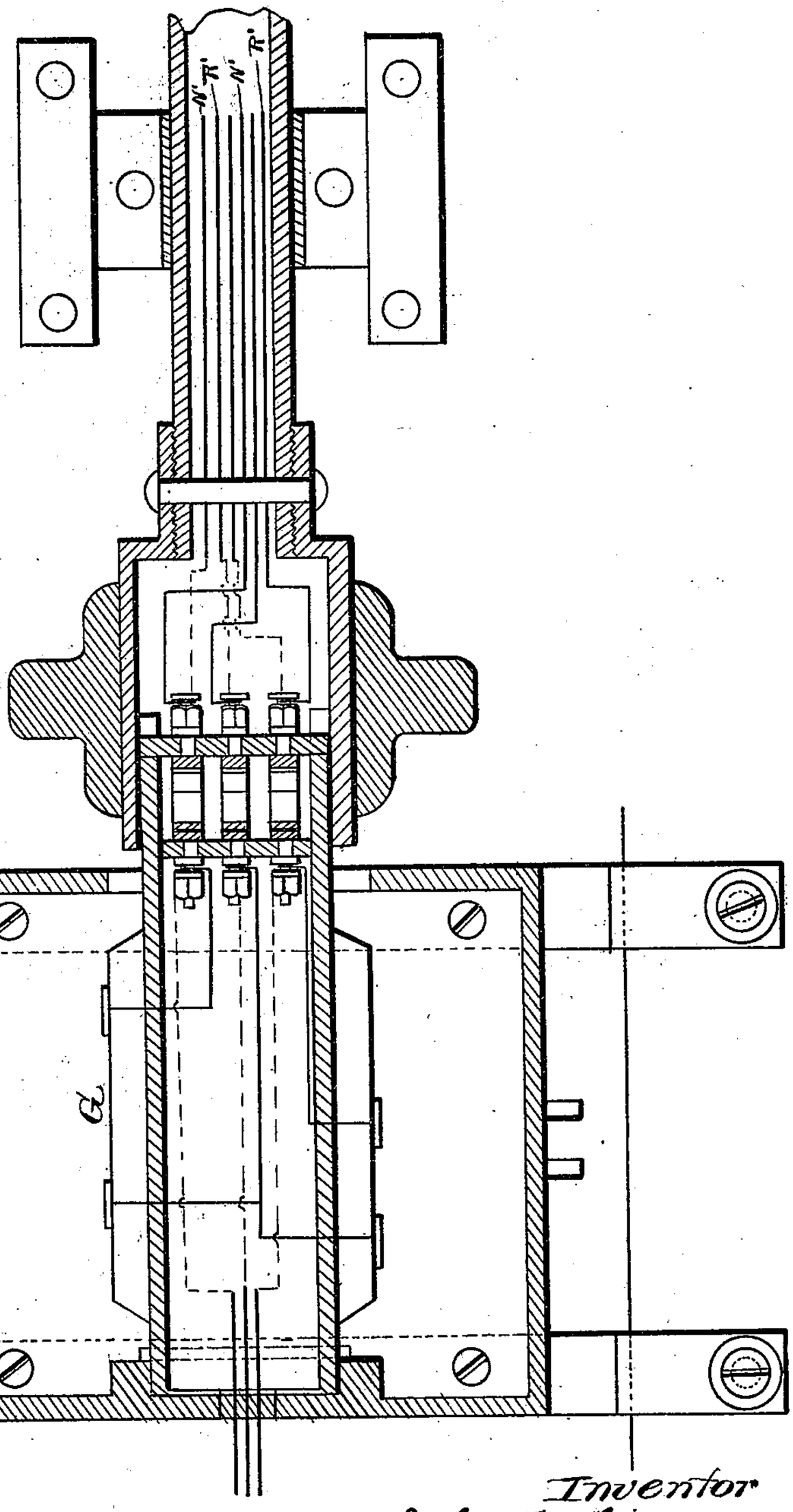


Fig. 4.



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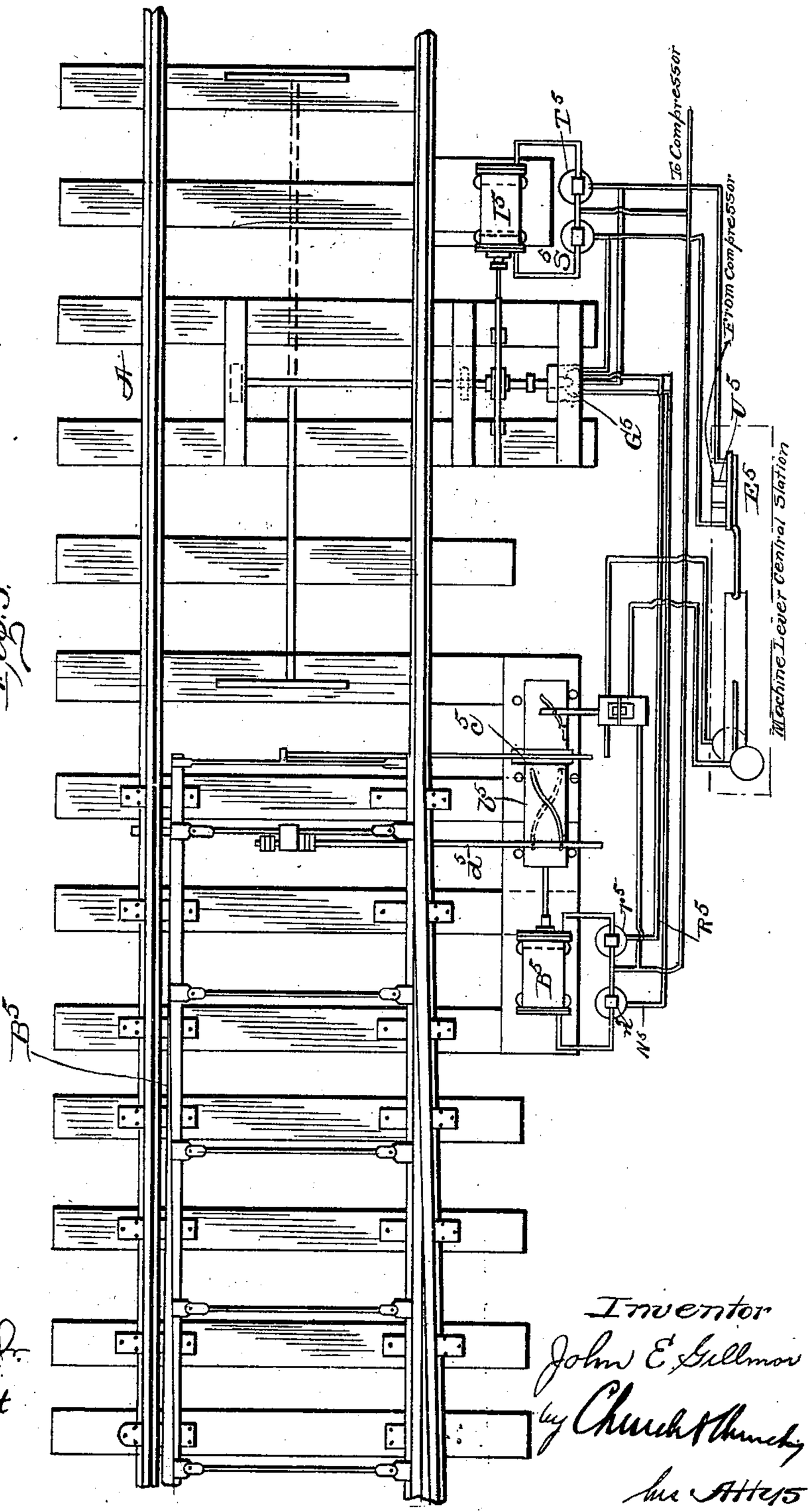
(No Model.) (Application filed Aug. 20, 1900.) 6 Sheets—Sheet 4.

Fig. 5.



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(No Model.) 6 Sheets—Sheet 5.

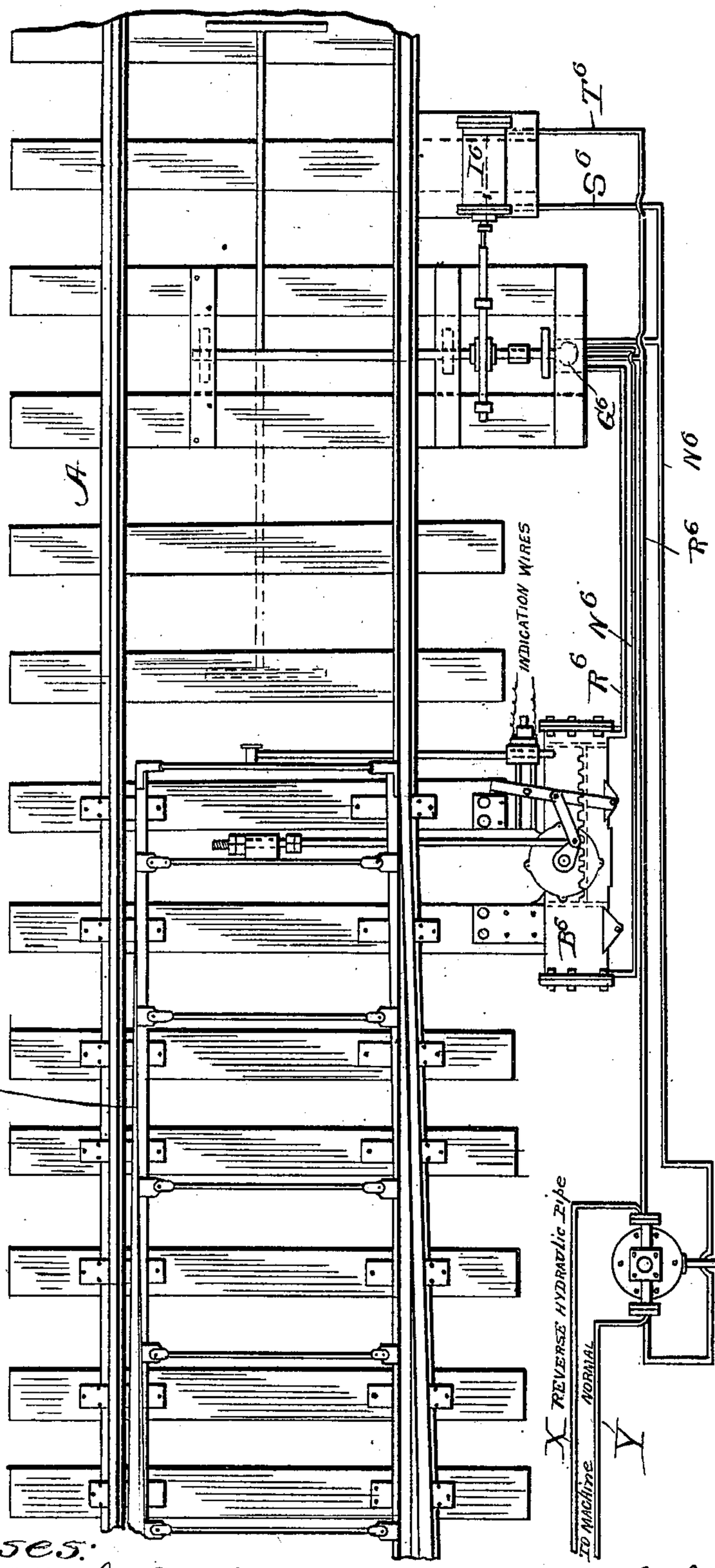

Fig. 2.

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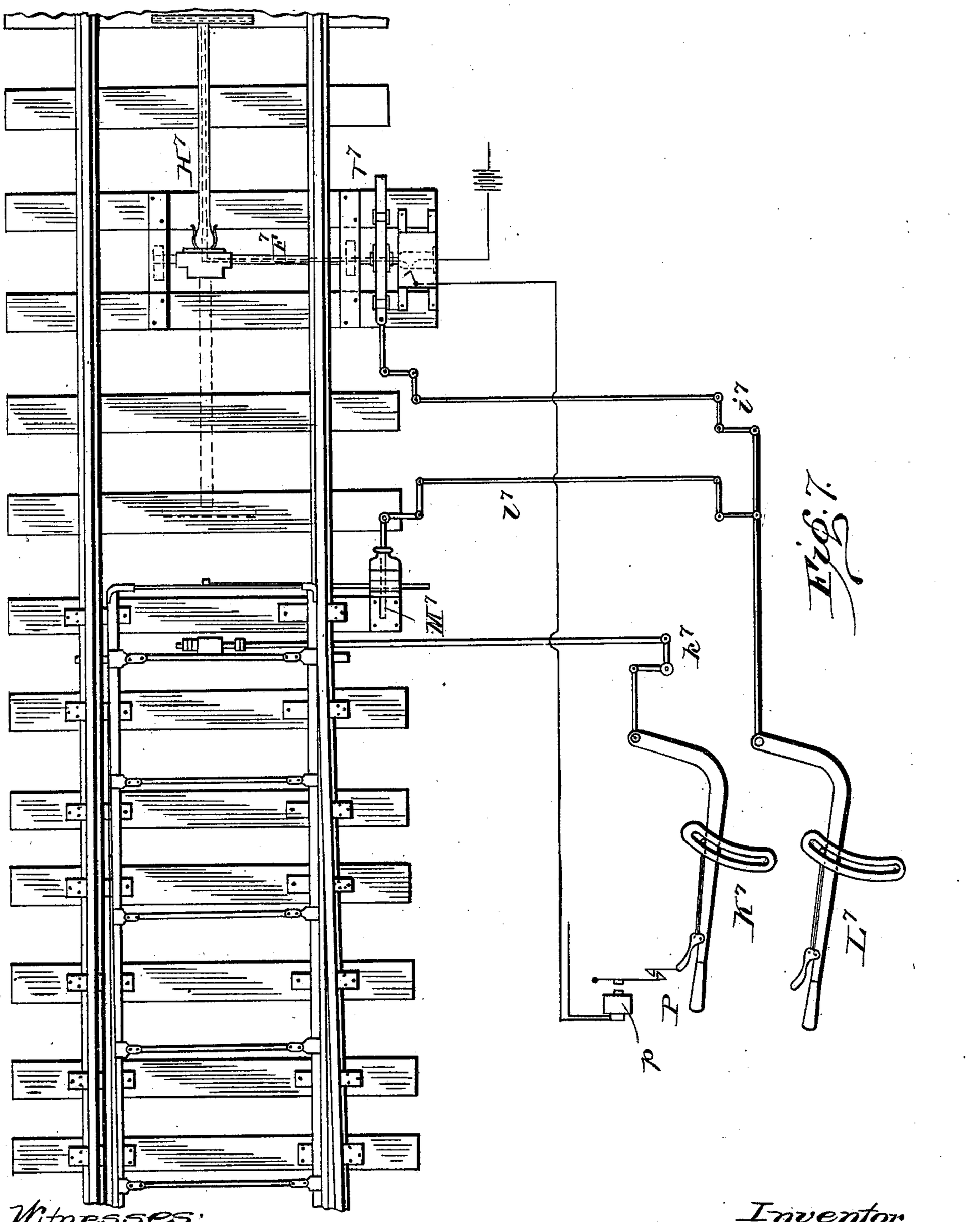

Fig. 1.

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UNITED STATES PATENT OFFICE.

JOHN E. GILLMOR, OF JERSEY CITY, NEW JERSEY.

RAILWAY SWITCH AND SIGNAL CONTROLLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 665,428, dated January 8, 1901.

Application filed August 20, 1900. Serial No. 27,466. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. GILLMOR, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Railway Switch and Signal Controlling Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in that class of apparatus designed for controlling the movement of switch and signal work on railways, wherein there is employed a means for preventing the movement of the switches during the passage of rolling-stock past the switching-point or while resting in proximity thereto, one type of such mechanism being exemplified in the usual detector-bar and connected mechanism commonly employed in switch and signal work at this day. Detector-bars have heretofore been connected with the switch mechanism in several different ways, the most usual of which is to operate as a lock for preventing the movement of the switch-operating mechanism at switch-points, save when the detector-bar is moved, the wheels of the rolling-stock when in the vicinity of the switch-points preventing such movement. Another arrangement has been to connect said detector-bar with the switch-moving mechanism for controlling the latter, whereby the switch is moved after the detector-bar has moved from one position to another. In these prior devices the detector-bar lies alongside the track and must be swung from one position to another in order that the switch-points may be moved, and in so swinging it will project at an intermediate point in its movement into the path of the wheels of the rolling-stock. Thus when said wheels are in the vicinity of the switch-points such movement is prevented; but practice has developed many defects, among which may be mentioned the accidental throwing or swinging over of the detector-bar, due either to breakage of some of the mechanism or to slack in the connections caused by pressure and wear in operation. As heretofore constructed in practice, the detector-bars were of necessity in continuous lengths for a distance equal at least to the greatest distance between the wheels of the rolling-stock in order that some one point would be certain to engage the wheels to prevent the operation of the switch, and while under ordinary conditions it is difficult to provide an effective bar of this length, such difficulties are greatly increased and the use of detector-bars rendered practically impossible in many situations where there is a complication of switches with frogs, guard-rails, splices, &c., such as are found at terminal stations or other points, from which numerous tracks and crossings emanate. These practical difficulties, together with the difficulties incident to the buckling of the levers, pipe connections, bars, and even links themselves when under the excessive strain necessary to resist the great power of the piston or actuating mechanism of the switch-points, as well as the difficulties incident to mounting all of the connected parts upon a solid and rigidly-connected foundation to prevent the accidental shifting of the several base-points of attachment of the mechanism with relation to each other, has suggested the desirability of providing a mechanism which may be located at a single point in any desired relation to the switch, and which will effectually prevent the operation of said switch whenever rolling-stock of any character is in the immediate vicinity, but without being directly connected for operating or locking the same against operation.

With a view to overcoming the objections heretofore pointed out, as well as others not necessary to mention, it is the object of the present invention to provide a means whereby the switch-points may be shifted as heretofore from the distant tower, power or controlling station; but the establishment of the connections between the switch-point and its distant power or controlling station shall be dependent upon the operation of a detector mechanism embodying what I shall herein term a "detector-rod" controlling suitable switching devices, which when the rod is in one position of adjustment will establish the connections for moving the switch-point in

one direction and when in the other position of adjustment will establish connections for moving the switch-point in the opposite direction, the operation of such detector-rod and its switching devices being itself controlled from the distant tower or controlling-station, and the specific construction of the detector-bar being such that should it be accidentally thrown or engage any portion of the rolling-stock—such as the car-trucks, brake-beams, body, or couplings—and be thereby transformed or ruptured it would be rendered inoperative to establish a different train of connections for enabling the switch-points to be shifted from their previous position of adjustment.

Referring to the accompanying drawings, Figure 1 is a top plan diagrammatic view showing the application of my invention to an electropneumatic switch-point-operating mechanism. Fig. 2 is a detail view showing a portion of the detector-rod and its supporting-base in section. Fig. 3 is a detail elevation of the rack and pinion for operating the detector-rod. Fig. 4 is a detail diagrammatic section showing the connections in the working circuit controlled by the detector-rod for enabling the switch-points to be operated in one direction or the other from the distant control-station. Fig. 4ª is a detail illustrating the connections in the detector-rod shaft. Fig. 5 is a view corresponding to Fig. 1 and showing the application of the invention to pneumatically-operated work. Fig. 6 is a similar view showing the application of the invention to electrohydropneumatically-operated work. Fig. 7 is a similar view illustrating a plan for attaching the detector-rod to manually-operated work.

Like letters of reference in the several figures indicate the same parts.

For the purpose of illustrating the present invention I have shown it in connection with several different forms of switch-point-operating mechanisms, such as are now in common use, and it will be understood that the invention is applicable generally to switch-operating mechanisms such as are designed to be controlled from a tower or control-station. Thus, referring to Fig. 1, I have illustrated the invention in connection with what is known as "electropneumatically-operating work," and in said figure the letter A indicates usual main-line rails, and A′ the switch-points adapted for coöperation therewith and operated by a pneumatic cylinder B, the piston of which cylinder, however, is not directly connected with the switch-points, but does directly operate a slide-bar *b*, which latter is provided with a pin *b*′, adapted to coöperate with a bell-crank lever C, having one of its arms connected with the switch-points through a rod D, as usual. Pressure is admitted to the cylinder for moving the piston in one direction or the other by means of electrically-controlled valves R and N, and the latter are controlled from the distant tower or control-station through electric circuits N′ and R′, which circuits are adapted to be established at suitable times for shifting the points by means of a commutator and machine-lever E under the control of the operator.

In accordance with the present invention the circuits for controlling the valves R and N or, in general terms, any of the valves which govern the position of the switch-points, instead of leading directly from the distant control-station to the valves, are at an intermediate point run through suitable switching devices, which are controlled by a device hereinbefore mentioned and termed by me a "detector-rod." This device, in general terms, comprises a swinging or movable member which in one position of adjustment will establish the circuit between the control-station and switch-operating mechanism for moving the switch-points in one direction, the other circuit being broken, but when in the other position of adjustment the opposite conditions are established—namely, the circuit for controlling the other valve is established, while the one formerly established is broken, and at an intermediate position of adjustment of the bar the arrangement is preferably, although not necessarily, such that neither of the circuits is operative. Obviously this portion of the invention may be carried into effect with a variety of mechanisms. In the most highly-developed form of the invention it is further desirable to provide a means whereby, should the detector-rod strike or be struck by any portion of the rolling-stock, that of itself will prevent the establishment of either of the circuits, thereby overcoming any danger of the switch-points being shifted while rolling-stock is passing over the same, and for this purpose the circuits leading from the control-station through the switching devices, heretofore mentioned, and to the switch-point-operating mechanism are also extended through the detector-rod and so arranged in relation to said rod that should the rod be broken or materially distorted by being brought into contact with the rolling-stock the circuit-wires would be broken and communication between the control-station and the switch-point-operating mechanism thereby prevented.

As illustrated in Fig. 1, I have provided a rock-shaft F, journaled in suitable bearings in proximity to the tracks, but preferably extending transversely thereof, which rock-shaft is adapted to carry at some point in its length, and preferably in its outer end, a commutator G, having suitable commutator-plates thereon for contact-brushes, which will establish the circuits as aforesaid when the rock-shaft is turned to one position or the other, while the opposite end of said rock-shaft is adapted to carry the detector-rod itself, (lettered H.) This detector-rod is pref-

erably of considerable length, and is also preferably adapted to lie between the tracks and is connected at one end only with the rock-shaft F. Thus under normal conditions it may be adjusted from the position indicated in full lines in Fig. 1 to the position indicated in dotted lines in said figure, and the rock-shaft and detector-rod are formed for the passage therethrough or for the attachment thereto of the wires which constitute the circuits leading to the switch-operating mechanism, such wires being simply extended out to the end of such parts and back again, as indicated by the dotted lines.

The detector-rod is operated by a mechanism preferably corresponding to the mechanism for operating the switch-points—that is to say, in pneumatically-operated work a pneumatic cylinder is provided for this purpose, while in other forms of operating mechanism other operating devices are employed, as will be presently pointed out. In Fig. 1 the detector-rod-operating cylinder is indicated at I, and the piston of said cylinder is connected with a rack-bar I′, adapted to mesh with a pinion I^2 on the rock-shaft F. Thus when the piston of the cylinder I is moved in one direction or the other the rock-shaft is correspondingly adjusted and the circuits aforesaid established or broken, as the case may be. The admission of pressure to the cylinder I is controlled by valves N^2 R^2, corresponding to the valves R and N of the cylinder B, and preferably connected in branches of the circuits R′ N′, such branches leading off from the circuits between the control-station and circuit-switching devices of the detector-rod, whereby the operator at the control-station has the movement of the detector-rod always under control and may shift it at will; but his control of the switch-point-operating mechanism is dependent upon the adjustment of the detector-rod.

In the preferred construction the detector-rod is preferably formed of a material which will be somewhat easily ruptured, and it is attached to the rock-shaft F by a detachable coupling of such character that should the said rod become broken a new rod may be readily substituted, and the outer or free end of the rod is preferably provided with a transverse projection H′, extending far enough on each side of the body of the rod to insure contact with some portion of the rolling-stock, even though it should so happen that the rod worked up between adjacent cars and would therefore have nothing to contact with, save the couplings or draft-bars, and the length of the rod is preferably such that it will insure a contact with some portion of the rolling-stock, and therefore such length will be somewhat dependent upon the character of the rolling-stock passing or employed on the railway to which the device is applied.

A convenient form of coupling for the detector-rod and rock-shaft is illustrated in Figs. 1 and 2, from which it will be seen that the rock-shaft is provided with spring-pressed arms J J′, some of which may be provided with hooks or shoulders *j* for locking the end of the detector-rod within the socket formed by the arms, and the said rod itself may be provided with contact-plates *j*′, with which other contact-plates j^2 on the rock-shaft will contact and establish the circuits whenever said rod is inserted in position between the spring-arms J J′.

In order to facilitate the electrical connections at the outer end of the rock-shaft, the circuit-wires may extend to suitable contact-plates disposed in the outer portion of said shaft, as illustrated at K in Fig. 4^a and in section in Fig. 4, such binding-posts or contact-plates being so arranged that they are more readily accessible for the attachment of the circuit-wires and, if desired, so as to automatically engage for establishing the proper circuits when the parts are brought into proper relation, as is well understood in electrical work, and therefore need not be herein specifically described.

The operation of the apparatus as arranged in Fig. 1 will now be readily understood. With the machine-lever or control-station lever in the position indicated the circuit N is the only one established at the machine-lever which permits the current to flow through the valve N′ of the detector-rod cylinder, holding the piston in the position indicated in dotted lines and the detector-rod in the position indicated in full lines, the circuit N′ also extending through the commutator G and detector-rod H back and to the valve N of the switch-point-operating cylinder, thereby holding the piston of said cylinder in the position indicated in dotted lines and the switch-point shifted to the position indicated in full lines. The circuit R′, it will be noted, is broken both at the machine-lever of the control-station and at the commutator G of the detector-rod, and hence it will be impossible for the circuits to be so shifted or air admitted or exhausted for shifting the switch-points until both the detector-rod and the machine-lever have been shifted. The operator desiring to shift the switch-points will turn the machine-lever so as establish the circuit R′, which will admit pressure through the valve R^2 of the detector-rod-operating cylinder, thereby turning the rod over to the position indicated in dotted lines, and when said rod has reached said position it will establish the circuit R′, leading to the valve R of the switch-point-operating cylinder B, thus permitting said switch-point to be shifted to the opposite position from that shown in Fig. 1 of the drawings. If the operator at the control-station should attempt to shift the switch-points during the passage of rolling-stock one of two things would happen, either the detector-rod could not be turned to the opposite position, because of the rolling-stock

above it, or, if sufficient power were applied or if the force tending to turn it were sufficiently great, it would be broken and the circuit leading to the switch-point-controlling cylinder interrupted, and the circuits could not be established, even though the rock-shaft F were turned. Should any accident turn the detector-rod, still the switch-points would not be shifted, because the control-station lever would not be in position to establish the circuit, even though it should be turned without being broken—an exigency not liable to occur.

From the above it will be seen that it is practically impossible for the switch-points to be shifted during the passage of rolling-stock past the same, either by the intentional attempted operation on the part of the switchman at the control-station or by reason of jolting or accidental movement of the parts due to train vibration or any of the other thousand and one accidental conditions liable to arise in railroad manipulation.

It is obvious, as before intimated, that the invention is applicable to any of the ordinary switch-point-operating systems. Thus in Fig. 5 I have illustrated it in connection with pneumatically-operated work wherein the power to shift the valves for the switch-point-operating cylinder, as well as the valves for the detector-rod-operating cylinder, is controlled and operated through pneumatic pressure and instead of electric circuits pipes adapted to carry compressed air are employed. In this figure, B^5 indicates the switch-point-operating cylinder adapted to shift said points by means of a slide-plate b^5, having an inclined groove c^5 therein for coöperating with a pin or projection on the rod d^5. Valves n^5 r^5 control the admission of pressure to the cylinder B^5, and the pipes N^5 and R^5, leading to these valves, extend back through a switching device G^5, corresponding to the commutator switching device G in Fig. 1, only arranged to shift or turn an air-cock having suitable passages or ports therein for establishing or breaking the circuits R and N just as explained in connection with the electrical circuits, only in this case air instead of electricity is the motive power. The pipes R^5 and N^5 extend to the control-station E^5, and branches lead therefrom to the valves S^5 and T^5 of the detector-rod-operating cylinder I^5. Compressed air is supplied at the control-station at the point U^5, and the return-circuit is as usual in this class of work and as indicated in the drawings. In operation this arrangement is similar to the apparatus illustrated in Fig. 1, the operator at the control-station being enabled to move the detector-rod, but not to reverse the position of the switch-points until said rod has moved, and until said rod has established the proper connection by completing its movement the switch-points cannot be moved. In this arrangement the air-pipes or a connection therewith may extend out through the detector-rod, as in the electrical circuits, and should said rod be ruptured obviously the parts would remain in their formerly-adjusted position and could not be shifted until the rolling-stock had passed beyond the switch and suitable repairs were made.

In Fig. 6 I have illustrated an application of the invention to electrohydro pneumatically-operated work, and in this figure B^6 indicates the switch-point-operating mechanism of usual construction, while R^6 N^6 indicate the pipes leading thereto, being extended through the switching devices G^6, which will establish the circuits in accordance with the position of the detector-rod, as before explained, such pipes R^6 N^6 having branches S^6 and T^6 leading to the detector-rod-operating cylinder I^6. The main air-line pipe is indicated by the letter W, while the hydraulic pipe lines to and from the distant control-station are indicated by the letters X and Y, the arrangement of all these parts save the switch mechanism of the detector-rod and the detector-rod-operating cylinder being in every respect similar to those now in common use, and this figure is designed to show simply the application of this invention to this class of work.

Obviously the detector-rod may itself be utilized to advantage even where the direct connection between the control-station and the switch-operating mechanism is not controlled by the position of the detector-rod. Thus, for instance, the arrangement of detector-rod may be utilized in manually-operated work, and, if desired, either the direct operating mechanism for the switch-points or the lock mechanism therefor may be controlled by the position of the detector-rod. In Fig. 7 I have illustrated one such arrangement, wherein the operating-lever for the switch-points is locked against movement to open the switch at all times except when the detector-rod has been shifted or turned and the switch-lock released, these two mechanisms being connected for simultaneous movement. In said drawing the switch-point-operating lever K^7 is connected with the switch-points through a bell-crank and rod connection k^7, as usual, while the locking-lever L^7 is connected through the rod and bell-crank connection l^7 with the locking-bolt M^7. The rock-shaft F^7 in this case is operated by a rack-bar I^7, connected through double bell-crank and link connection i^7 with the lock-operating lever L^7, whereby when said locking-lever is moved to release the switch-point the detector-rod H^7 will be turned over to the position indicated in dotted lines, and in order to control the switch-operating lever an electrically-released lock (indicated diagrammatically at P) is provided, and a circuit extending from the electromagnet p leads back to the rock-shaft F^7 and a commutator, which permits the cir-

cuit to be established or which establishes the circuit whenever the detector-rod is turned to the position indicated in dotted lines. Thus it is only when the detector-rod is in that position that the switch-points can be shifted, and they can never be shifted either when the detector-rod is at an intermediate position of adjustment or when in the position indicated in full lines. The electric circuit in this case, as in the others, preferably passes out through the rock-shaft and detector-rod in order that in case of accidental shifting of the detector-rod as rolling-stock is passing over the same will cause a rupture of the circuit, and thereby prevent the points from being shifted.

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

1. In a switch-operating mechanism, the combination of the following instrumentalities, to wit, direct operating mechanism in proximity to the switch-points, a detector-rod embodying a member adapted to contact with the rolling-stock to check the movement of the rod, a control-station with connections between the control-station and direct switch-operating mechanism, whereby the switch-points may be moved without moving the detector-rod and means for establishing or breaking the connections between the control-station and direct switch-point-operating mechanism controlled by the detector-rod whereby said detector-rod controls by its position the direct connection between the control-station and switch-point-operating mechanism; substantially as described.

2. The combination of a switch, a control mechanism therefor, connections intermediate the switch and control mechanism embodying switching devices for making or breaking such connections whereby the direct connections may be broken or established for moving the switch in either direction and an independently-controlled detector-rod controlling such switching devices; substantially as described.

3. The combination of a switch, control mechanism therefor located at a control-station, connections intermediate the switch and control mechanism embodying switching devices for making or breaking such connections, a detector-rod controlling such switching devices and independent operating connections between the detector-rod and control-station whereby the detector-rod must be operated or set in order to establish the connection through which the switch may be operated; substantially as described.

4. The combination with a switch-operating mechanism embodying direct operating mechanism in proximity to the switch-points and a control-station with connections between the control-station and said direct operating mechanism, of a detector-rod embodying a member independently operated from the control-station and a member adapted to contact with the rolling-stock to check the movement of the rod and means for establishing or breaking the connections between the control-station and direct operating mechanism controlled by the detector-rod; substantially as described.

5. In a switch-point-operating mechanism the combination with a detector-rod adapted to be deformed by contact with the rolling-stock, of a switch-point-shifting mechanism and control connections therefor extending in such relation to the detector-rod as to be rendered inoperative by the deformation of the detector-rod; substantially as described.

6. In a switch-point-operating mechanism the combination with a detector-rod adapted to be deformed by contact with the rolling-stock, of a switch-point-shifting mechanism and control connections therefor carried by the detector-rod and rendered inoperative by the deformation of said rod; substantially as described.

7. In a switch-point-operating mechanism the combination with mechanism for moving the switch-points in opposite directions, a control-station and an independent connection between the control-station and moving mechanism for moving the points in each direction, of a detector-rod operated independently of the switch-points and adapted to engage the rolling-stock when at an intermediate point of adjustment and switching devices controlled by the detector-rod for establishing one of the connections between the control-station and point-moving mechanism when at each extreme of its movement; substantially as described.

8. In a switch-point-operating mechanism, the combination with mechanism for moving the switch-points, in opposite directions, a control-station and an independent connection between the control-station and moving mechanism for moving the points in each direction, of a detector-rod adapted to engage the rolling-stock when at an intermediate point of adjustment and connections independent of the switch-point-operating connections between the control-station and detector-rod for moving the latter; substantially as described.

9. In switch-point-operating mechanism the combination with the switch-point-shifting mechanism, of a detector-rod controlling the same and consisting of a rod pivoted between the tracks to swing longitudinally of the same and of such length as to contact with the rolling-stock between the wheels when swung upwardly; substantially as described.

10. In switch-point-operating mechanism, the combination with the switch-point-shifting mechanism, of a detector-rod controlling the same and consisting of a horizontal rock-shaft and a rod detachably connected therewith between the tracks and of such length

as to contact with the rolling-stock between the wheels when swung upwardly; substantially as described.

11. In switch-point-operating mechanism, the combination with the switch-point-shifting mechanism, of a horizontal rock-shaft, a detector-rod detachably connected therewith and connections controlling the switch-point-shifting mechanism carried by the shaft and rod and rendered inoperative by the detachment of the rod from the shaft; substantially as described.

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