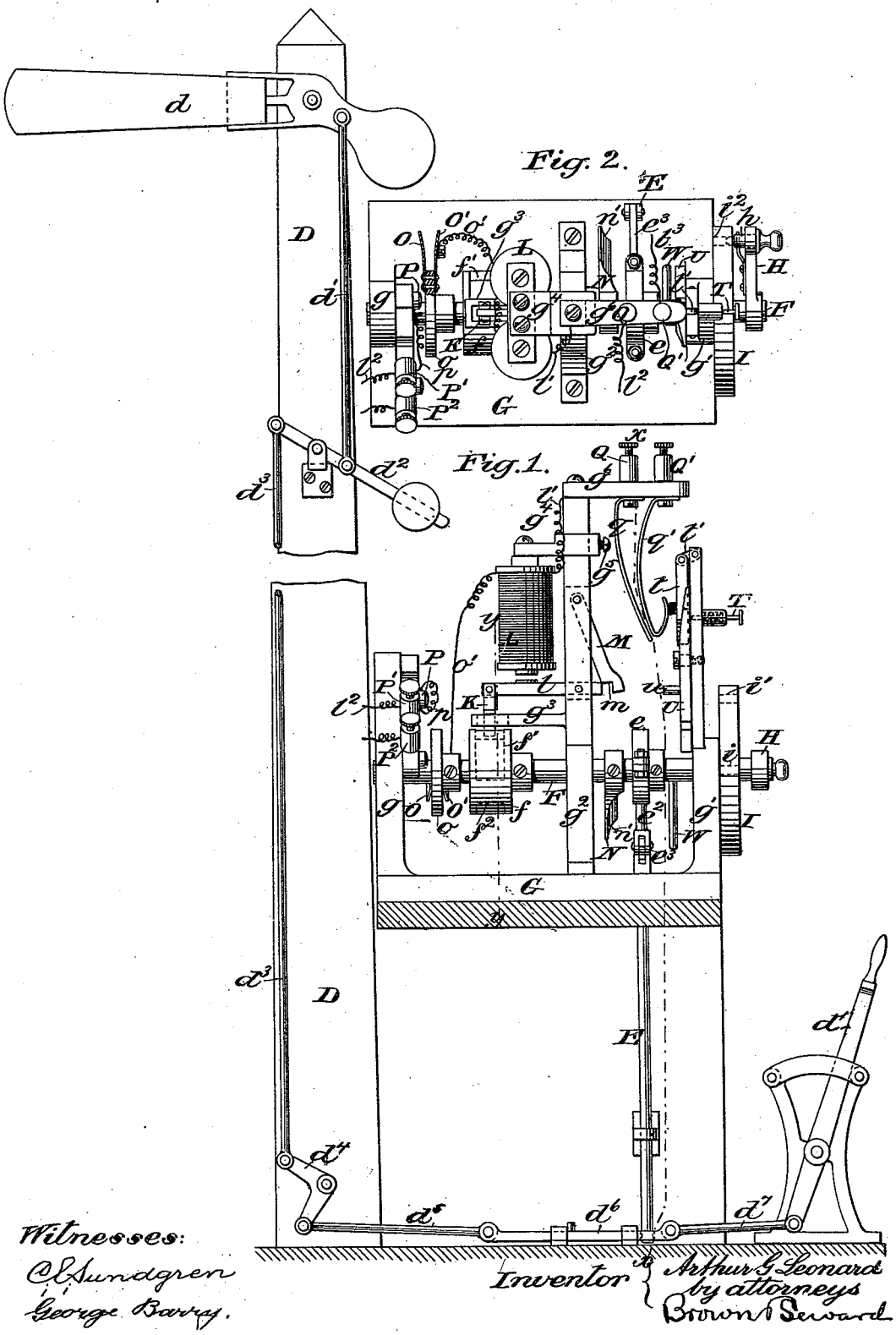
(No Model.) 3 Sheets—Sheet 1

A. G. LEONARD.

MANUALLY CONTROLLED ELECTRIC BLOCK SIGNAL SYSTEM.

No. 554,884. Patented Feb. 18, 1896.



(No Model.) 3 Sheets—Sheet 2.

A. G. LEONARD.

MANUALLY CONTROLLED ELECTRIC BLOCK SIGNAL SYSTEM.

No. 554,884. Patented Feb. 18, 1896.

Fig. 3.

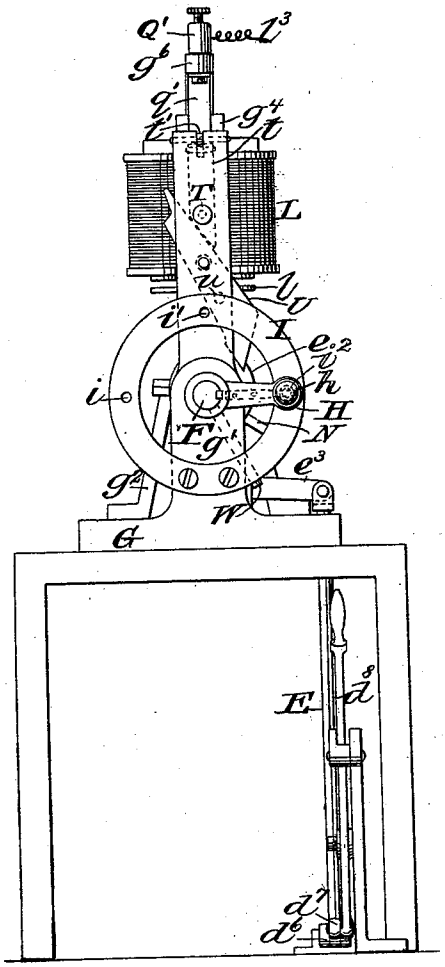


Fig. 4.

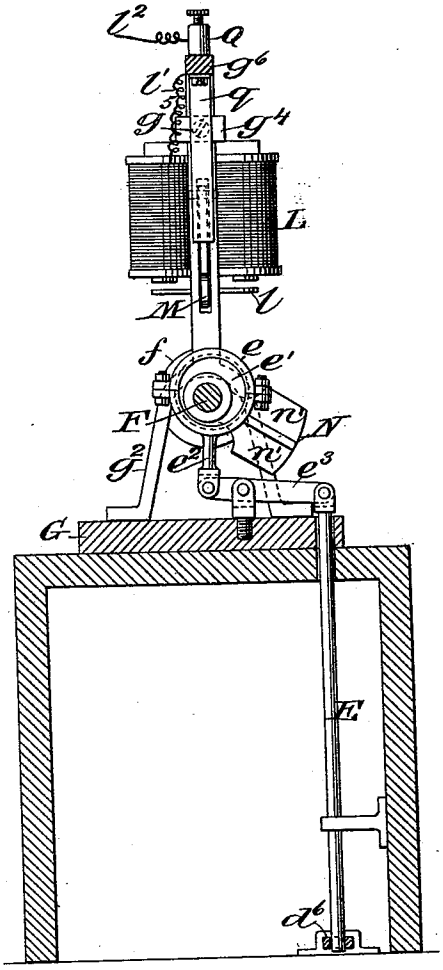
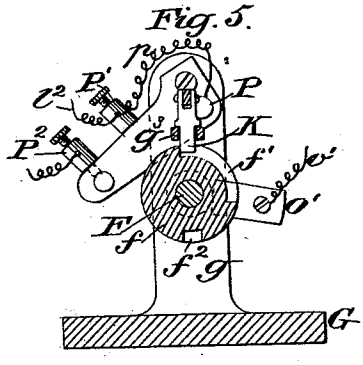


Fig. 5.



Witnesses:
C. Sundgren
George Barry.

Inventor:
Arthur G. Leonard
by attorneys
Brown & Seward

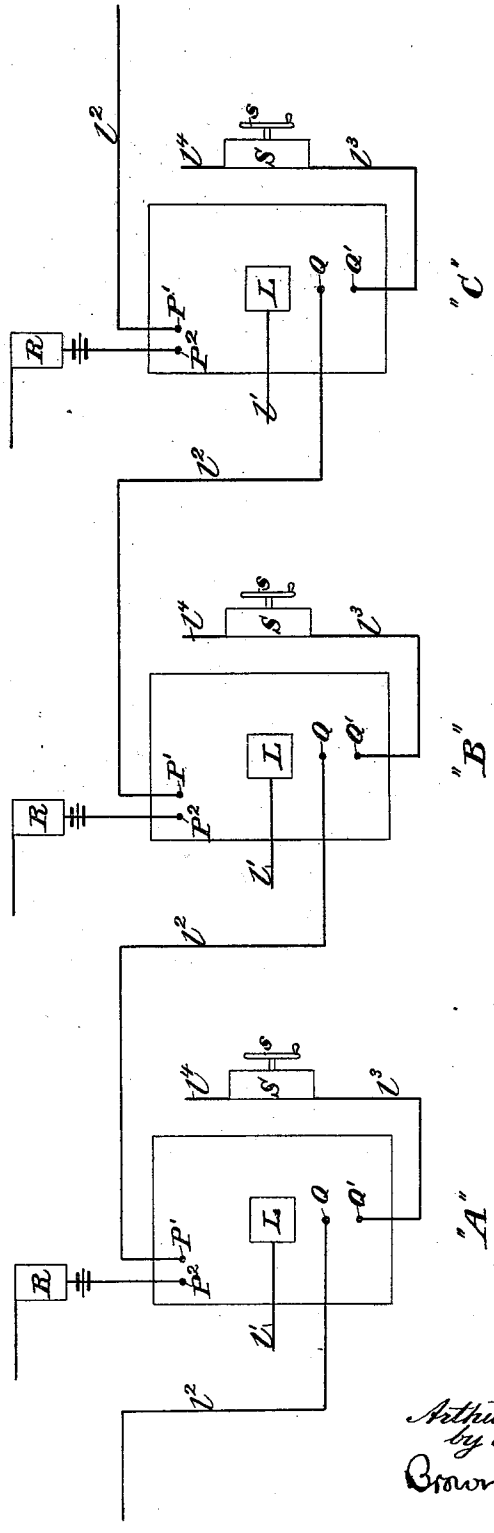
(No Model.) 3 Sheets—Sheet 3.

A. G. LEONARD.

MANUALLY CONTROLLED ELECTRIC BLOCK SIGNAL SYSTEM.

No. 554,884. Patented Feb. 18, 1896.

Fig. 6.



Witnesses:
C. E. Sundgren
George Barry.

Inventor:
Arthur G. Leonard
by attorneys
Brown & Seward

UNITED STATES PATENT OFFICE.

ARTHUR G. LEONARD, OF NEW YORK, N. Y.

MANUALLY-CONTROLLED ELECTRIC BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 554,884, dated February 18, 1896.

Application filed July 26, 1894. Serial No. 518,646. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR G. LEONARD, of New York, in the county and State of New York, have invented a new and useful Improvement in Manually-Controlled Electric Block-Signal Systems, of which the following is a specification.

My invention relates to an improvement in manually-controlled electric block-signal systems, with the object in view of providing a simple and effective instrument for locking and unlocking the signal-operating levers and materially reducing the cost of maintaining the electric force for releasing the instrument.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a view in side elevation of a signal-tower signal-operating lever and an instrument in connection therewith in position to hold the lever locked. Fig. 2 is a top plan view of the instrument. Fig. 3 is an end view of the instrument and its connection with the signal-operating lever. Fig. 4 is a vertical transverse section through the instrument and its support, taken along the line $x\ x$ of Fig. 1. Fig. 5 is a vertical transverse section of an instrument, taken along the line $y\ y$ of Fig. 1; and Fig. 6 is a diagram, representing conventionally three consecutive towers along a line of track, showing their electric connections.

D represents a signal-post. The semaphore-arm d is mounted thereon and operated by a rod d', connected with one arm of a counterbalance-lever d^2, the opposite arm of said counterbalance-lever d^2 being connected by a rod d^3 with an angle-lever d^4 connected by a rod d^5 with a sliding bar d^6, which in turn is connected by a rod d^7 with the signal-operating lever d^8.

The particular arrangement and connections of the bar d^6 with the operating-lever and with the signal-operating rods at the post is immaterial, so far as my present invention is concerned, except so far as to render the device operative, the particular arrangement herein shown being adopted for purposes of bringing the arrangement concisely into view.

The sliding bar d^6 is locked and released by the downward and upward movement of a tappet E, operated in the present instance by a strap e on an eccentric e', fixed on a spindle F, the strap e being provided with an arm e^2 connected with one arm of a vibrating lever e^3, the opposite arm of said lever being connected with the tappet E.

The spindle F is mounted in suitable bearings in standards g and g' connected with a base G, and said spindle passes through an intermediate standard g^2 and may or may not have a bearing therein, but preferably does have a bearing therein for the purpose of holding it truly to its work. The spindle F is operated by a crank H, fixed on its projecting end at the front and carrying a spring-actuated stop-pin h adapted to enter perforations i, i', and i^2 in the face of a rim or disk I, fixed to the front standard of the instrument. The perforations i and i^2 denote the extremes of the movement of the crank, its intermediate position being at the point where its pin rests in the perforation i'. The normal position, or that in which the tappet E is down and the signal-operating mechanism locked, is that represented in the several figures hereinabove referred to, with the stop-pin h in the perforation i^2.

So far as the mechanism thus far described is concerned, the stop-pin h may be withdrawn from the perforation i^2 and the spindle F be turned at pleasure to lift the tappet E out of engagement with the bar d^6 to release the signal-operating lever. This movement, however, is prevented, excepting under certain conditions to be hereinafter particularly pointed out, the intent being that the operator who desires to release his signal for the purpose of setting it to "clear" to admit a train to pass his signal must first receive permission to do so from the next succeeding tower toward which the train is moving and that the operator at the next succeeding tower shall not be allowed to give this permission until the train which has previously passed the tower of the first operator aforesaid shall have passed out of the block between the first and the next succeeding towers.

The instruments in the several towers are quite similar to one another, and hence, after explaining the structure and operation of one of the instruments, it will be assumed in the further explanation of the operation of the

system that an instrument similar to that which has been particularly described is located in each of the successive towers.

The spindle F is provided with a disk, collar, or cylinder-sleeve f provided with a longer depression f' and a shorter depression f^2, as clearly indicated in Fig. 5, the former, f', being of sufficient length to permit the spindle F to be turned about a quarter of a revolution and the latter, f^2, being of such length as to lock the spindle at the limit of a half-revolution when the locking-dog is in the depression. A gravity-dog K is suspended from the end of the vibrating armature l of the electromagnet L in position to drop into the depression f' or f^2 whenever the magnet L is de-energized, the dog K being guided in its movements and held against lateral displacement by the arm g^3 projecting from the standard g^2. The magnet L is held suspended in position by means of a bracket-arm g^4 secured to the standard g^2, the arm g^4 being preferably adjustably secured to the standard g^2—as, for example, by means of a set-screw g^5, passing through the perforation of the arm g^4, which embraces the standard g^2 into engagement with the standard.

There is a gravity-catch M pivoted to the standard g^2 and provided at its lower free end with a notch m in position to swing over the projecting end of the armature l when the latter is drawn toward the magnet L to raise the dog K out of the depression in the sleeve f, thereby holding said armature in position to release the spindle F until the swinging catch M has been forcibly released from its engagement with the projecting end of the armature.

The spindle F has further fixed thereon a bevel-faced arm N, its beveled faces n' extending from its thicker central portion toward its thinner opposite edges. The arm N is so fixed upon the spindle F that when the spindle is moved from its middle position, or with its stop-pin h in the perforation i', to its extreme position, or with its stop-pin h in the perforation i, the arm N will slip into the notch m at the free end of the gravity-catch M and crowd it off out of engagement with the armature l, permitting the gravity-dog K to again drop into engagement with the sleeve f, and when the spindle reaches the position with the stop-pin h in the perforation i the said dog K will drop into the depression f^2 in the sleeve and lock the spindle in that position until the gravity-dog K shall again be released by the energizing of the magnet L.

For purposes of explanation I shall consider the spindle to be in its first position when its stop h is in the perforation i^2, in its second position when the said stop is in the perforation i' and in its third position when the said stop is in the perforation i.

It will be observed that when the spindle F is returned from its third to its second position the bevel-faced arm N will again engage the swinging catch M and release the armature L, if it shall have been drawn toward the magnet and caught in position with the dog K released while the spindle F remained at its third position.

The spindle F is further provided with a pair of yielding contact-pieces O O', secured in the present instance to the rim of a collar o, fixed to and insulated from the spindle, the said contact-pieces O and O' being in electric communication with each other and one of them, in the present instance O', being electrically connected by a wire o' with one pole of the electromagnet L. The other contact-piece O will, when the spindle F is turned into its second position, make electric connection with a post P electrically connected by a wire p with a binding-post P', which in turn is electrically connected with a binding-post Q of the next succeeding instrument, as will be more clearly seen by referring to the diagram to be hereinafter described.

When the spindle F is turned to its third position, the contact-piece O will break contact with the post P and will make contact with the post P^2, which post is electrically connected with the ground through a track-instrument of any well known or approved form (represented in the diagram by R) and so constructed as to close the electric circuit between the bindingp-ost P^2 and the ground when the train passes over it.

The arm g^6, extending from the standard g^2, is provided with a pair of binding-posts, one of which, Q, has been hereinabove referred to, and is electrically connected with the binding-post P' of the next preceding instrument. The other binding-post, Q', is connected with a source of electricity, in the present instance a temporary source—such, for example, as a magneto-electric machine of any well-known or approved form, represented conventionally in Fig. 6 by S and provided with a hand-wheel s for generating an electric current whenever it is desired to energize the electromagnet of a preceding instrument for the purpose of unlocking the spindle F.

The binding-posts Q and Q' are normally out of electric connection with one another, but an electric connection may be established between them by the closing of a depending yielding arm q'. The arm q' is pressed into electric contact with the arm q by means of a spring-actuated plunger T mounted in an upward extension of the standard g'. The spring in connection with the plunger T tends to hold it normally out away from the arm q', and when it is desired to press the arm q' into contact with the arm q the plunger is forced inwardly into engagement with the swinging piece t suspended from a link t' pivoted to the standard, so as to place the piece t a short distance away from the inner face of the standard.

When the parts are in the normal position represented in the drawings, a laterally-swinging plate or flat bar U, pivoted to the extension of the standard g', rests with its upper

portion held off to one side by the swinging piece t in position to permit the plunger to engage the piece t to close the arms q q'. Just as soon, however, as the plunger has pushed the depending piece t to swing the arms q' and q together it releases the bar or plate U, and the latter, as the plunger recedes, tilts into position with its upper portion interposed between the inner face of the standard extension and the piece t, so as to effectually prevent the plunger from again acting upon the piece t to close the arms q' and q until the instrument of the operator who has just used the plunger shall have had its spindle F turned to release the signal-operating lever to pass a train and shall have again returned the instrument to its normal position. This is effected by means of an arm or laterally-extending pin W on the spindle F, which engages a pin u projecting from the side of the lower arm of the swinging bar U, swinging it, as the spindle is moved from its first to its third position, in a direction which will constantly keep its upper portion interposed between the plunger and the piece t, but when the spindle is returned to its first position will swing the bar U in such a direction as to remove its upper portion from between the standard and the piece t, thereby permitting the piece t, under the influence of gravity, to catch it and hold it out of the way of the plunger until the plunger shall have been again operated.

The opposite pole of the electromagnet L is connected with ground by a wire l' in electrical connection with the standard g^2. The line-wire connecting the binding-post P' of one instrument with the binding-post Q of the next succeeding instrument is denoted by l^2. The wire connecting one pole of the magneto-electric machine with the binding-post Q' is denoted by l^3. The opposite pole of the magneto-electric machine is connected by a wire l^4 with ground.

In operation, referring to the diagram Fig. 6, suppose a train to be on the track between the towers A and B and the operator at B has been notified by the operator at A that he has passed the train onto such block. It becomes the duty of the operator at tower B to place his signal at "safety," in order to pass the train onto the block between towers B and C, provided such block be clear. To do this, the operator at tower B asks the operator at tower C to unlock his instrument. Just before making this request the operator at tower B must put his instrument into position to be released—*i. e.*, he must move his spindle F from position 1 to position 2—in order to bring the contact-piece O into engagement with the post P, which is electrically connected with the binding-post P'. This he is permitted to do because the depression on the sleeve of the spindle is sufficient to permit the spindle to rotate a one-quarter revolution without the dog being released.

The operator at C, provided the train previously received has passed his tower, gives the magneto-electric machine a turn and presses his plunger, closing the contact-arms q' and q, and thereby establishing an electric current from ground at the magneto-electric machine, through wire l^3, to binding-post Q', through arms q' and q to binding-post Q of tower C, thence through line-wire l^2 to binding-post P' of instrument at tower B, thence through contact-pieces O and O' and wire o' to electromagnet L at tower B, thence through electromagnet L and wire l' to ground. This will energize the electromagnet L at tower B, lifting the dog K out of engagement with the sleeve f on the spindle F, where it will be held by the catch M until the operator at tower B has turned the spindle F over into position 3, thereby lifting the tappet E out of engagement with the sliding bar d^6 and releasing the signal-operating lever. The operator at tower B may now set his signal at "safety" to permit the train to pass, or he may retain it at "danger" in case of any unusual reason therefor, but he cannot plunge to release the instrument at tower A until he has returned his instrument to its normal position and thereby released his plunger to permit it to operate upon the swinging piece t. Furthermore, he cannot return his instrument to its normal position until his signal has been set at "danger," because the tappet E will rest on the top of the bar d^6 instead of in the perforation therein so long as the bar D is drawn back into position to drop the signal to "safety," and, still further, he cannot move the spindle F, even through the movement of the third to the second position, until the dog K has been withdrawn from the depression f^2 in the sleeve f, and this happens when the electromagnet L has been energized. The energizing of the electromagnet L cannot take place excepting by the closure of the circuit through the track-instrument R, which has a ground connection from one of its contact-points, the electric connection from the other point extending to the binding-post P^2, and thence through the contact-pieces O and O' and wire o' to the electromagnet L, and thence to ground through the wire l'. The current of electricity for this purpose is supplied by a galvanic battery, which may be located in the circuit last named either in the tower or in the box containing the track-instrument, or the current may be supplied by some other well-known or approved means.

After the train has passed the tower B and released the spindle F the latter may then be returned to position 1, provided the signal has been set to "danger," and in making that movement the arm N on the spindle will have released the armature l of the magnet L from the catch M, permitting the dog K to again fall into engagement with the sleeve on the spindle, and the arm W will have rocked the bar U away from in front of the plunger T, so as to leave the latter free to act upon the swinging piece t to permit the operator at B

to plunge to the operator at A to permit the operator at A to pass another train onto the block between A and B.

The process above set forth is repeated at each tower as the train moves along the line, the towers in connection with a double track being provided each with two instruments, one for trains running in one direction on one track and the other for trains running in the opposite direction on the other track.

It is obvious that slight changes might be resorted to in the form and arrangement of the several parts without departing from the spirit and scope of my invention. Hence I do not wish to limit myself strictly to the structure herein set forth; but

What I claim is—

1. A block-signal system comprising a plurality of signals and their locking mechanisms arranged at suitable intervals and instruments for operating the signal-locking mechanisms each instrument including a rocking spindle, a plunger, a yielding contact-plate under the control of the plunger to complete an electric circuit and contact-pieces in position to complete different electric circuits as the rocking spindle is operated and a track-instrument for each of the aforesaid instruments, the electric circuits through the track-instrument and through the yielding contact-plate of a distant signal-controlling instrument being beyond the control of the operator at the home signal-controlling instrument.

2. The combination with a signal-operating lever and a reciprocating tappet for locking and releasing the lever, of an instrument comprising a rocking spindle connected with the tappet for operating it, an electromagnet, a dog under the control of the magnet when energized to release the spindle and under the control of an arm on the spindle when the magnet is de-energized to lock the spindle, and means under the control of the spindle for bringing the said electromagnet into and out of an electric circuit which is to be completed at a distance from the instrument, substantially as set forth.

3. The combination with a signal-operating lever, a rocking spindle and a locking device under the control of the spindle for locking and releasing the signal-operating lever, of a gravity-dog in position to lock and release the spindle, an electromagnet for lifting the gravity-dog, a catch for holding the dog elevated, an arm on the rocking spindle in position to release the catch and permit the dog to fall, and means for energizing the electromagnet from a distance, substantially as set forth.

4. A block-signal system, comprising a plurality of signal-instruments, electric circuits connecting them, each instrument being provided with a rocking spindle, a plunger, an electromagnet, means controlled by the spindle for locking and releasing the signal, means controlled by the spindle for preventing and permitting the operation of the plunger, means for rocking the spindle, a yielding contact-piece under the control of the plunger to complete an electric circuit through the electromagnet of a distant instrument to unlock the spindle of that distant instrument and a circuit-closer under the control of the spindle to permit the unlocking of the spindle by the plunger at a distant instrument, and a circuit-closer such for example as a track-instrument under the control of a passing train and beyond the control of the operator at a given instrument to permit the operation of the plunger at that instrument, substantially as set forth.

5. The signaling-instrument, comprising a rocking spindle, means for locking and releasing it at suitable intervals, a plunger, a circuit-closer and a swinging bar or plate under the control of the rocking spindle to prevent or permit the action of the plunger, substantially as set forth.

6. The block-signal instrument, comprising a rocking spindle; a circuit-closer; a plunger for operating the circuit-closer; contact-posts for different electric circuits, one including a circuit-closer at a distant instrument and another including a circuit-closer under the control of a passing train; an electromagnet; a locking-dog carried by the electromagnet; a catch for holding the armature of the magnet at one limit of its movement; a slanting-faced arm carried by the spindle to release the catch from the armature, and mechanism under the control of the spindle for preventing and permitting the action of the plunger and for making and breaking the electric circuits between the contact-posts and the electromagnet, substantially as set forth.

ARTHUR G. LEONARD.

Witnesses:

FREDK. HAYNES,

IRENE B. DECKER.