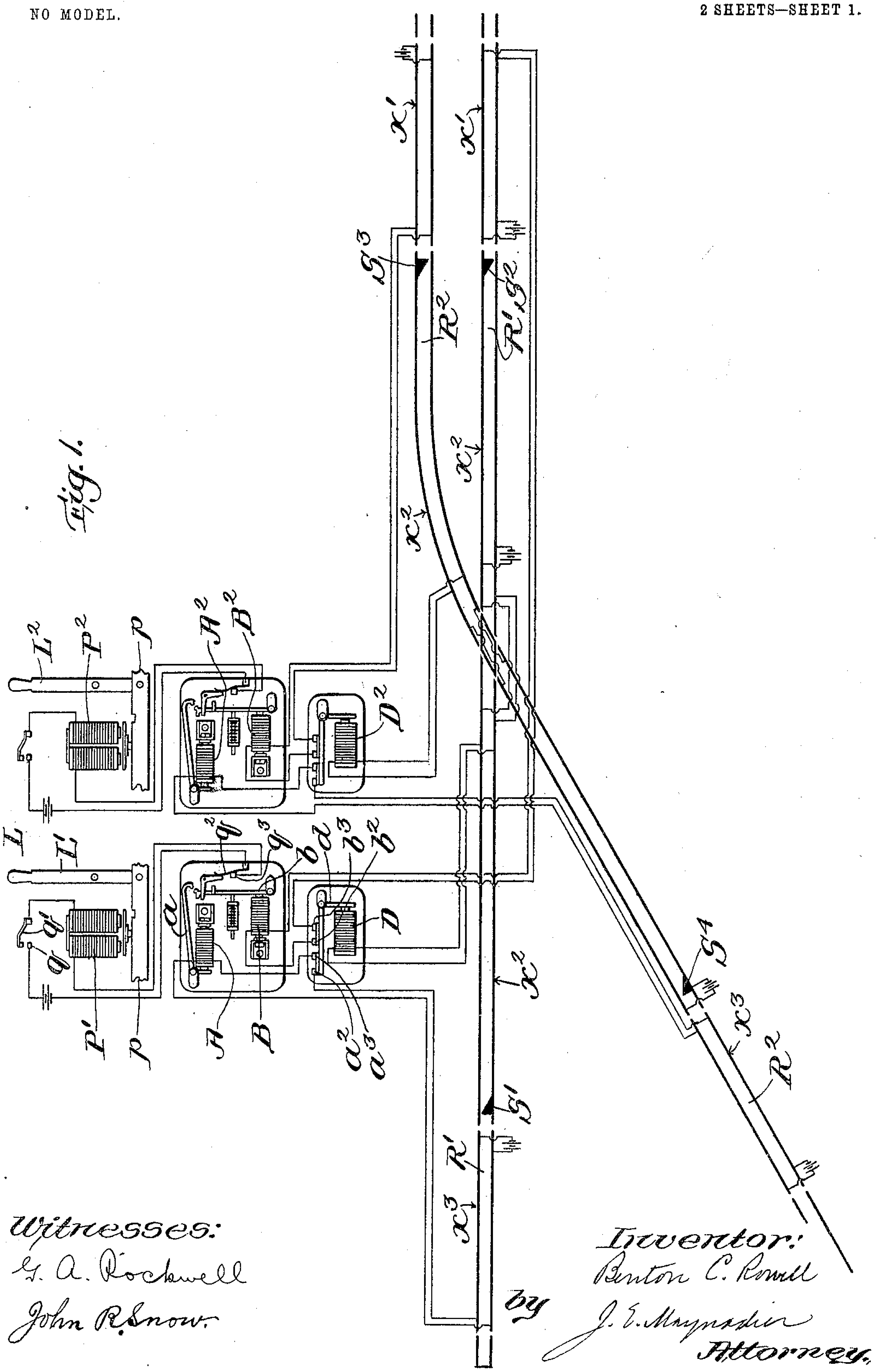
No. 770,656. PATENTED SEPT. 20, 1904.

B. C. ROWELL.

INTERLOCKING SYSTEM FOR RAILROADS.

APPLICATION FILED JAN. 9, 1902.

NO MODEL. 2 SHEETS—SHEET 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

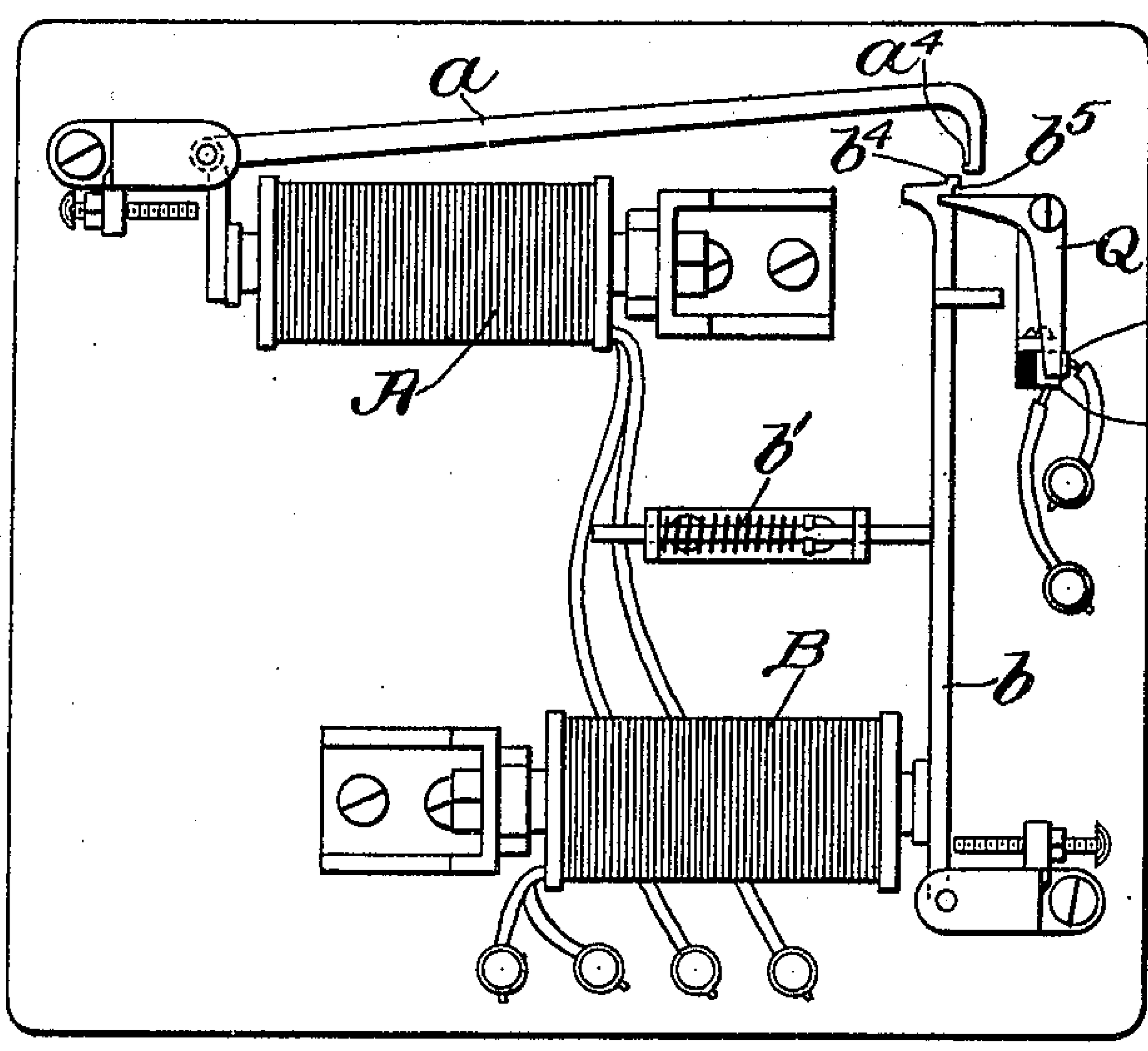


Fig. 3.

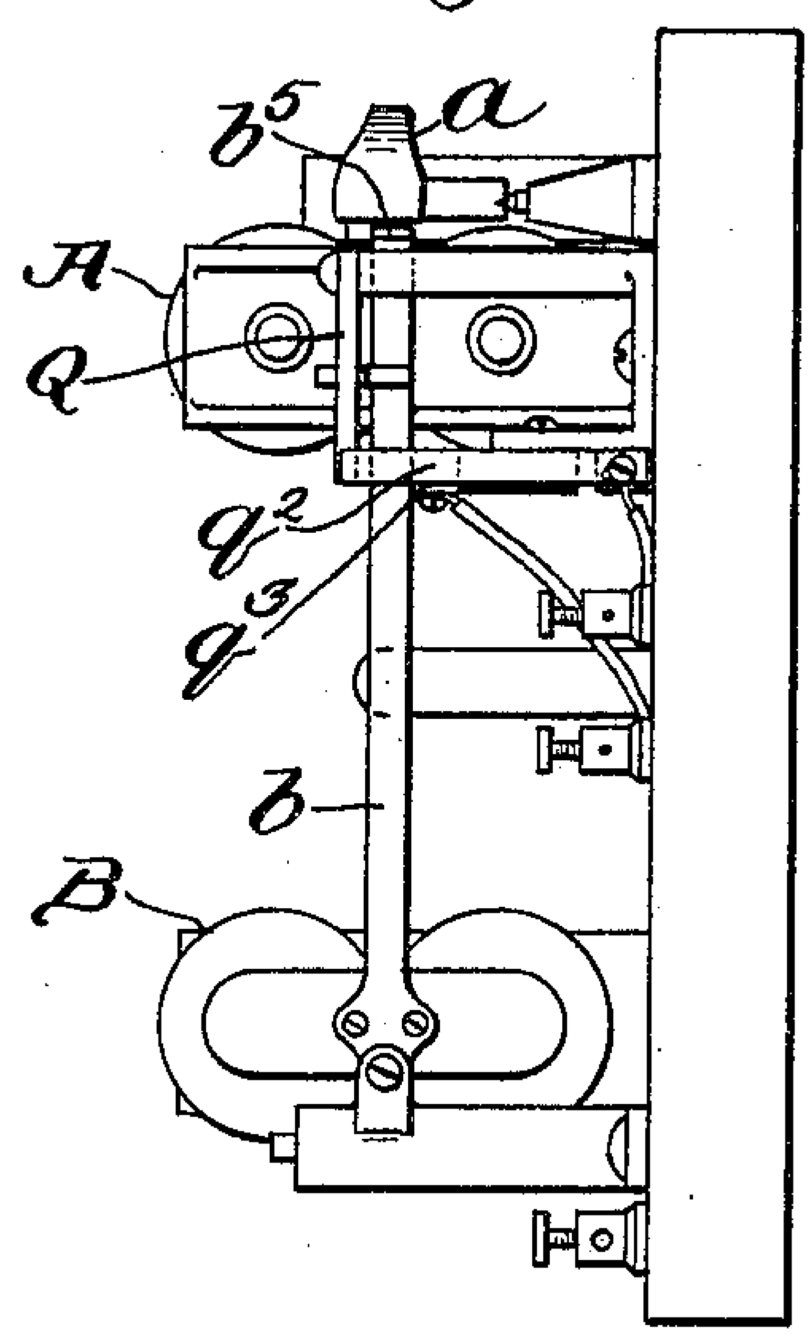
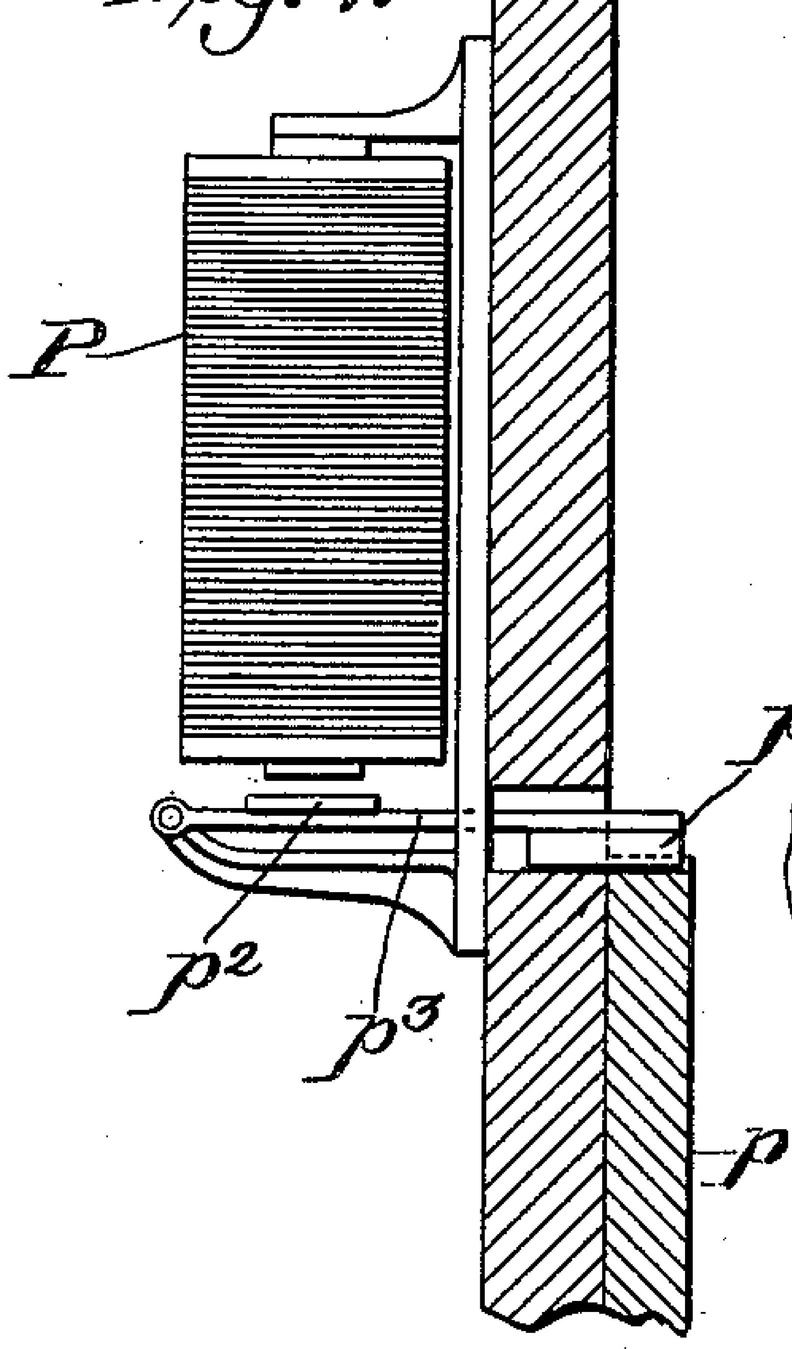


Fig. 4.



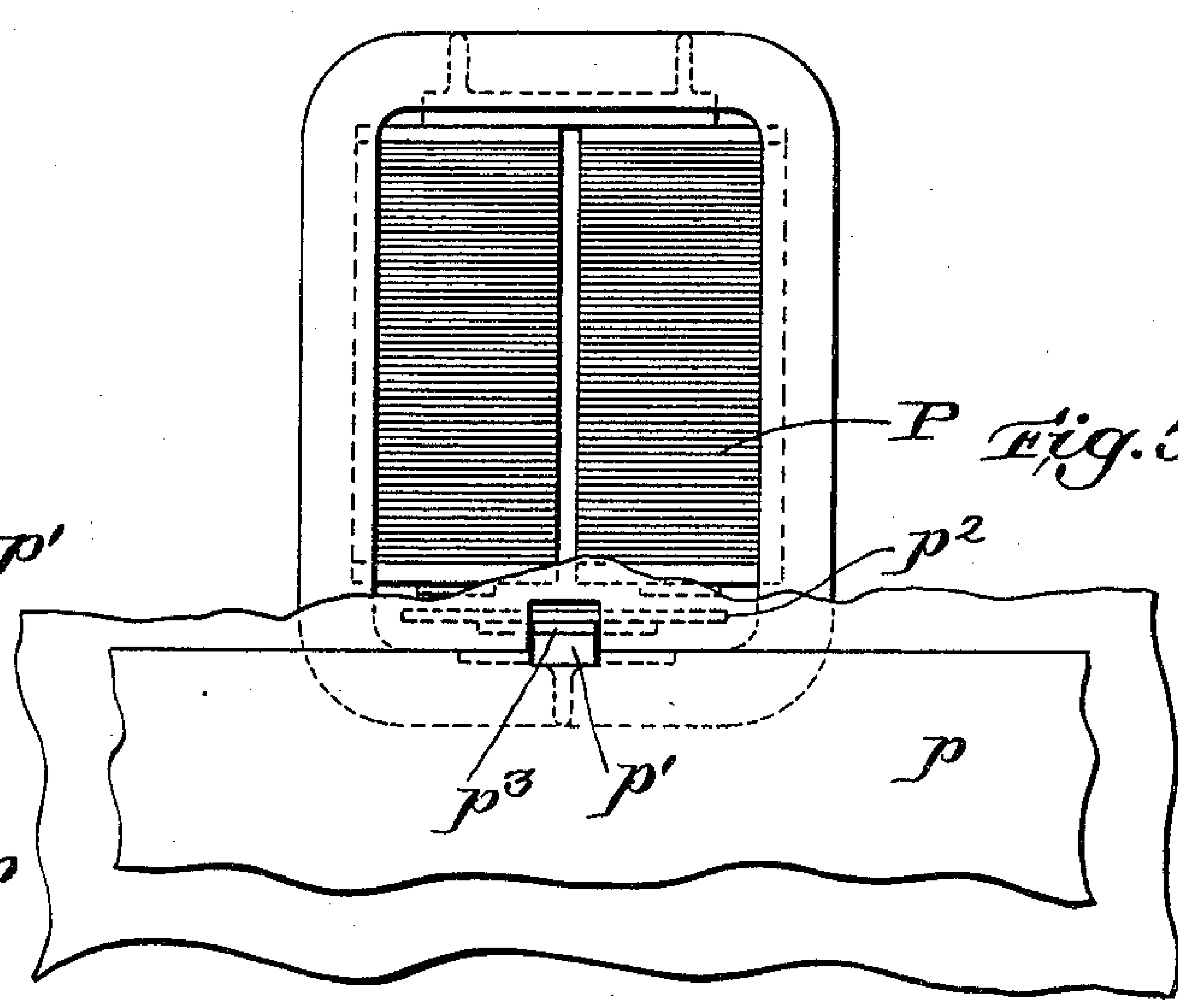


Fig. 5.

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UNITED STATES PATENT OFFICE.

BENTON C. ROWELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO ROWELL POTTER SAFETY STOP COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

INTERLOCKING SYSTEM FOR RAILROADS.

SPECIFICATION forming part of Letters Patent No. 770,656, dated September 20, 1904.

Application filed January 9, 1902. Serial No. 89,006. (No model.)

To all whom it may concern:

Be it known that I, BENTON C. ROWELL, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Interlocking System for Railroads, of which the following is a specification, reference being had to the accompanying drawings, making part hereof.

Interlocking systems as now used comprise an interlocking machine, which consists of a series of levers for clearing or blocking the tracks and mechanical locking devices, such that when one or more levers have been reversed—that is, moved from normal far enough to shift certain of the blocking appliances from "danger" to "safety" and clear a certain route—all levers which control conflicting routes are mechanically locked and all conflicting levers remain mechanically locked while any one of them is reversed. The result is that when any train approaching a crossing "calls for signals" giving it the right of way the operator at the interlocking machine "sets up a route" for that train by "reversing" the proper lever or levers, and thereby shifting the proper appliances to "safety." Usually visible signals which inform the engineer whether his route is clear or not are used as blocking appliances and in addition prohibitory signals which derail or otherwise stop any train attempting to pass in disregard of the visible signal when at "danger." The train which called for signals then passes over the crossing, and all conflicting trains are prohibited from so doing; but should a conflicting train call for signals before the first train had cleared the crossing and should the operator forget himself he would restore the lever he had reversed, (to give right of way to the first train,) and thereby shift the prohibitory signals in front of or under the first train and take away the right of way from that train to which he had just given the right of way. To prevent this, it has long been usual to provide an "electrical lock," which makes it impossible for the operator of the interlocking machine to restore a lever he has reversed to give right of way to a train while that train is on the crossing, and interlocking systems for railway-crossings have long been known in which each train must first call for signals, the operator must next reverse the proper lever or levers to clear a route for that train over the crossing, and thereby mechanically lock all conflicting levers, and, thirdly, that train in passing over the crossing automatically made or broke an electric circuit which operated a locking device or devices and prevented the operator of the interlocking machine from restoring the lever he had just reversed to normal while that train was on the crossing, and thereby prevented the operator from reversing any lever controlling conflicting routes. In short, the interlocking machine prevented the operator from clearing two conflicting routes by the mechanical interlocking of its levers, except when the operator forgot himself and attempted to restore the lever he had reversed to clear one route while the train was passing over that route and the passing train automatically prevented the operator from restoring that lever while the train occupied that route. Heretofore in these systems the train took control of the interlocking machine away from the operator when its front wheels entered the section of track over which it had obtained right of way from the operator of the interlocking machine and retained that control until its rear wheels had left that section of track, when it surrendered control of the interlocking machine to the operator, and this is highly objectionable, as it causes a train to hold control of the section longer than is practical at busy crossings, and the only means heretofore known for shortening the time during which the passing train held control of a section was to reduce the length of that section, and thereby make the protection questionable.

My invention is subdividing the section into three sections and providing means whereby the entrance of a train on either of the extreme sections takes away the control of the lever for operating the blocking appliances from the operator and causes the train to retain that control until the rear wheels of the train leave the middle section and to surrender that control when the rear wheels of the train leave the middle section, also a novel electric locking device for a lever of an interlocking machine, and also a novel electric switch operated by either of two levers, so disposed that the first lever operated takes control of the electric switch and also inhibits the second lever from controlling that switch—that is, the passing train automatically operates the levers successively—and the operation of either lever first not only gives control of the switch to that lever, but also causes the lever first operated to prevent the action of the other lever on the switch.

In the drawings, Figure 1 is a diagram illustrating one embodiment of my invention. Fig. 2 is a front view, and Fig. 3 an edge view, of the preferred form of circuit-controlling device. Figs. 4 and 5 show the electromechanical lock for the interlocking machine.

In Fig. 1 I show two tracks R′ R^2 and blocking appliances S′ to S^4 normally at "danger," so that no train can pass over either track until it has called for signals and until the operator at the interlocking machine (indicated by L) has replied to the call by setting up the route called for, which he does by reversing the proper lever or levers of the interlocking machine, long used and too well known to need description except as to my electromechanical locking device, which constitutes one feature of my present invention.

The interlocking machine is shown as having two levers, and the lever L′ must be reversed to clear the route over track R′ and locks the other levers in the well-known way. So reversing-lever L^2 clears R^2 and locks the other levers. In short, only one of these two levers can be reversed at one time, and of these two levers one will be locked in its normal position when the other is reversed, so that when one is reversed it must be restored to its normal position before the other one can be reversed. This is the familiar mechanism for interlocking long well known and familiar to all skilled in this art. One example of such an interlocking machine is fully described in Patent No. 724,947, dated April 7, 1903.

When both levers L′ L^2 are normal, all the routes are blocked; but either can be unlocked by reversing its controlling-lever, and when the operator hears a call for signals over either route he reverses the controlling-lever of that route and sets up or clears that route; but should he hear a call for signals over a conflicting route he must first restore the lever of the cleared route before he can reverse the lever of a conflicting route, and therefore I have provided the electromechanical lock. (Shown in Figs. 4 and 5.) This lock consists, as shown, of a slide p, notched for locking-bolt p', which is actuated by magnet P through armature p^2 and lever p^3, which carries locking-bolt p'. There are two of these slides p, one for each lever, and when either lever is reversed the notch of its slide p is carried under its bolt p', and that bolt drops into that notch, the magnet P being then not energized; but when magnet P is energized its armature p^2 is attracted, lever p^3 raised, and bolt p' withdrawn from its notch in slide p, and the lever which actuates slide p can then be restored to its normal position.

When both levers L′ L^2 of the interlocking machine are at normal, neither is locked and either can be reversed, but all routes are blocked, and reversing either lever locks the other in normal position, and the lever reversed is also locked in its reversed position by its slide p and bolt p' and the proper route is cleared, leaving the other route blocked and locked. Moreover, the lock of the reversed lever is under control of magnet P, so that the reversed lever cannot be restored until a current is sent through the coils of magnet P.

If there be no train on either route and one of the levers be reversed, the operator can send a current through magnet P of the reversed lever to lift bolt p', so that he may restore the reversed lever; but if there be a train on the route controlled by that reverse lever the circuit (which is formed in part by the coils of the magnet P of that route) is broken and remains broken until the rear wheels of a train on that route have traveled over the crossing far enough to prevent all possibility of its being struck by a train over a conflicting route. For example, suppose a train on track R′ calls for signals, all the routes being then blocked. The operator then sets up the route on R′ by first reversing its lever L′, and thereby locks lever L^2 in the usual way and also locks lever L′ in its reversed position by the slide p and bolt p'. Should a train on R^2 call for signals before the train on R′ has passed the crossing and should the operator forget himself or erroneously suppose that the train on R′ had passed and try to restore the lever of R′ preparatory to setting up the route over R^2, the slide p and bolt p' of the lever L′ of R′ prevent him from restoring lever L′, and he cannot remove bolt p' from slide p of lever L′ of R′ by sending current through the circuit of magnet P′ of the lever L′, for the reason that that circuit is automatically broken at switch q^2 q^3 by the presence of a train on route R′. This will be plain from Figs. 2 and 3, taken with Fig. 1. In Figs. 2 and 3 the electrodes q^2 q^3 of the switch are moved into and out of contact by lever Q. So long as both magnets A and B are energized q^2 and q^3 are in contact; but when magnet B is short-circuited by the entrance of a train on section x' of track R′ its armature b is thrown out by spring b' and swings lever Q, carrying electrode q^2 away from electrode q^3.

The break at q^2 q^3 is automatically caused by the entrance of a train on section x' of R′ and remains, of course, until the rear wheels of that train have left section x^2 of R′; but as soon as the front wheels of that train pass from section x' to section x^2 of R′—that is, pass derailer S^2, for S′ S^2, &c., indicate derailers or the like—magnet D is short-circuited and the circuit of magnet B automatically broken at b^2 b^3, so that a train passing over R′ from the right automatically breaks the circuit of magnet B, and the operator cannot close that circuit until the rear wheels of that train have left section x^2 of R′, and a train passing over section x^2 of R′ from right to left acquires control of magnet P′ and takes away control of magnet P′ from the operator as soon as its front wheels enter section x' of R′ at the right and keeps control of magnet P′ until its rear wheels leave section x^2 of R′ at the left, when the operator reacquires full control of magnet P′ through his switch q q'.

The break at b^2 b^3 remains until the rear wheels of the train have left section x^2 of track R′ and have also passed signal S′, (which is, in fact, a derail and cannot be passed except when at "safety;") but as the rear wheels of the train leave section x^2, near S′, current flows through magnet D, which attracts its armature and closes the circuit of magnet B at b^2 b^3, when current flows through circuit of magnet B, which attracts its armature and closes circuit of magnet P′ at q^2 q^3. When the circuit through locking-magnet p' is closed at q^2 q^3, that circuit is complete except at the operator's switch q q', so that the operator can then unlock the reversed lever L′ by making contact at q q', and this is done in practice by a switch always under control of the operator, but normally with its points q q' separated. It will also be plain that when the front wheels of the train leave x' at S^2 and enter x^2 and short-circuit magnet D the fall of the armature D not only breaks the circuit of magnet B at b^2 b^3, but also of magnet A at a^2 a^3, and magnet A drops the armature a onto the end of armature b of magnet B, but without affecting lever Q or switch q^2 q^3, then under control of armature b. This provision of a break at a^2 a^3 when a train from x' enters x^2 is precautionary merely, for when the front wheels of a train pass from section x^2 onto section x^3 of R′ magnet A is short-circuited and its armature a would drop if there were no means for dropping it before; but armature a cannot drop far enough to strike lever Q, as armature b is then in the way, so that armature a is upheld by armature b. Magnet A remains short-circuited until the rear wheels of the train leave section x^3; but as soon as the rear wheels of that train leave section x^2 magnet D ceases to be short-circuited, becomes "energized," attracts its armature d, and closes the circuit of magnet B at b^2 b^3, also of magnet A at a^2 a^3, and magnet B becomes reënergized, attracts its armature b, which is moved far enough to allow lever Q to close the circuit of magnet P′ at q^2 q^3; but armature b is stopped by its shoulder b^4 engaging armature a, so that armature b cannot be fully retracted until armature a is lifted, which happens when the rear wheels of the train leave section x^3, when both armatures a and b return to normal, both magnets A and B being then energized.

It will now be plain that locking-magnet P′ is not under the control of the operator from the moment when the front wheels of a train moving from right to left enter section x' until the rear wheels of that train leave section x^2 at S′ and from the moment when the front wheels of a train moving from left to right enter section x^3 until the rear wheels of that train leave section x^2 at S^2.

For a train running from left to right over R′, as soon as its front wheels enter section x^3 short-circuits magnet A, and thereby drops armature a, which moves lever Q to break the circuit of magnet P′ at q^2 q^3, and as soon as its front wheels enter section x^2 short-circuits magnet D and drops armature d, breaking the circuit of magnet A at a^2 a^3, and incidentally of magnet B at b^2 b^3, and as soon as its rear wheels leave section x^3 at S′ magnet A is no longer short-circuited, but the circuit is broken at a^2 a^3, and as soon as its rear wheels leave section x^2 at S^2, magnet D is no longer short-circuited, but is reënergized, and the break at a^2 a^3 in the circuit of magnet A is closed and magnet A is reënergized, its armature a moving far enough to close the break at q^2 q^3 in the locking-circuit through the coils of magnet P′, but not making the whole of its return stroke, for the reason that as soon as magnet D drops its armature the circuit of magnet B is broken at b^2 b^3 and its armature b thrown by spring b' onto armature a, so that when magnet A is reënergized (by the rear wheels leaving section x^2) the shoulder a^4 of the armature a engages shoulder b^5 of armature b, and both are thus interlocked until the rear wheels of the train running from left to right have left section x'. Of course when the front wheels of a train running from left to right leave section x^2 and enter section x' the battery of magnet B is short-circuited, and magnet B would then drop its armature if its circuit had not before been broken at b^2 b^3.

The operation of a train running over R^2 in either direction and its automatic control of locking-magnet P^2 through magnets A^2, B^2, and D^2 will be plain without further description.

The main object of my invention, as will now be clear, is to keep the main levers of the interlocking machine when reversed under control of the passing train until the rear wheels of that train have left section x^2 of R′ or of R^2 and then taken away that control from the passing train and restore it to the operator at the interlocking machine, my main advance in the art being that heretofore the passing train retained that control until its rear wheels left section x^3, if running from right to left, or its rear wheels left section x', if running from left to right. It will also be obvious that my invention is not limited to crossing railroad-tracks—as, for example, track R^2 as opposed to R' might be a highway or a drawbridge or, in short, any other obstacle to the free running of a train over R', and vice versa.

The gist of the matter is that a train from any direction automatically takes control of the interlocking machine after the operator has set up the route and retains that control until the rear wheels of the train have left the middle one of these sections.

While I have shown the levers for controlling-switch q^2 q^3 as armatures *a* and *b* of magnets, it is obvious that these levers may be successively operated by other means than electrical or magnetic, as will be plain without description.

What I claim as my invention is—

1. The interlocking system above described comprising a railway-track divided into three insulated sections, blocking appliances for said track under control of a lever which when in one position clears that track for the passage of trains and which when in the other position blocks that track; a locking-bolt locking that lever when in position for clearing the track; means by which the operator can shift the locking-bolt and control the lever when no train is on the track; and automatic means by which the entrance of a train on either extreme section takes away the control of the locking-bolt from the operator, retains that control while the train travels over one extreme section and the intermediate section, and surrenders that control to the operator when the train leaves the intermediate section.

2. In an interlocking system in combination with a lever; a locking-slide carried by that lever; a bolt locking that slide when its lever is reversed; an electromagnet for disengaging the bolt from the slide; and means for energizing that magnet under the joint control of the operator and a passing train.

3. In combination an electric switch whose points q^2 q^3 are controlled by a lever Q; levers *a* and *b*, either one of which will when swung on its fulcrum operate lever Q; means for swinging each lever *a* and *b*, on its fulcrum; and means carried by the levers *a* and *b*, by which lever *a* automatically prevents the back swing of levers *b* and Q when lever *b* has control of lever Q, and lever *b* automatically prevents the back swing of levers *a* and Q when lever *a* has control of lever Q.

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