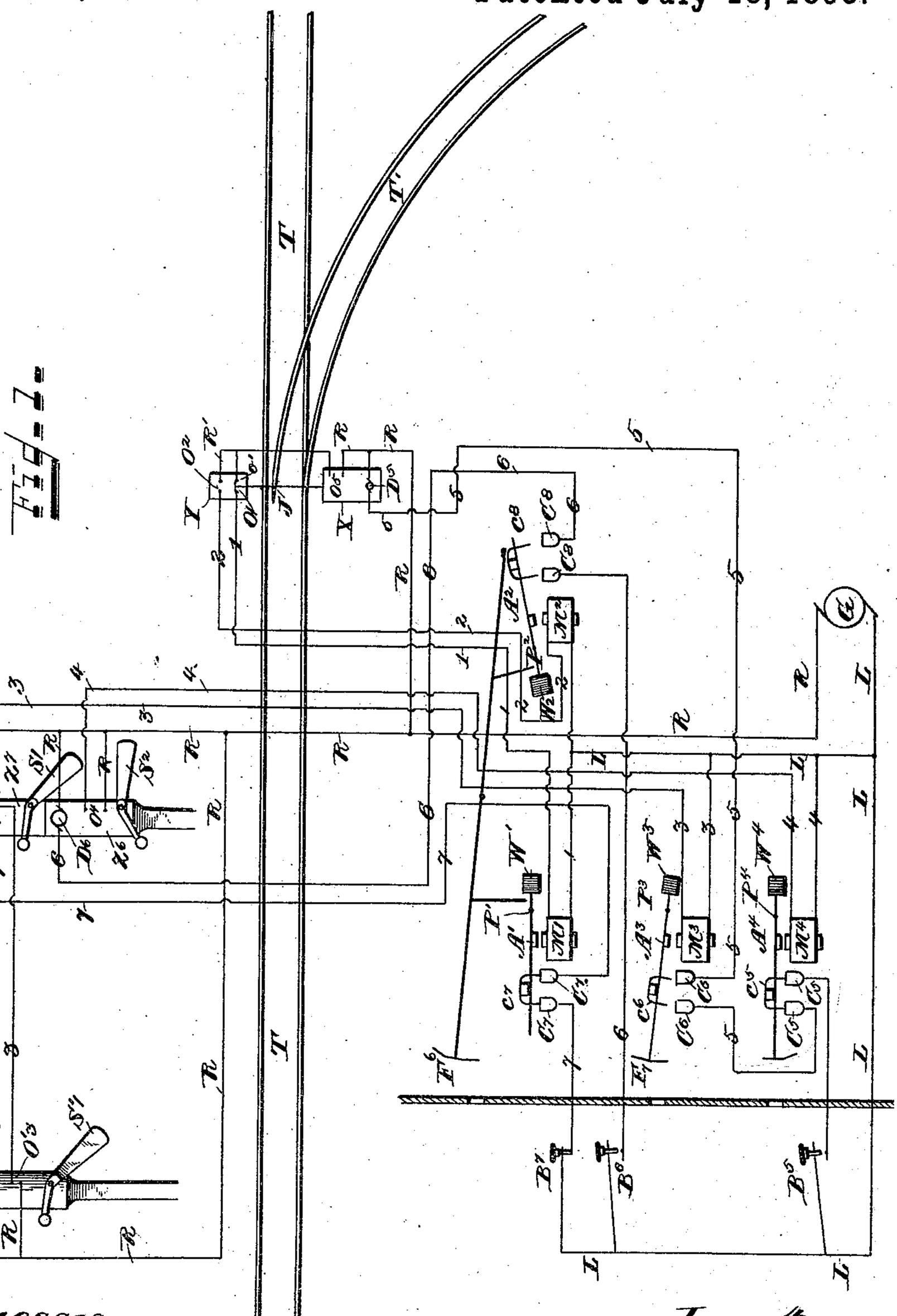
(No Model.) 5 Sheets—Sheet 1.

C. M. WILDER.

ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 501,701. Patented July 18, 1893.



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(No Model.)

5 Sheets—Sheet 2.

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ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 501,701. Patented July 18, 1893.

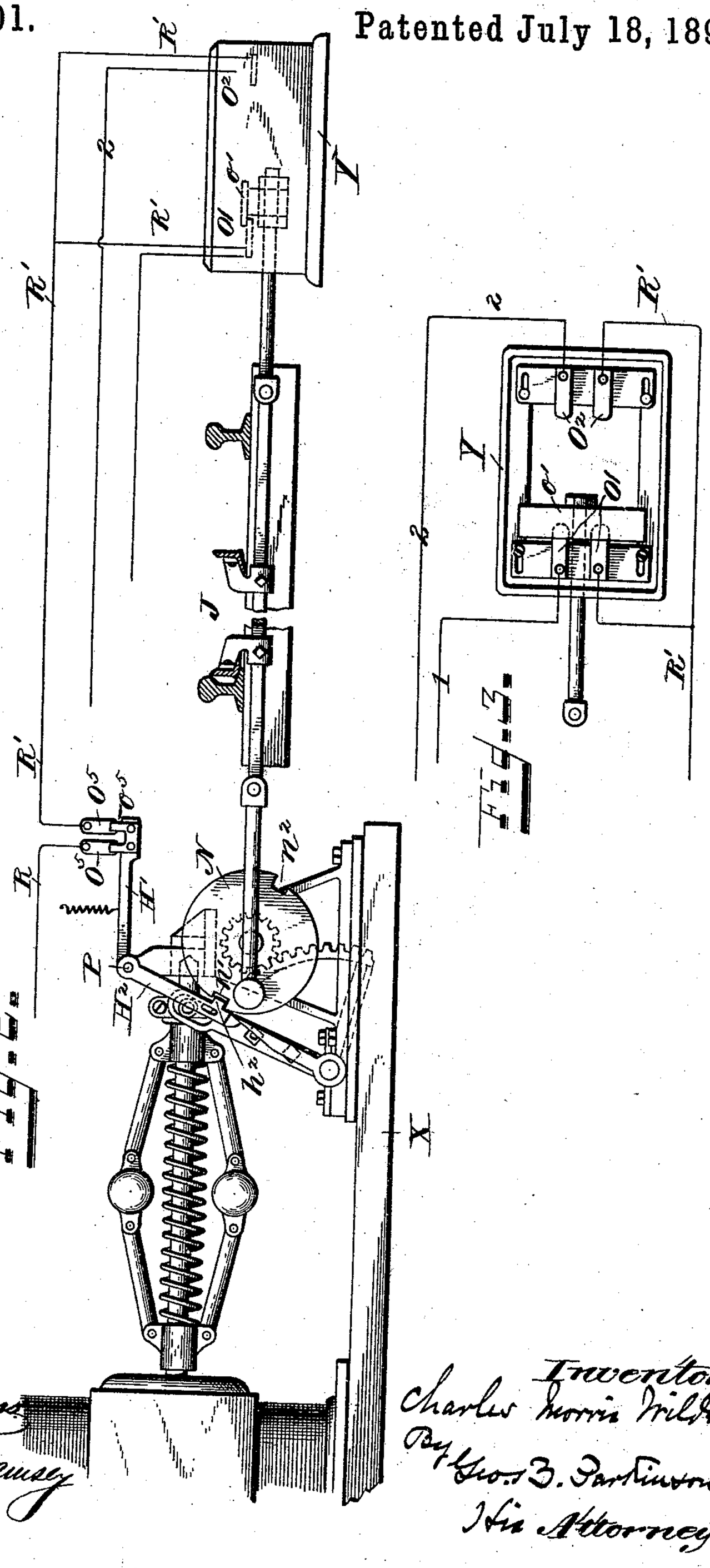

Fig. 2.

Fig. 3.

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(No Model.) 5 Sheets—Sheet 3.

C. M. WILDER.

ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 501,701. Patented July 18, 1893.

Fig. 4.

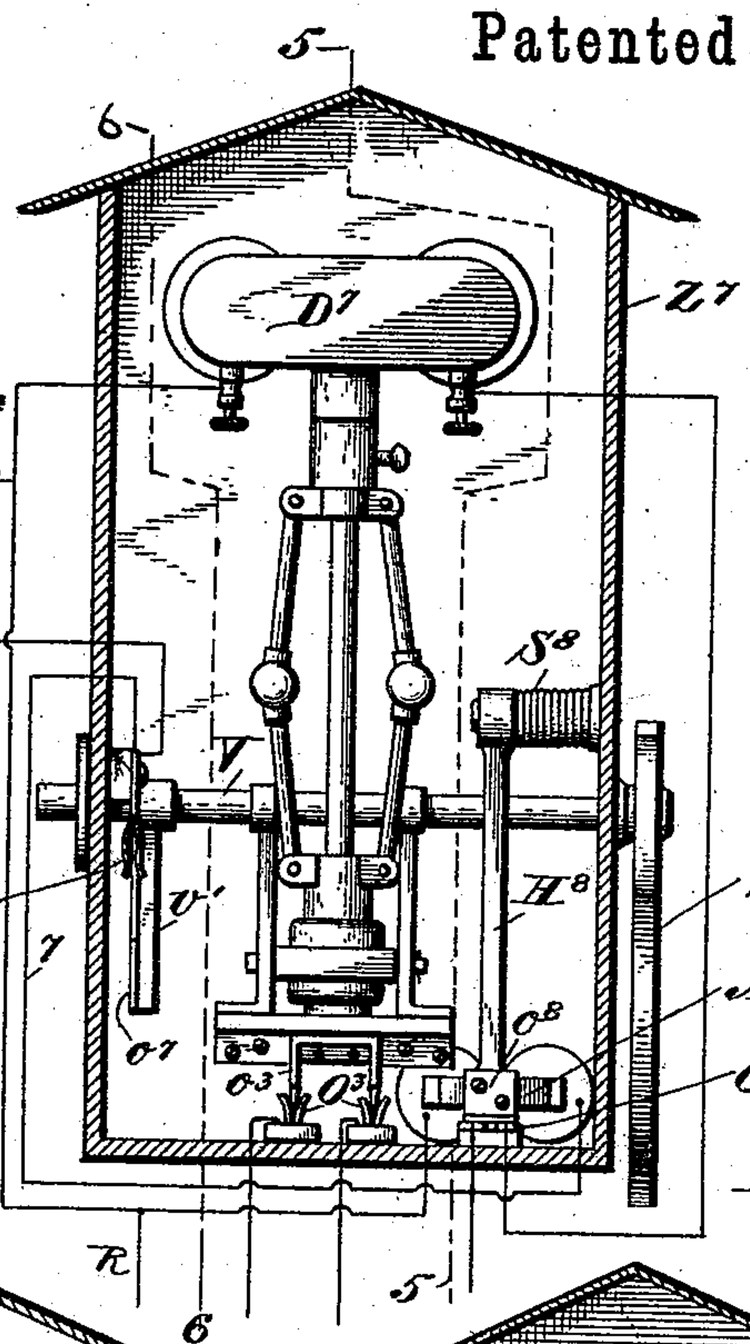


Fig. 5.

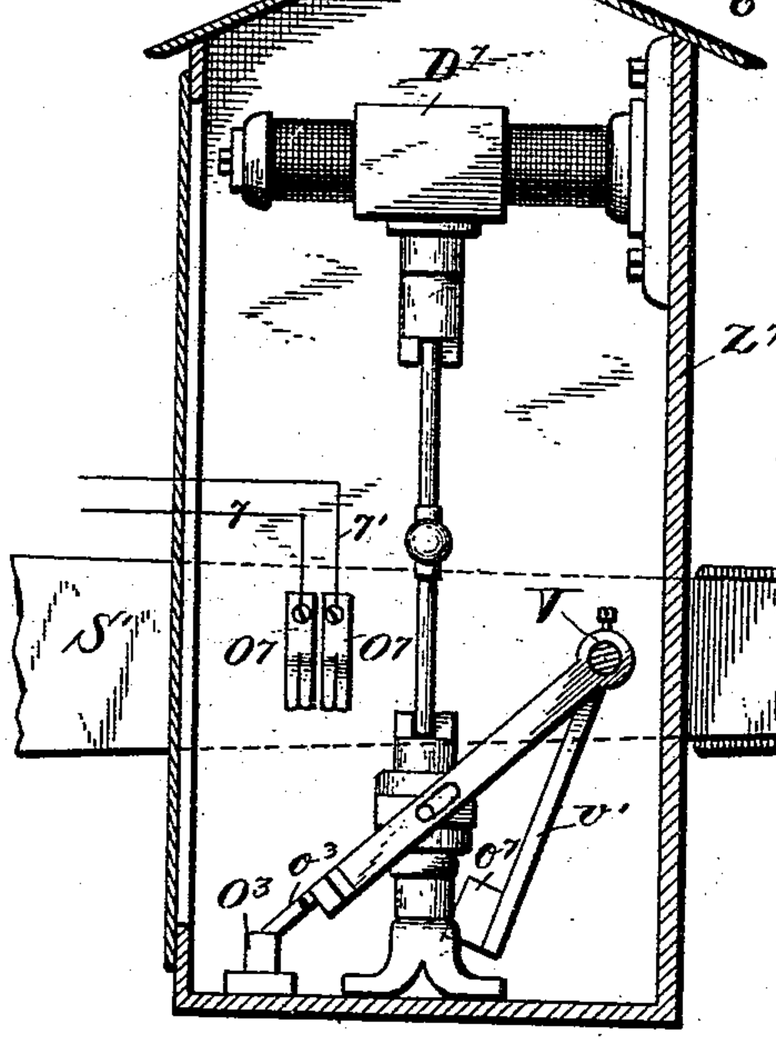
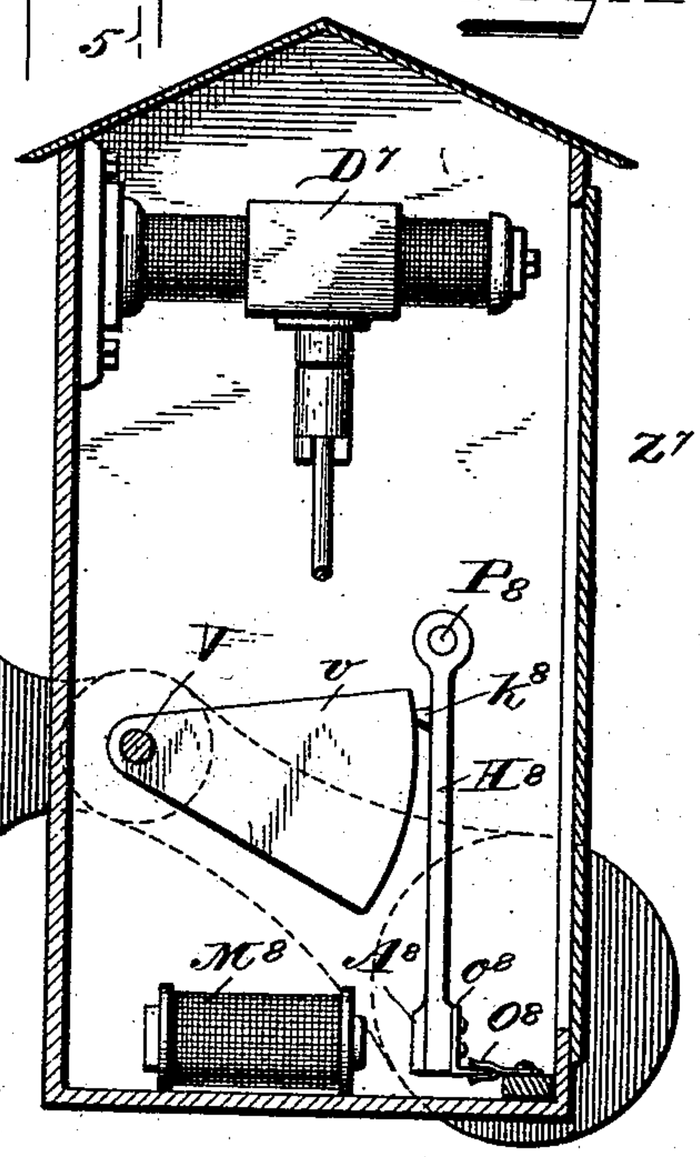


Fig. 6.



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5 Sheets—Sheet 4.

C. M. WILDER.

ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 501,701. Patented July 18, 1893.

Fig. 7.

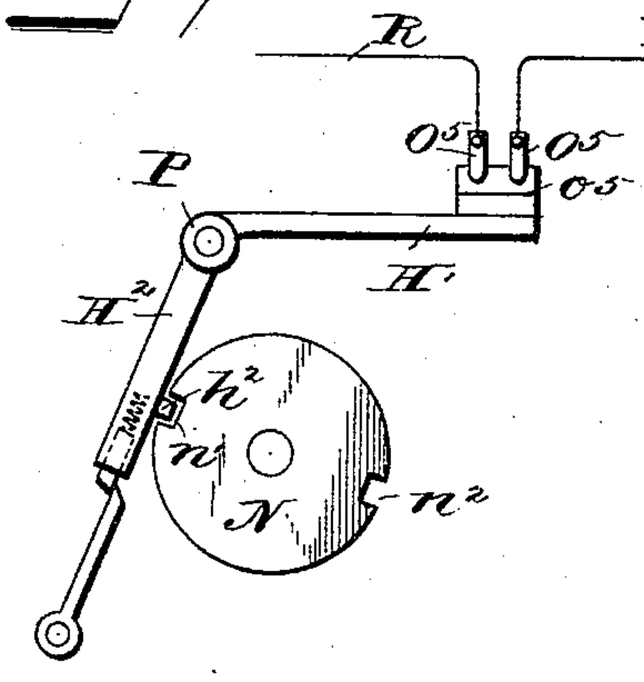


Fig. 8.

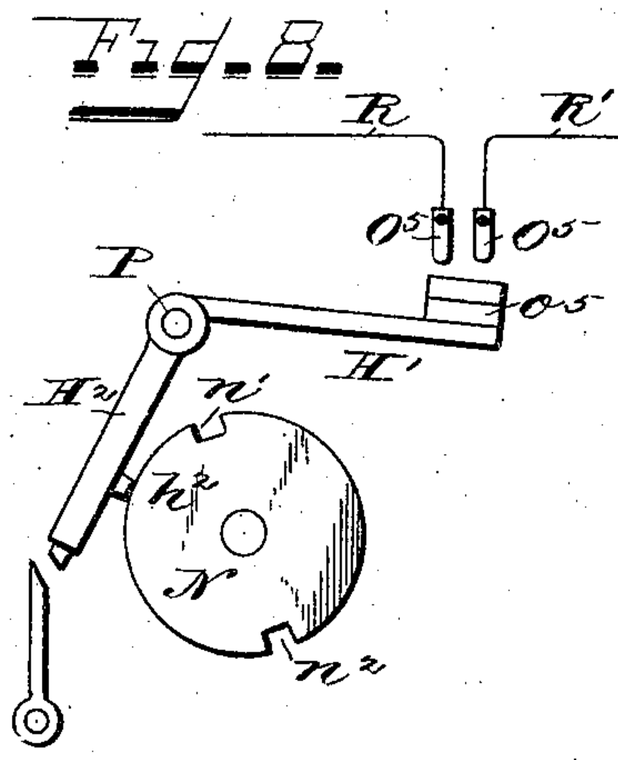


Fig. 9.

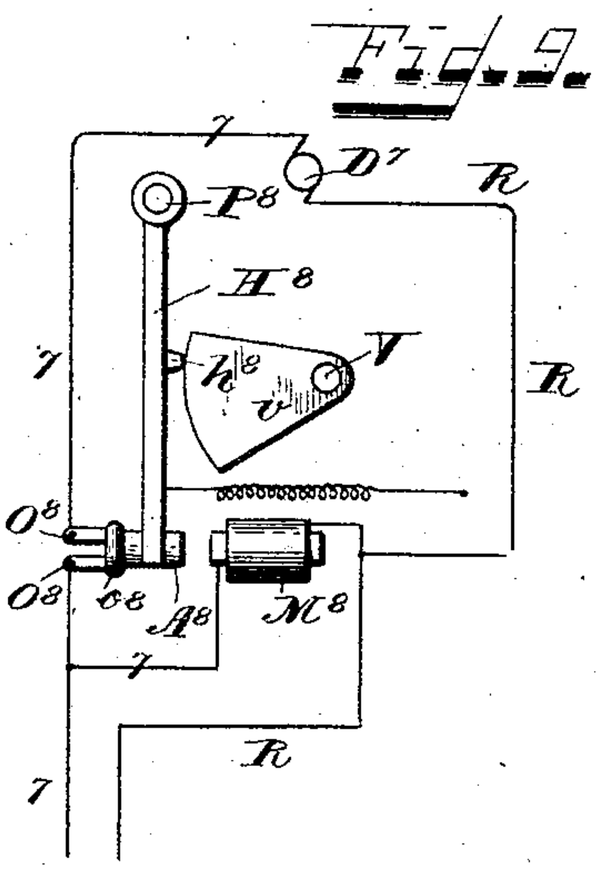


Fig. 10.

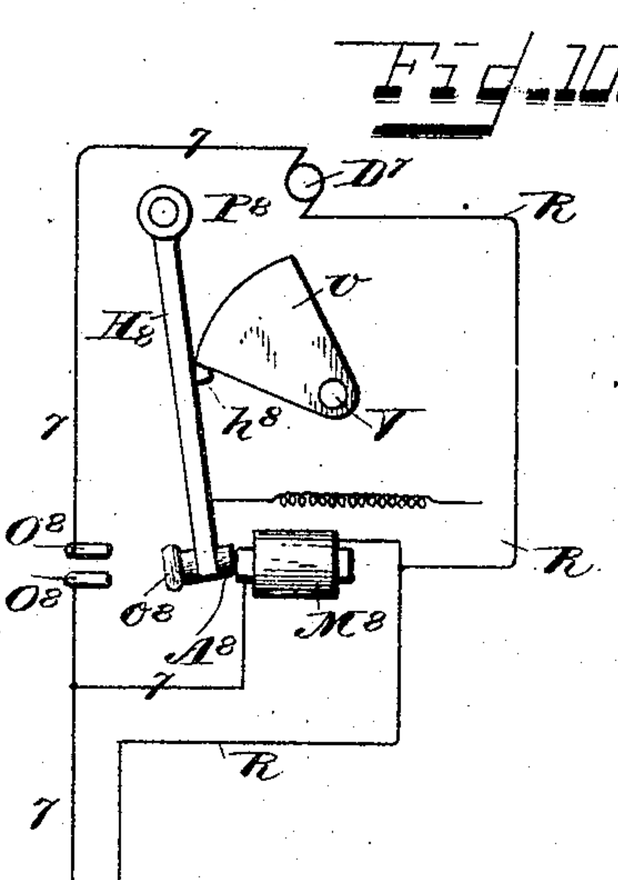


Fig. 11.

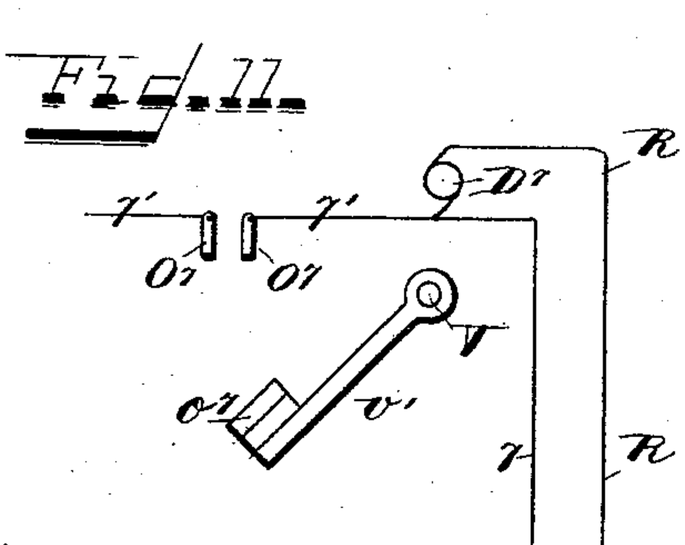
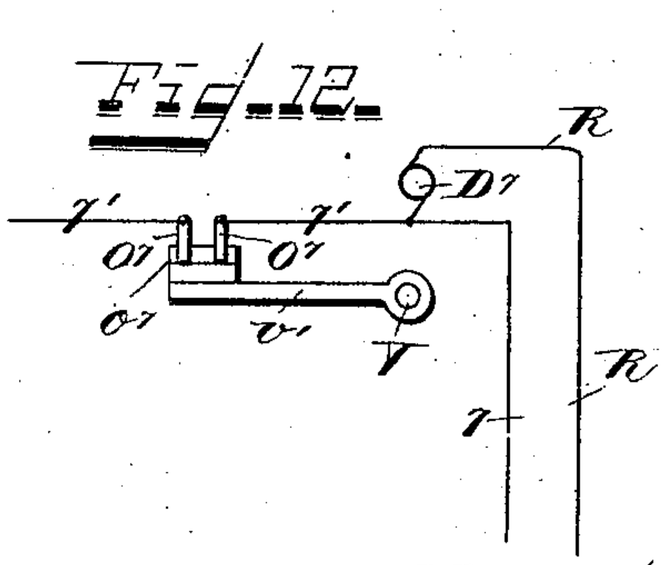


Fig. 12.



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(No Model.) 5 Sheets—Sheet 5.

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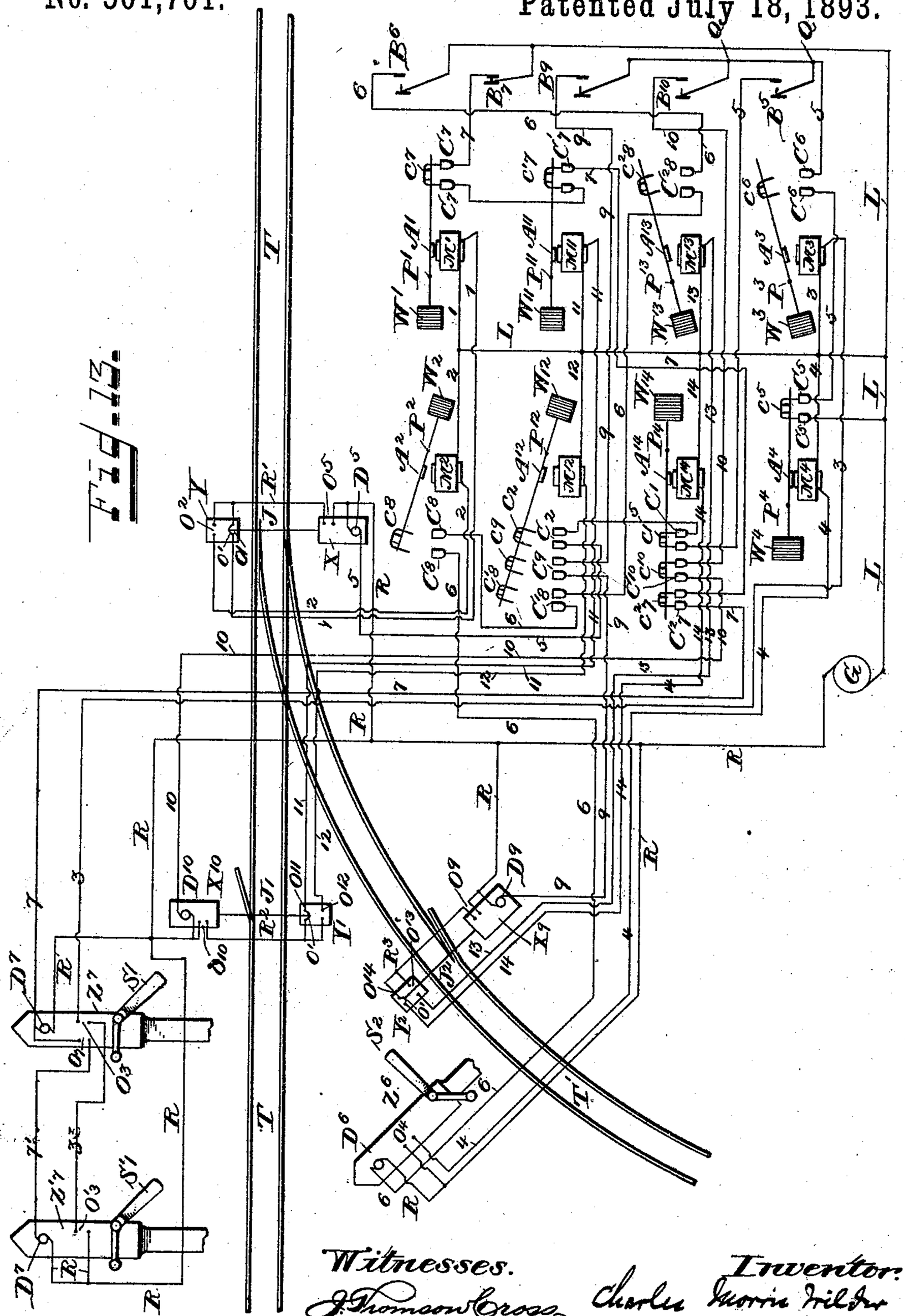
ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS

No. 501,701. Patented July 18, 1893.



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J. Thomson Cross.
Benjamin Block

Inventor:
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UNITED STATES PATENT OFFICE.

CHARLES MORRIS WILDER, OF CINCINNATI, OHIO.

ELECTRIC CONTROLLING AND LOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

SPECIFICATION forming part of Letters Patent No. 501,701, dated July 18, 1893.

Application filed October 17, 1892. Serial No. 449,092. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MORRIS WILDER, a citizen of the United States of America, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric Controlling and Locking Mechanism for Railway Switches and Signals, of which the following is a specification.

My invention relates to systems for controlling and locking electric railway switches or signals or both, and it consists in an electrical interlocking system of circuit controlling devices whereby the position of a switch rail controls dependent switch or single circuits or both, through the agency of electro-magnets and their armatures; in means for preventing the establishment of the switch or signal circuits or both until the dependent switch rails are locked in position; in a signal motor cut out and catch whereby the motor is cut out of circuit after it has actuated the signal and the signal is held at "clear" after the motor has been cut out; and in electrical provisions for preventing the throwing of the distant signal until the home signal has been brought to "clear." For complete working the system includes a source of electricity, a station in which is an operating case which contains magnets, indicating and controlling devices, circuit terminals and operating levers; switch and signal throwing devices; track boxes; a system of electric circuits; motors for operating the signals, and, preferably, motors for operating the switches.

In the drawings: Figure 1 is a diagrammatic view showing the various circuits and connections, the trains running in one direction and governed by a home signal for each track, main and branch, and a distant signal for the main track. Fig. 2 is an elevation of the switch throwing mechanism. Fig. 3 is a plan view of the track box. Fig. 4 is a front view of the signal throwing mechanism showing the signal at "block." Fig. 5 is a section on line 5—5 of Fig. 4. Fig. 6 is a section on line 6—6 of Fig. 4 a portion of the mechanism being broken away to show the motor cut-out mechanism and catch. Fig. 7 is an elevation of the switch locking device showing the switch locked and contact closed. Fig. 8 is a like view showing the switch unlocked and contact open; Fig. 9 an elevation of the signal motor cut-out and catch showing the signal at "block;" Fig. 10 a like view showing the signal at "clear;" Fig. 11 an elevation showing the distant signal controlling device in the position it occupies when the home signal is at "block;" Fig. 12 a like view when the home signal is at "clear." Fig. 13 is a diagrammatic view of the various circuits and connections showing signal and switch circuits controlled by a switch indicator circuit.

T represents the main track; T′ a branch track; J J^1, and J^2 switch rails; G a source of electricity; L a common lead; R a common return; R^1, R^2, &c., return branches for switch indicator circuits; B^5, B^6, &c., hand operated circuit controllers; M^1, M^2, &c., electro-magnets; A^1, A^2, &c., armatures; W^1, W^2, &c., armature counterweights; P^1, P^2, &c., armature pivots; F^6, F^7 indicating faces on armatures; C^1, C^2, &c., circuit contact terminals, shown as mercury cups; c^1, c^2, &c., circuit terminal closers; X, X^9, X^{10}, switch boxes; Y, Y^1, Y^2, track boxes; Z^6, Z^7, Z'^7 signal boxes; D^5, D^9, D^{10} switch motors; D^6, D^7, D'^7 signal motors; S^1, S'^1, S^2 signals provided with counterweights adapted to return them to their normal positions; O^1, O^2, O^{11}, O^{12}, O^{13} and O^{14} circuit terminals in the track boxes; o' connecting strip in track boxes; O^5, O^9, O^{10} circuit terminals in the switch boxes; O^3, O'^3 and O^4 circuit terminals in the signal boxes; closed by the signal when at "block;" O^7 circuit terminals in signal box Z^7, closed by the signal when at clear; 1, 2, 3, 4, 5, 6, 7, 7′, 9, 10, 11, 12, 13 and 14 electric circuits.

In the arrangement shown in Fig. 1, circuit 1, containing magnet M^1, starts from lead L, goes to contact terminal O^1 in track box Y, thence by R′ to contact terminal O^5 in switch box X and thence by R to generator G. Circuit 2, containing magnet M^2, starts from lead L, goes to contact terminal O^2 in track box Y, thence by R′ to contact terminal O^5 in switch box X, and thence by R to generator G. Circuit 3, containing magnet M^3, starts from lead L, goes to contact terminal O^3 in signal box Z^7, thence to contact terminals O'^3 in box Z'^7 and thence by R to generator, G. Circuit 4, containing magnet M^4, starts from lead L, goes to contact terminals O^4 in signal box Z^6 and

thence by R to generator G. Circuit 5, containing contact terminals B^5, C^5, C^5, C^6, C^6, starts from lead L, goes to switch motor D^5 and thence by R to generator G. Circuit 6, containing contact terminals B^6, C^8, C^8, starts from lead L, goes to signal motor D^6 and thence by R to generator G. Circuit 7, containing contact terminal B^7, C^7, C^7, starts from lead L, goes to signal motor D^7 and thence by R to generator G. Circuit 7′ starts from circuit 7, goes to contact terminals O^7 in box Z^7, thence to signal motor D'^7 in box Z'^7 and thence by R to generator G.

In the arrangement shown in Fig. 13, circuit 5, containing terminals B^5, C^5, C^6, C^1, and C^2, starts from lead L and goes to switch motor D^5. Circuit 6, containing terminals B^6, C^{28}, C'^8, C^8, starts from lead L and goes to signal motor D^6. Circuit 7, containing terminals B^7, C^7, C'^7, C^{27} starts from lead L and goes to signal motor D^7. Circuit 9 starts from lead L, follows the path of circuit 5 to Q, thence through B^9, C^9 to switch motor D^9. Circuit 10 starts from lead L, follows the path of circuit 9 to Q′ and goes through terminals B^{10} and C^{10} to switch motor D^{10}. Circuit 11, containing magnet M^{11}, starts from lead L, goes to O^{11} in box Y^1, thence by R^2 to terminals O^{10} in track box X^{10}, thence by R to generator G. Circuit 12, containing magnet M^{12}, starts from lead L, goes to terminals O^{12} in track box Y^1, thence by R^2 to terminals O^{10} in switch box X^{10}, thence by R to generator G. Circuit 13, containing magnet M^{13}, starts from lead L, goes to terminals O^{13} in track box Y^2, thence by R^3 to terminals O^9 in switch box X^9, thence by R to generator G. Circuit 14, containing magnet M^{14}, starts from lead L, goes to terminals O^{14} in track box Y^2, thence by R^3 to terminals O^9 in switch box X^9, thence by R to generator G.

Circuits 1 and 2 are controlled by the position of the switch rail and control respectively circuits 7 and 6 through contact terminals C^7 and C^8. Circuit 3 is controlled by the position of signal S^1 and closes circuits 5, 9 and 10 at C^6. Circuit 4 is controlled by the position of signal S^2 and closes circuits 5, 9 and 10 at C^5. Circuit 5 is controlled by circuits 3, 4, 12 and 14 and through it the switch motor D^5 is operated. Circuit 6 is controlled by circuits 2, 12 and 13 and through it signal motor D^6 is operated. Circuit 7 is controlled by circuits 1, 11 and 14 and through it signal motor D^7 is operated. Circuit 7′ is controlled by circuits 1, 11 and 14, and by the signal S^1, and through it signal motor D'^7 is operated. Circuit 9 is controlled by circuit 12 and through it switch motor D^9 is operated. Circuit 10 is controlled by circuit 14 and through it switch motor D^{10} is operated. Circuit 11 is controlled by the position of switch J^1 and closes circuit 7 at C'^7. Circuit 12 is controlled by the position of switch J^1 and closes circuit 5 at C^2, circuit 6 at C'^8 and circuit 9 at C^9. Circuit 13 is controlled by the position of switch J^2 and closes circuit 6 at C^{28}. Circuit 14 is controlled by the position of switch J^2 and closes circuit 5 at C^1, circuit 10 at C^{10} and circuit 7 at C^{27}.

The preferred mechanism for throwing and locking the switch is that shown in Letters Patent of the United States No. 458,489, granted Ramsey, Harden and Wilder, August 25, 1891, consisting of an electric motor, gyratory transmitting links, devices for converting rotary into reciprocating movement, a crank and pitman connected with the switch rails, a notched disk fixed to the crank shaft, a locking arm with a lug adapted to take into the notches, a tripping arm and drop catch for unlocking the disk.

In Figs. 7 and 8 I have shown the mechanism for preventing the establishment of the controlling and indicating circuits until the dependent switch rails are locked in position. N represents a disk fixed upon the crank shaft of the switch throwing mechanism and having two diametrically opposite notches n', n^2 adapted to receive a lug h^2 on a swinging locking arm H^2 pivoted at P. This mechanism and its operation are described in the above-named Letters Patent. H^1 is a leg extending from arm H^2 and moving with it and carrying connecting strip o^5 adapted to connect terminals O^5 in circuit R, R′, R′ being common to circuits 1 and 2 and connecting one side of terminals O^1, O^2 and O^5. The leg H^1 is so mounted that connecting strip o^5 will engage with the terminal O^5 when the lug h^2 is in its locking position and then only.

The track box mechanism, as shown in Fig. 3, consists of two pairs of contacts O^1 and O^2 which are arranged to be closed by a conducting strip o' in mechanical connection with and sliding with, the switch rail and so adjusted that one pair of contacts is closed when the switch rail reaches one of its terminal positions and the other when the switch rail reaches the opposite position.

The preferred mechanism for actuating and indicating the signals consists of an electric motor D^7, gyratory transmitting links, a rock shaft V actuated thereby, a signal blade connected with and actuated by the rock shaft, and contact terminals O^3 which are controlled by a connecting-strip o^3 operated by the rock shaft and adjusted to be closed only when the signal is at "block." This portion of the mechanism is described and shown in Letters Patent of the United States No. 427,361, granted Joseph Ramsey, Jr., May 6, 1890. To the rock shaft V is secured a segmental cam v. H^8 is an arm pivoted at P^8 provided with a lug h^8 and preferably slightly spring pressed against the segmental cam. This arm carries the contact strip o^8 and armature A^8 of magnet M^8. Magnet M^8 is in parallel circuit with motor D^7 in circuit 7. The circuit terminals O^8, O^8 are in motor shunt of circuit 7 so that when circuit 7 is broken at O^8, O^8 the motor D^7 is cut out of circuit while magnet M^8 remains in circuit. Rock shaft V also carries an arm v^1 to which is attached the

connecting strip o^7 which closes the terminals O^7 in circuit 7'. This arm v^1 is so set that it closes these terminals only when the signal is at clear. Figs. 4, 5, 6, 9 and 11 represent the position of this mechanism when the signal is at "block." Figs. 10 and 12 represent the positions when at clear. In these figures the connections are shown for signal S^1 but the arrangement shown in Figs. 9 and 10 is the same for all the signals, circuit 7 and motor D^7 becoming circuits 6 and 7' and motor D^7 becoming motors D^6 and D'^7 for signals S^2 and S'^1.

In order to set the switch for the branch track the operator breaks circuit 7 by means of circuit controller B^7, the catching magnets of signals S^1 and S'^1 are demagnetized and the signals thereby released and brought to "block" by their counterweights breaking circuit 7' at O^7 and closing terminals O^8 of circuits 7 and 7' and closing circuit 3 at O^3 and O'^3 thereby completing circuit 3 and energizing magnet M^3. This attracts its armature A^3 and closes terminals C^6, C^6 of circuit 5. Circuit 5 may then be completed by depressing circuit controller B^5 and switch J will be thrown to its opposite position by motor D^5 and its connections. Circuit terminals 5 are broken as the locking lug is withdrawn from its locking position and again made when the lug takes into the opposite locking notch and switch rail J is locked in its new position. Circuit 1 is now broken at terminal O^1 in box Y, its magnet M^1 demagnetized and, by the action of the counterweight W^1 of armature A^1, circuit 7 is broken at C^7. Contact terminals O^2 in box Y of circuit 2 are now closed and, since terminals O^5 are closed, the magnet M^2 is energized and its armature A^2 attracted and terminals C^8 of circuit 6 thereby closed by connecting strip c^8. Circuit controller B^5 may now be raised breaking circuit 5 without changing the position of switch J. By depressing circuit controller B^6 circuit 6 is completed and signal S^2 is brought to "clear" thereby breaking circuit 4 at O^4 and demagnetizing M^4 whereby by the action of counterweight W^4 circuit 5 is broken at C^5. It will be seen that circuit 7 cannot be completed at B^7 because it is broken at C^7 and circuit 5 cannot be completed at B^5 because it is broken at C^5. Hence no signal can be given unless the switch rail is locked in its proper position and the switch rail cannot be moved unless all dependent signals are at "block." By breaking circuit 6 at B^6 signal S^2 is released and brought to block, by the action of its counterweight, closing terminals O^4 and thereby completing circuit 4 and energizing magnet M^4 closing terminals C^5 in circuit 5. By closing B^5 the switch rail J may be set and locked for the main track, circuits 1 and 2 then being respectively completed and broken as shown and terminals C^7 and C^8, respectively, closed and open as shown in Fig. 1. All signals now being at block, by depressing circuit controller B^7 circuit 7 is completed, magnet M^8 is energized and the signal motor D^7 set in motion. This rocks shaft V and rocks signal S^1 to "clear." Rock shaft V carries with it segment v and arm v^1 and, as it reaches the "clear" position lug h^8 is drawn under segment v by the action of magnet M^8 thereby breaking circuit 7 at O^8 and cutting out the signal motor. The rock shaft and signal are locked against return to their normal position by the lug h^8 until magnet M^8 is demagnetized. The circuit terminals O^7 are closed by strip o^7 of arm v^1 as the signal reaches "clear." This completes circuit 7' and the distant signal S'^1 is brought to clear and its signal motor likewise cut out and the signal held at "clear" by action of a magnet. When circuit 7 is broken the magnets are demagnetized and the signal counterweights return the signals to "block," break the contact at terminals O^7 and, acting through the rock shaft and segmental cam, force the lug h^8 from under the segmental cam and force connecting strip o^8 on arm H^8 into contact with terminals O^8 thereby connecting terminals O^8 in circuit 7 and likewise in 7'. The action in all the signals is the same except that the home signals only are arranged to control the distant signals.

In the arrangement shown in Fig. 13, in order to set the switches for the branch track, the operator breaks circuit 7 by means of circuit controller B^7. Signals S^1 and S'^1 are brought to block, circuit 7' broken at O^7, terminals O^8 of circuits 7 and 7' closed, circuit 3 closed at O^3 and O'^3, and thereby completed, and magnet M^3 magnetized, thereby closing circuit 5 at terminals C^6 C^6 as previously described. Switch J may now be set for the branch track by depressing key B^5 and, as previously described, the magnet M^1 is demagnetized, circuit 7 broken at C^7 C^7 and the magnet M^2 energized and terminals C^8 C^8 of circuit 6 closed. Before switch J^2 can be closed, to allow a train to run over the branch, switch J^1 must be opened since the working, or motor circuits, of D^9 and D^{10} are controlled by the switch indicator circuits 12, and 14 which are controlled by the position of the switches J^1 and J^2 respectively. Circuit 9, which is the working circuit, of D^9 is broken at C^9, while circuit 10, the working circuit of D^{10}, may be completed by depressing key B^{10}. Switch J^1 being moved to the open position, opening circuit 11 and closing circuit 12 in track box Y^1, magnet M^{11} demagnetized, and circuit 7 broken at C'^7, C'^7, magnet M^{12} is energized and contact terminals C^2, C'^8, and C^9, in circuits 5, 6 and 9, closed. Circuit 9 may now be completed by depressing key B^9. Switch J^2 is then closed, the contacts O^{14} and O^{13} in track box Y^2 respectively opened and closed, and the circuits 14 and 13 likewise respectively opened and closed, magnet M^{14} demagnetized, circuits 5, 7 and 10 broken at C^1, C^{27}, and C^{10}, magnet M^{13} energized and terminals C^{28} of circuit 6 closed. By depressing key B^6, signal S^2 is brought to clear, circuit 4 being broken as the signal

leaves its block position and thereby breaking circuit 5 at terminals C^5. No signal or switch can now be moved until signal S^2 is returned to the block position and M^4 energized, closing C^5. Then switch J may be set for the main track but switch J^1 cannot be moved until after J^2 has been opened. These having been accomplished in the order named, the signals S^1, S'^1 may be cleared by depressing the key B^7.

As a matter of convenience I have termed the switch motor circuits 5, 9 and 10, and the signal motor circuits 6, 7 and 7′ working circuits and the circuits through which these circuits are governed controlling circuits.

I claim—

1. In an interlocking system a railway switch, electrical terminals controlled thereby, one or more controlling circuits leading from the terminals, electro-magnets in these circuits, one or more working circuits, terminals in the working circuits adapted to be controlled by the action of the magnets and other terminals adapted to be controlled by the operator.

2. In an interlocking system, a railway switch; two pairs of electrical terminals controlled thereby; two electrical circuits each containing a pair of said terminals; an electro magnet in each of said circuits; armatures for said magnets carrying terminal closers; other switches or signals or both; electrical circuits leading to and adapted to operate said switches or signals; terminals in these circuits controlled by the action of the magnet armatures, and terminals within said circuits adapted to be controlled by the operator.

3. In an interlocking system a railway switch, electrical terminals controlled thereby, controlling circuits leading from the terminals, terminals within these circuits, a locking device, a strip controlled by the locking device to connect said terminals, electro-magnets in the controlling circuits, working circuits, and terminals in the working circuits adapted to be controlled by the magnets.

4. In an electrical interlocking system a switch motor circuit, one or more switch indicator circuits and a signal circuit controlled thereby.

5. In an electrical interlocking system a switch motor circuit, one or more switch indicator circuits and a switch circuit controlled thereby.

6. In an electrical interlocking system a switch motor circuit, one or more switch indicator circuits and one or more signal and switch circuits controlled thereby.

7. In an electrical controlling and locking system a signal, a motor for operating the signal, mechanism for holding the signal after it has been moved and an electro-magnet for cutting the motor out and controlling the signal holding mechanism.

8. In an electric controlling and locking system a signal, a motor for operating the signal, a segmental cam arranged to rock with the signal, a pivoted armature arm carrying a lug adapted to engage with and lock the cam against return movement, an electric circuit leading to the motor, terminals in this circuit, a connecting strip on the pivoted arm and an electro-magnet for actuating the pivoted arm.

9. In an electric controlling and locking system a signal, one or more dependent signals, motors for actuating the signals, an electric circuit leading to the dependent signal motor or motors a rock shaft, governed by the position of the primary signal, and an arm extending therefrom carrying a connecting strip, adapted to close the dependent signal circuit or circuits.

10. In an electric controlling and locking system a signal, one or more dependent signals, motors for actuating the signals, an electric circuit leading to the dependent signal motor or motors a rock shaft governed by the position of the primary signal, and an arm extending therefrom and carrying a connecting strip arranged to close the circuit when the primary signal has been brought to clear.

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