(No Model.) 3 Sheets—Sheet 1.

J. W. LATTIG.

RAILWAY SIGNAL APPARATUS AND SYSTEM.

No. 486,047. Patented Nov. 8, 1892.

Fig. 1.

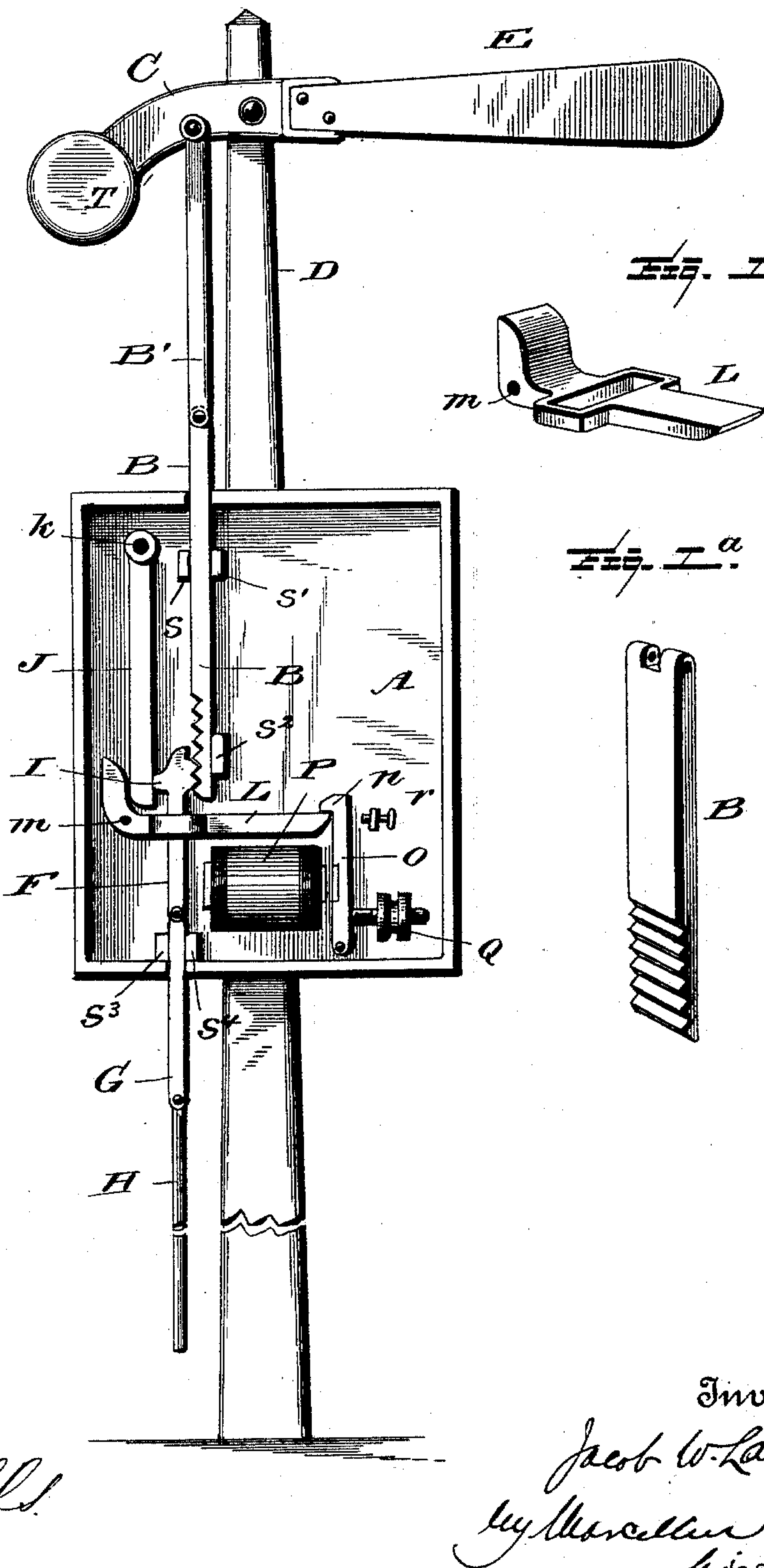


Fig. 1.c

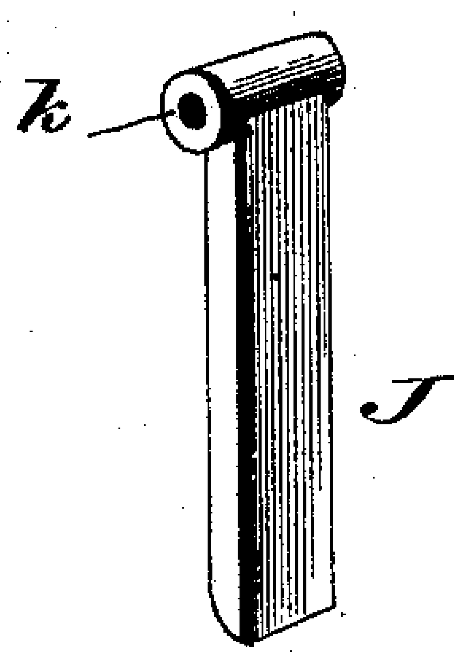
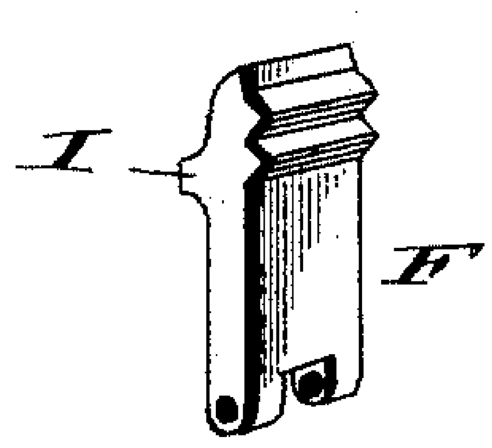


Fig. 1.d

Fig. 1.a

Fig. 1.b



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3 Sheets—Sheet 2.

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Fig. 2.

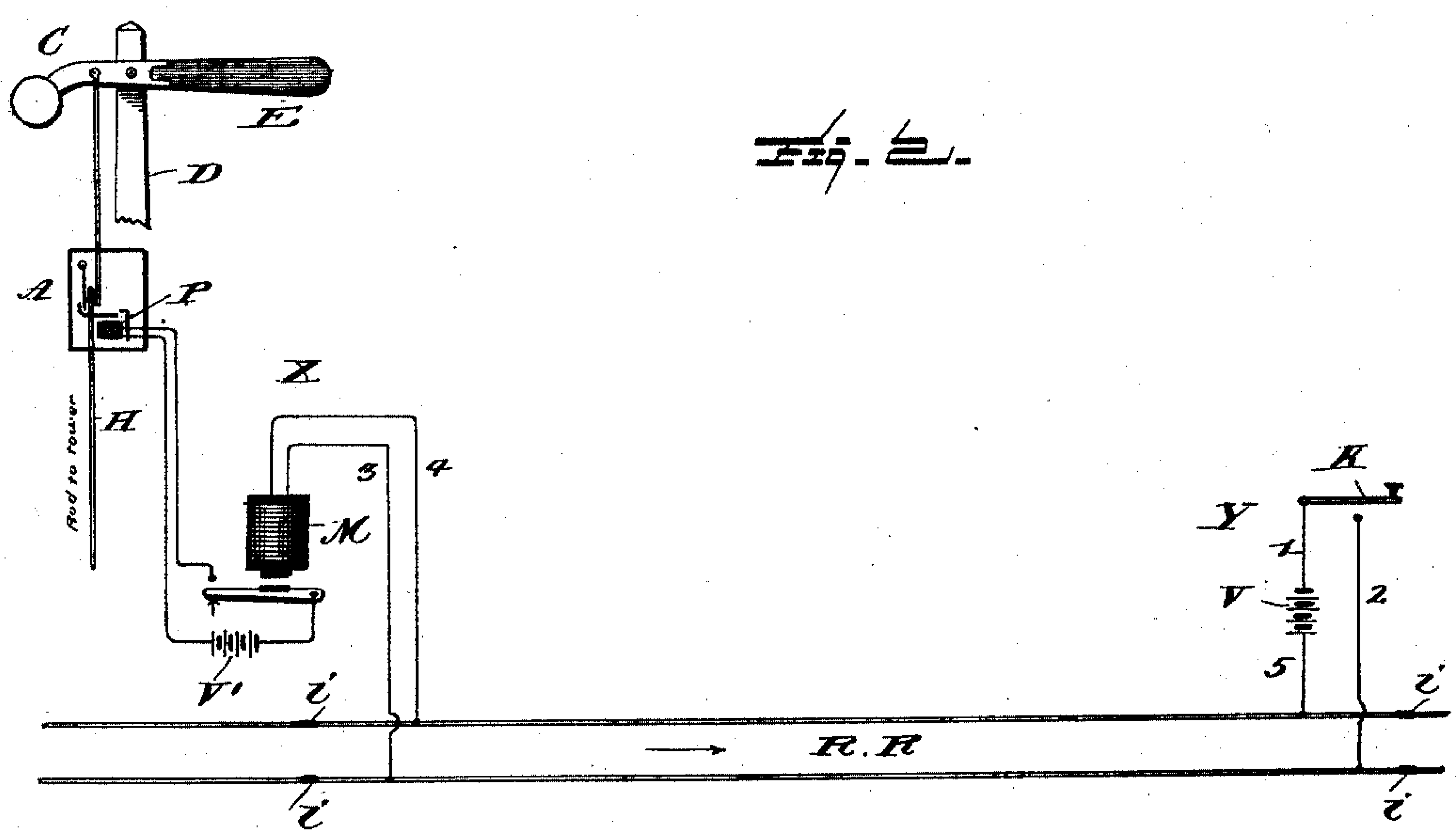
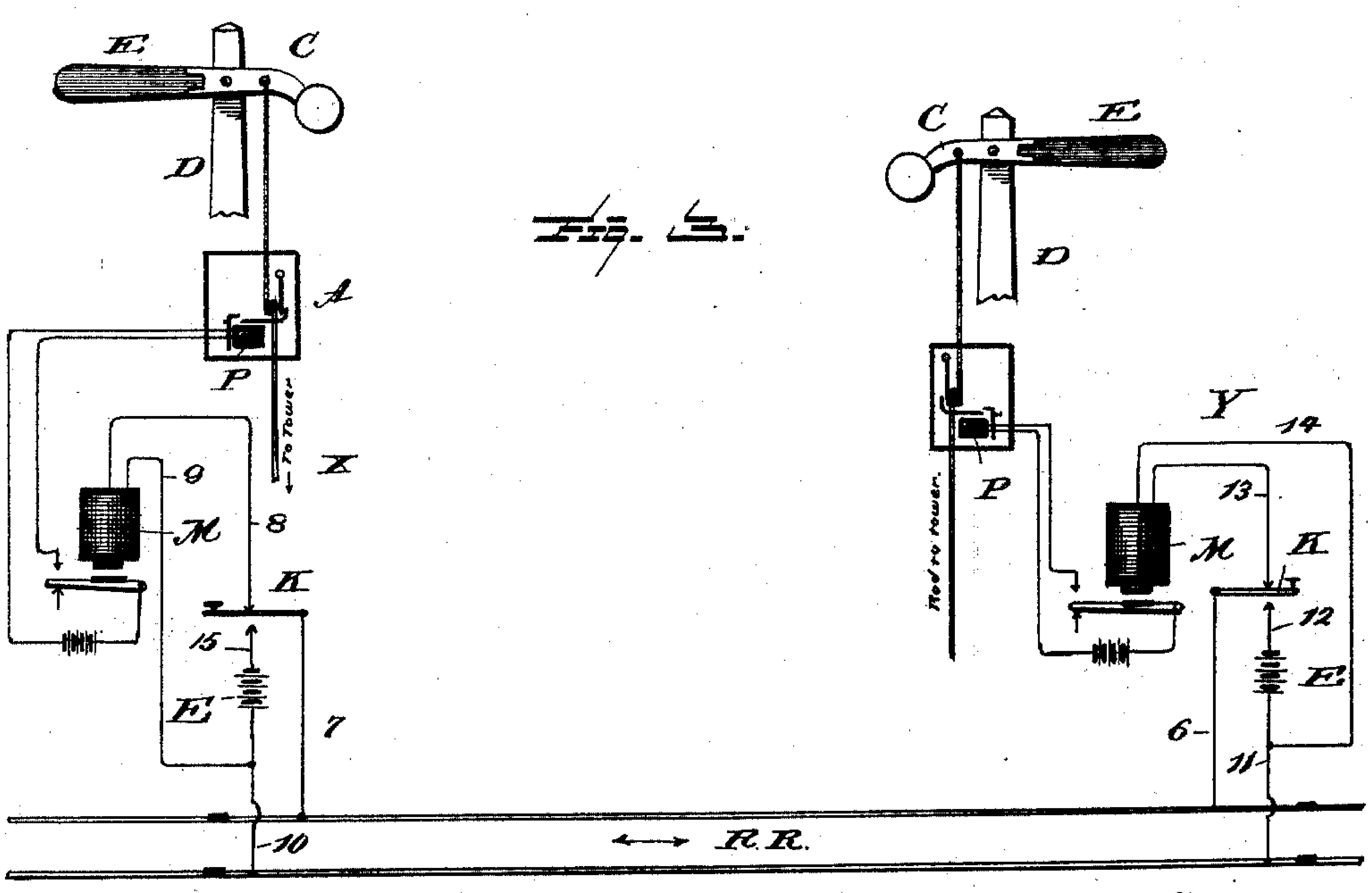


Fig. 3.



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RAILWAY SIGNAL APPARATUS AND SYSTEM.

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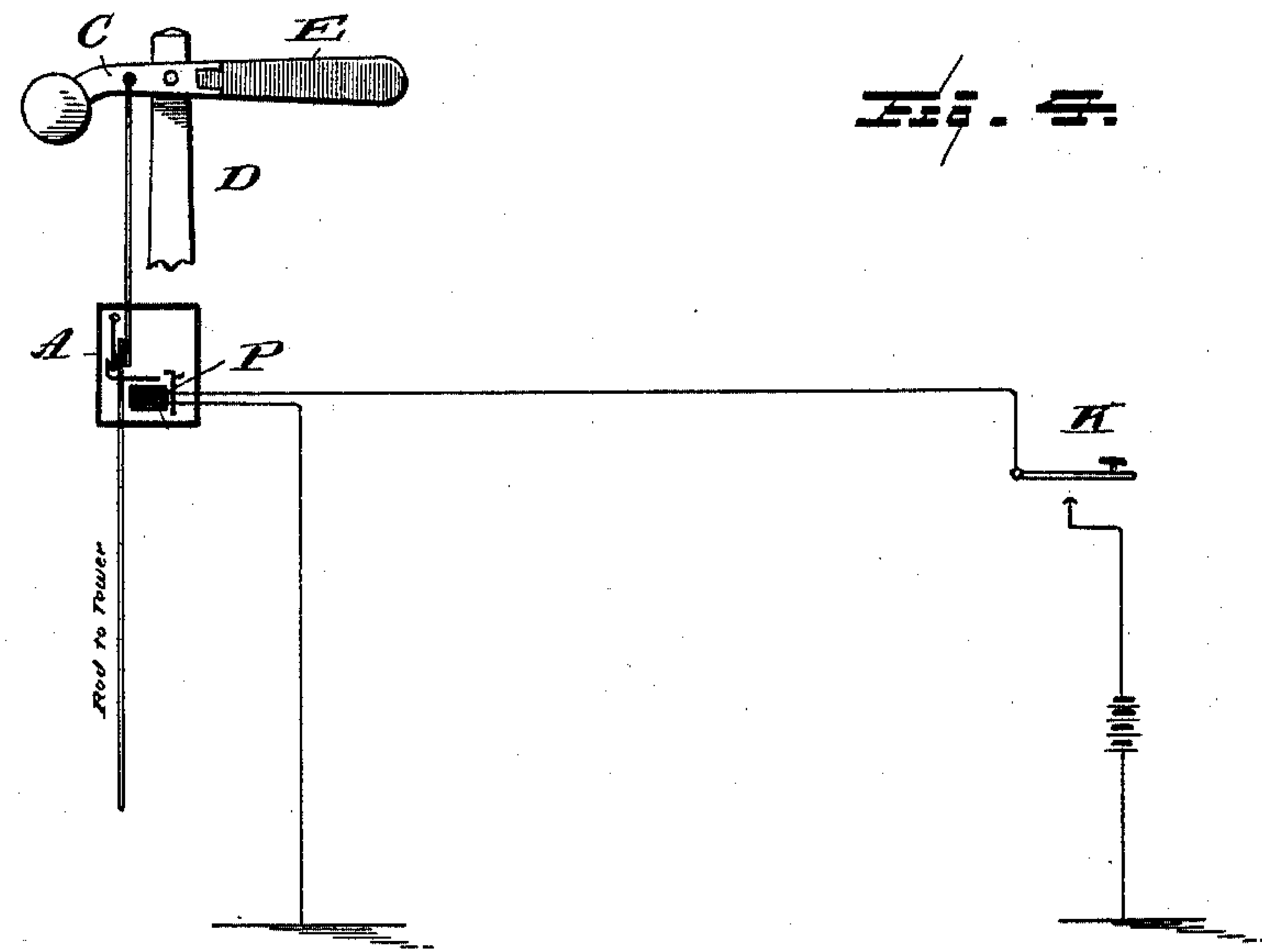

Fig. 4.

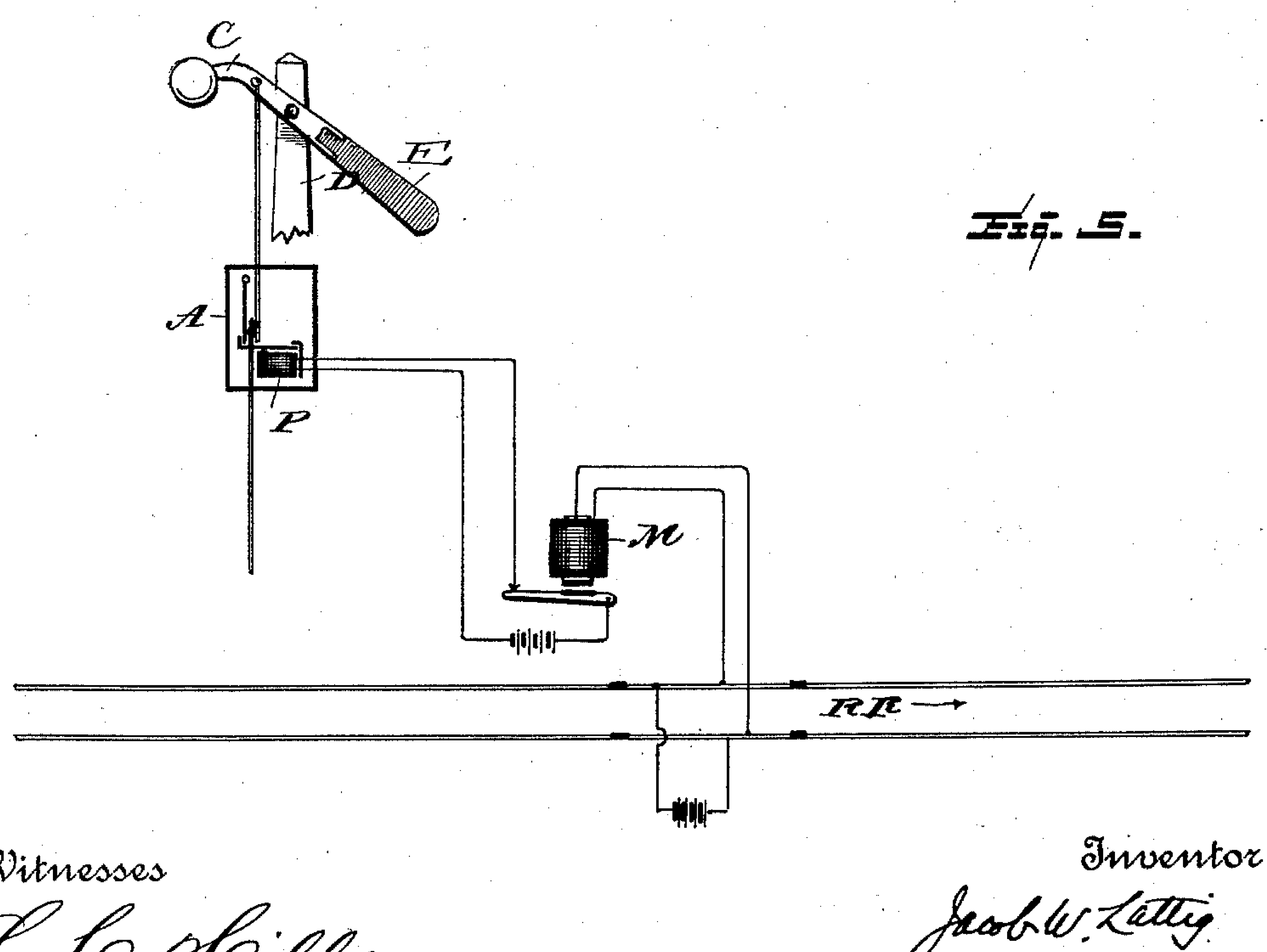

Fig. 5.

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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNAL APPARATUS AND SYSTEM.

SPECIFICATION forming part of Letters Patent No. 486,047, dated November 8, 1892.

Application filed August 18, 1892. Serial No. 443,373. (No model.)

To all whom it may concern:

Be it known that I, JACOB W. LATTIG, of Easton, in the State of Pennsylvania, have invented new and useful Improvements in Railway Signal Apparatus and Systems, of which the following is a specification.

My invention relates to that kind of railway signal apparatus in which the signal-operating mechanism, having in it a mechanical break at some point between the signal and the signal-operating lever, is combined with means for closing the break and an electro-magnet for controlling the operation of the break-closing means, the arrangement being such that whenever and so long as the magnet is inactive the break in the signal-operating mechanism will be open and incapable of closure by the break-closing means, and the signal, if not already in "danger" position, will be returned to and maintained in "danger" position or in that position (whatever it may be) which it is intended it shall assume whenever the magnet is inactive.

My invention, so far as the apparatus is concerned, resides, mainly, in the break-closing means. The break itself is conveniently provided by dividing one of the operating-rods of which the connections are composed and by forming the adjoining ends of the two divisions in such manner that they will engage each other so long as they are pressed together. The break-closing means consists of a clamp-like guide, the walls of which (one or both) can yield whenever desired, but which so long as they are rigid and unyielding will press together and hold in engagement the two ends of said rod, which can slide freely between them. The movable member of the clamp is movable or fixed, according as the magnet is inactive or active, the magnet for this purpose controlling a latch or lock, by which when the magnet is active, and only then, the movable member is locked tight in its clamping position. The apparatus thus organized is susceptible of wide and varied use in single and double railway track-block systems, in which the circuit for controlling the magnet may or may not be formed in part of the track-rails, or in connection with the home and distant signals of ordinary interlocking towers.

Some of its more important applications will be hereinafter illustrated and described, involving other and additional features of invention, which will be pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section of the more important parts of the mechanism for operating and controlling the signal. Figs. 1^a 1^b 1^c 1^d are details. Fig. 2 represents my invention as embodied in a railroad signal system where the traffic, as on a double-track railroad, is in one direction only on one track. Fig. 3 shows the embodiment of the invention in a system of railroad-signaling where the traffic, as on a single-track railroad, is in both directions on the same track. Fig. 4 represents the invention as applied to a system in which the electric circuit containing the magnet is not formed in part of the track-rails. Fig. 5 represents the invention as embodied in a system where it is designed to act, in effect, as a trip to place the signal to "danger" automatically under certain conditions.

To an understanding of the systems illustrated in Figs. 2, 3, 4, and 5, it will be necessary to first explain the construction and mode of operation of the apparatus illustrated in Fig. 1.

C is the signal-casting carrying the semaphore E and pivoted in the usual way to the pole D. It is represented in its normal or "danger" position and is brought and held in this position by its weight T.

B' B F G H are a portion of the signal-operating connections or mechanism leading from the signal to the operating-lever in the tower in the usual way. The break in this mechanism is between the parts B and F.

A is a suitable box to contain the magnet and the parts of the apparatus with which it is in more immediate operative connection. In practice I prefer to attach this box to the signal-pole D, so as to be out of tampering reach; but it may be inserted anywhere on the line of rod or pipe leading from the tower to the signal.

The part B is a toothed slide-bar, which passes up through an opening in the top of the box and is guided and held in place from lateral movement by guides s s' s^2. The part F is also a toothed slide-bar, the teeth of the two bars F B facing each other, so that they will interlock or engage when pressed together. It is shown in perspective in Fig. 1[b]. The bar F, unlike the bar B, does not move between fixed guides and it is jointed to the end of rod G, which for this purpose projects into the box A through the bottom, at which point it is received between guides s^3 s^4. To hold the hinged toothed bar F in engagement with bar B, I make use of the lever J, (shown in face view in Fig. 1[c],) which is pivoted at k to the box A and is intended to bear upon the rib or projection I on the back of bar F. This swinging lever forms the movable member of the clamp hereinbefore referred to, the stationary member of said clamp being the fixed guide s^2.

To hold the lower and free end of the lever up to its work, I make use of a latch, consisting in this instance of an angle-lever hung at its elbow in the box on a horizontal pivot m, with its shorter arm arranged to extend up just behind the lower end of the lever J. The longer arm of the latch-lever extends across the path of the toothed bar F, and it accordingly is at this point forked or slotted, as shown in the plan view, Fig. 1[d], to clear the bar and to allow the latter freedom to swing into and out of engagement with the toothed bar B.

To hold in turn the latch-lever in the position in which it will prevent the clamp-lever J from moving outwardly, I make use of a detent, which in this instance consists of a hook n on the upper end of the pivoted armature-lever O, which carries the armature of the electro-magnet P, the arrangement being such that when the magnet is active or energized the movement of the armature-lever thereby caused will cause the hook n to catch over the end of the long arm of the latch-lever and thus lock the latter in place. Whenever the magnet is inactive or de-energized, the armature-lever, by its weight Q or equivalent retractile agency, will be pulled back against its back stop r, thus removing the hook n from the latch-lever and releasing the latter, and consequently the clamp-lever J also, which leaves the bar F free to fall back out of engagement with the bar B.

When the parts occupy the position shown in the drawings, the magnet P is energized, as it must always be whenever the hook n is in the position represented. Under these conditions, if the rod H be pushed upward, then, inasmuch as the levers J L are held up to their work by the hook or detent n, the bars F and B are held firmly in engagement, and consequently the signal will be operated and lowered to inclined or "safety" position. If when this is accomplished, or, indeed, at any time during the movement, the magnet P should be demagnetized, the detent n would be at once removed from the latch-lever, and the latter, together with the clamp-lever J, would at once be set free, thus permitting the bar F to swing back out of engagement with the bar B, the result of which would be that the signal would at once return to "danger" position and the bar F would thereafter be incapable of giving any motion whatever to the bar B; and so, with the parts in the position shown in Fig. 1, if the magnet were de-energized the signal could not be operated at all, because the detent n would be drawn back from the latch-lever, and consequently there would be nothing at all to hold the bar F up to its work. If under these conditions the rod H were raised, the bar F would rise with it; but instead of lifting the bar B it would simply push to one side the clamp-lever J.

It will be seen from the foregoing that the signal is, in effect, governed entirely from the magnet P and that the signal is inevitably returned to or kept at horizontal or "danger" position in case of breakage of wires or any portion of the circuit, failure of battery, or short-circuiting of the magnet from any cause, a feature of which is of manifest advantage in block systems where the magnet-circuit is formed in part of the track-rails, as will be understood by reference to Figs. 2, 3, 4, and 5.

In Fig. 2, R R is a section of one track of a double-track railroad between two stations X Y, the direction of traffic on which is indicated by the arrow. The section is insulated at each end, as indicated at i. The rails of the section form part of an electric circuit, which includes key K, and battery V at station Y, and magnet M at station X, the circuit being completed by wires 1 2 3 4 5. This circuit I term the "lock-operating circuit." There is also a second and local circuit at station X, which includes the magnet P of the mechanism hereinbefore described, and its battery V′, and is completed through the armature-lever of magnet M, or through contacts controlled thereby. This circuit I term the "lock-circuit." The parts and their connections are represented in normal position, the signal standing at "danger." The part marked A is intended to conventionally represent the apparatus of Fig. 1. Both circuits are open, the lock-operating circuit at the point controlled by the key K, at station Y, the lock-circuit at the point controlled by the armature-lever of magnet M, which is on its back-stop. Under these conditions, to permit a train to enter the block the lever-man at the station X must wire the man at station Y to connect him to his signal, which the station-Y man does by closing the lock-operating circuit through his key K, thereby energizing magnet M, which by attracting its armature closes the local lock-circuit at station X. In this way the magnet P is energized and the break in the signal-operating mechanism at station X is consequently closed, thus enabling the lever-man at this station to shift his signal to "safety." It is to be noted, however, in this connection that the ability of the operator at station Y to close the circuit through magnet M, at station X, would be curtailed by several contingencies, as, for example, by a broken rail or wire, a defective battery, a bridge swept away, a land slide, and last, but most important, by a section of a train or even by a pair of connected wheels left on the insulated section. The men at both stations must, therefore, not only act in harmony, but the track, the circuits, and the battery must be intact, the preceding train must have entirely cleared the block and all conditions of safety must be fulfilled before a following train can be admitted to the block. It is obvious that switches also may be included in the rail portion of the lock-operating circuit, so as to prevent the giving of a safety-signal if a switch be wrong. As soon as the train passes the signal at X and enters upon block-section R R, magnet M is cut out, the current seeking the path of lower resistance offered by the wheels and axles of the cars its armature-lever drops back, and consequently the local lock-circuit including magnet P is broken with the effect of unlocking the bars F B of Fig. 1 and causing the released signal to at once go automatically to "danger." No two trains, therefore, can enter the block without the consent and aid of the lever-men at both stations. The signal is always locked at "danger," or what is equivalent to the same thing the break in the signal-operating mechanism is open, so that the signal cannot be moved from the "danger" position until all safeguards are complied with. There will be a corresponding arrangement for the section of the other track of the double track, except, of course, for this section, the apparatus at station X will be at station Y, and vice versa. Substantially the same arrangement obtains in applying the system and apparatus to a single track on which the traffic is in both directions with such modification of the lock-operating circuits as required in order to enable the same insulated track-section to be used in common for both lock-operating circuits. This will be understood by reference to Fig. 3. At each station there is a key K to control the lock-operating circuit which includes the magnet M at the other station. Each key K is between two contacts. The upper contact against which it normally rests is in the lock-operating circuit controlled from the other station. The lower contact from which it is normally operated is in its own lock-operating circuit. Thus each key when out of action forms part of the other circuit, and when closed to complete its own circuit necessarily opens the contact with the other.

The lock-operating circuit from key K at station Y is traced from that key as follows: 6, one rail of insulated section to station X, 7, K, (of station X,) 8, magnet M, 9, 10, other rail of insulated section, back to station Y, 11, battery E, (station Y,) 12, and lower contact of key K.

The corresponding circuit from key K at station Y is traced from that key as follows: 7, one rail of insulated section to station Y, 6, K (of station Y) 13, magnet M, 14, 11, other rail of insulated section back to station X, 10, battery E (station X) 15, lower contact of key K. Each magnet M controls at the station where it is located a lock-circuit precisely similar to that already described by reference to Fig. 2. All four of the circuits, the two lock-operating circuits, and the two local lock-circuits are normally open.

If the operator at station X, for example, close his key K, this will energize the magnet M at station Y, thus closing the local lock-circuit through the magnet P at that station and permitting the operator there to set his signal to "safety" and admit a train from his end into the block. The moment the train enters the block the signal at Y, for reasons hereinbefore given, automatically goes to "danger," and thereafter and until that train has passed out from the block a safety-signal cannot be given from either end. It is utterly impossible to give a safety-signal from both ends simultaneously.

The arrangement illustrated in Fig. 4 is one which can be advantageously employed whenever for any reason it is deemed prudent to require the services of two men to operate one signal, even at the same station, one to control the key K, the other to operate the mechanical appliances for setting the signal. In view of what has already been said the arrangement will be understood from the figure without further explanation. The man who handles the operating-lever by which the signal is set can never put the signal to "safety" without the aid of the man at the key K; but the key-man can always put the signal to or keep it at "danger."

The apparatus, as hereinbefore indicated, can also be used in connection with any of the home or distant signals of ordinary interlocking-towers, and be made to act as a "trip" to place such signals automatically to "danger" as soon as a train passes beyond the signal; but for this purpose to open the break in the signal-operating mechanism only momentarily, the break then automatically closing, so as to restore the signal-operating mechanism to operative condition. This is illustrated in Fig. 5, in which the signal is supposed to be operated from a tower, the traffic is in the direction of the arrow, and the track has a short insulated section a little in advance of the signal.

There is a local lock-circuit containing magnet P for controlling the break in the signal-operating mechanism similar to the like circuit already described and illustrated in Figs. 2 and 3. There is also a second circuit, which like the lock-operating circuits already described, is completed through the insulated track-section and includes the magnet M, by whose armature the circuit of magnet P is opened and closed, but which, unlike those circuits, contains no key K and is constantly closed. Under these conditions the magnet M is normally energized, the circuit of magnet P normally is closed, and the signal-operating mechanism normally is in operative connection with the signal; but whenever a train passes over the short insulated track-sections the magnet M is cut out or short circuited and the signal goes to "danger." The moment, however, the train passes the section the parts resume their normal condition and the signal can, as before, be operated in the usual way from the tower.

Having described my improvements, what I claim herein as new and of my own invention is as follows:

1. The combination of a railway-signal, signal-operating mechanism composed in part of two rods or slide-bars capable of engaging and being disengaged from one another, a clamp through which said bars pass and can move, means for locking the clamp in its closed position, and an electro-magnet for controlling said locking means, substantially as and for the purposes hereinbefore set forth.

2. The combination, substantially as set forth, of a signal, a divided signal-operating rod, a clamp for holding together the two parts of the rod which pass through and move in said clamp, and an electro-magnetically-operated detent for controlling the movable member of said clamp, substantially as and for the purposes hereinbefore set forth.

3. In combination with the two toothed slide-bars forming part of the signal-operating mechanism, the clamp-lever, the pivoted latch-lever locking and releasing the clamp-lever, the detent for locking and releasing the latch-lever, and the electro-magnet and its armature-lever for controlling the detent, substantially as and for the purposes hereinbefore set forth.

4. The combination, substantially as hereinbefore set forth, of a signal-operating mechanism having at some point in it between the signal and the operating-lever a mechanical break, means for closing said break, an electro-magnet controlling said break-closing means, a lock-circuit including said magnet, and a second or lock-operating circuit including an electro-magnet which controls contacts included in the lock-circuit, substantially as and for the purpose hereinbefore set forth.

5. A railway electric block-signaling system comprising at one station a signal, signal-operating mechanism having in it a mechanical break, means for closing said break, an electro-magnet for controlling said break-closing means under such an arrangement that the break shall be open so long as and whenever the magnet is inactive, and a normally-open lock-circuit including said magnet, in combination with an insulated track-section extending from that station to the next, a normally-open lock-operating circuit formed in part by the track-rails of said section, and including at the last station the key by which it is closed and opened, and at the first-named station (or station where the signals to be operated is located) an electro-magnet controlling normally-open contacts in the local lock-circuit, the arrangement being such that the local lock-circuit at the one station can be closed only through the closure of the lock-operating circuit at the other station, substantially as and for the purposes hereinbefore set forth.

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