No. 863,238. PATENTED AUG. 13, 1907.

L. H. THULLEN.

INDICATION APPARATUS FOR SWITCH AND LOCK MOVEMENTS.

APPLICATION FILED MAR. 30, 1906.

4 SHEETS—SHEET 1.

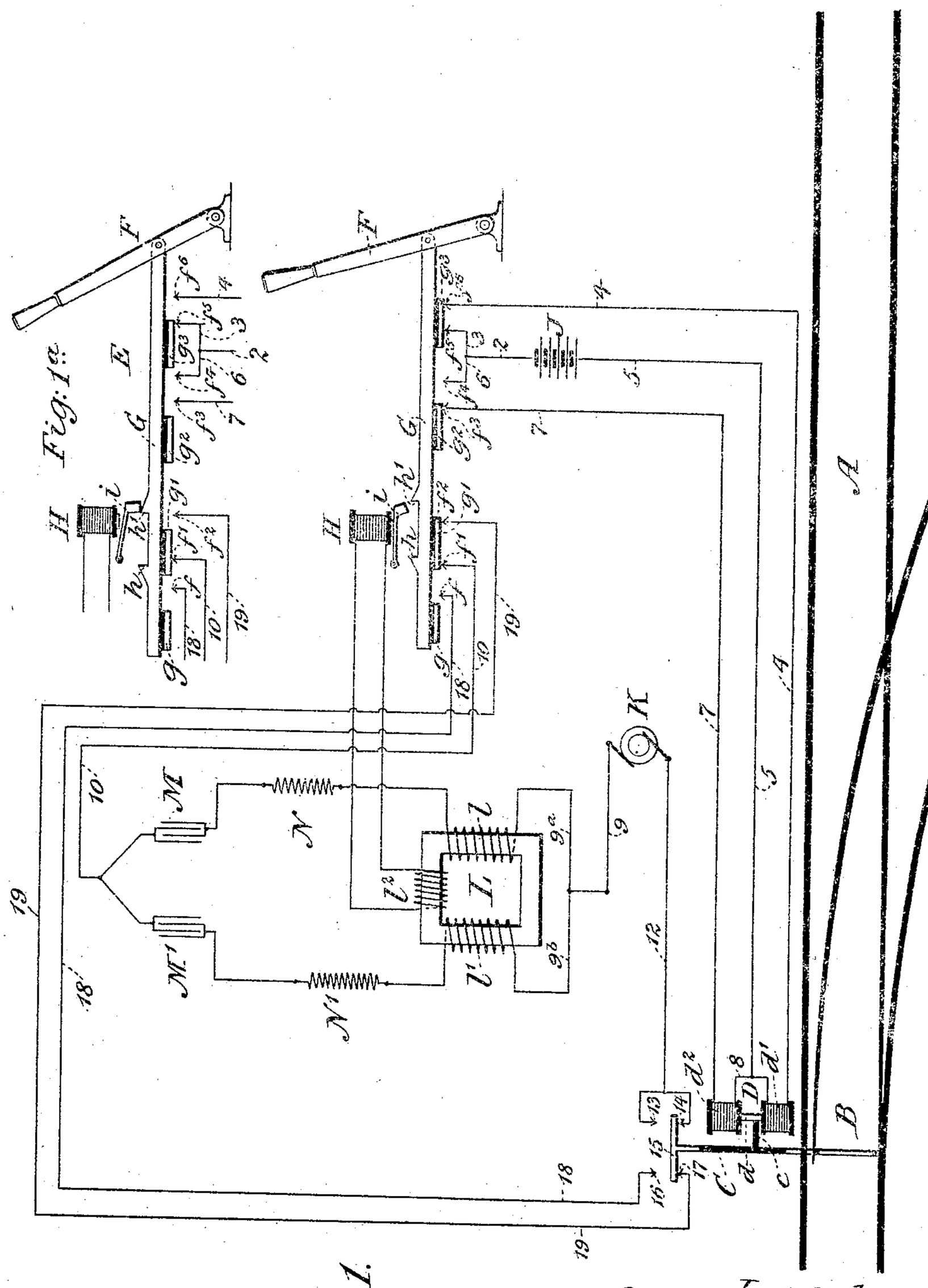

Fig. 1.

Witnesses:
J. A. Rennie
A. Herman Wegner.

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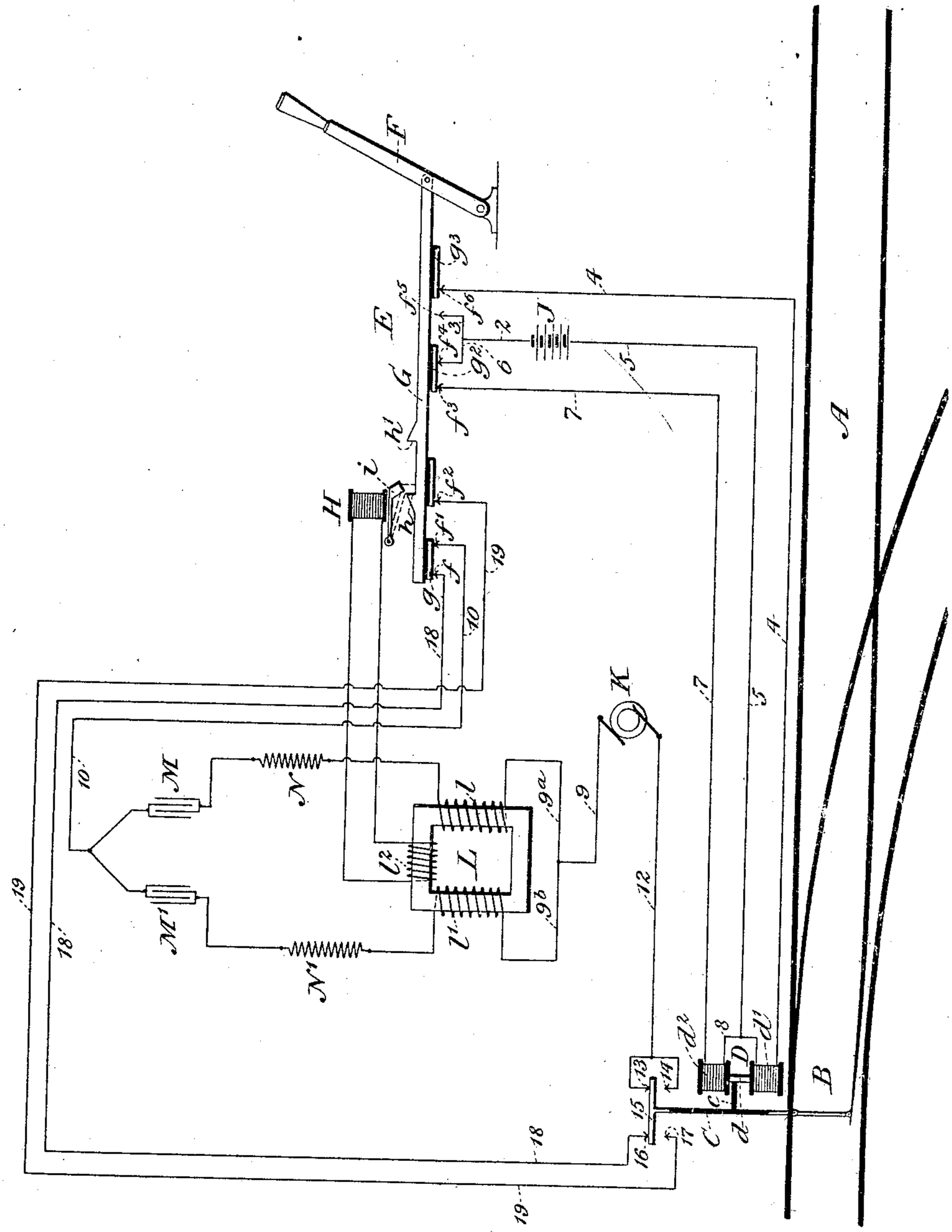

Fig. 2.

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4 SHEETS—SHEET 3.

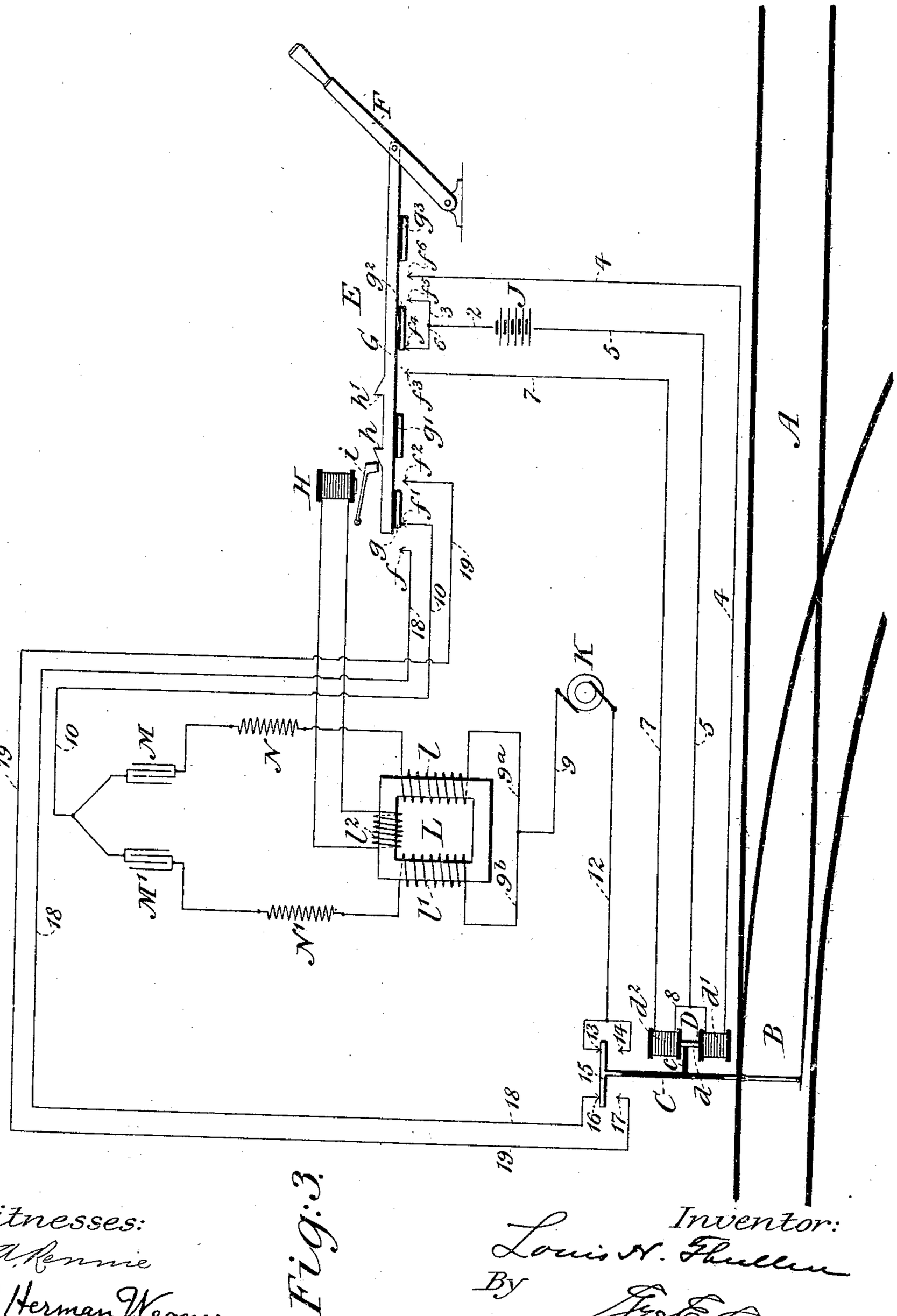

Fig. 3.

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4 SHEETS—SHEET 4.

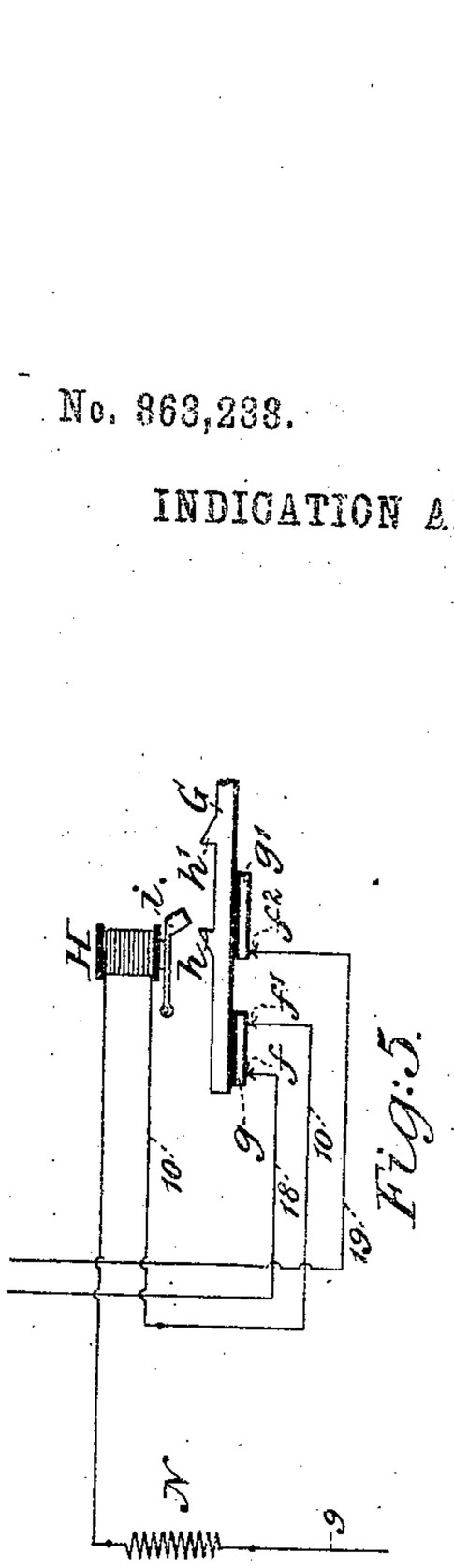

Fig. 5.

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

LOUIS H. THULLEN, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH AND SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

INDICATION APPARATUS FOR SWITCH AND LOCK MOVEMENTS.

No. 863,238. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed March 30, 1906. Serial No. 308,842.

To all whom it may concern:

Be it known that I, LOUIS H. THULLEN, a citizen of the United States, residing at Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Indication Apparatus for Switch and Lock Movements, of which the following is a specification.

My invention relates to indication apparatus for switch and lock movements, and more especially to that class of indication apparatus used in electric interlocking railway system and operated by alternating currents, an object being to provide means whereby the operation of the indicator is only effected by an alternating current of one predetermined frequency, the several parts or appliances comprised in the indication mechanism, and their controlling circuits, being so arranged as to render them neutral, and not responsive, to alternating currents of any other frequency.

Heretofore it has, to a large extent, been customary to operate indicators for switch and lock movements in electric interlocking systems by alternating currents of undetermined frequencies, but in these arrangements it has been found that the indicators are liable to be influenced by currents of varying frequencies, as well as by stray currents which exist to a more or less degree in the immediate vicinity of the mechanisms, thereby rendering the operation of the indicator uncertain and frequently effecting false indication as is well understood in the art.

My invention is designed to overcome these and other difficulties, and I will now describe means or mechanism, and the circuits for operating the same by an alternating current of one predetermined frequency and embodying my invention.

In the accompanying drawings, Figure 1 is a diagrammatic view of railway switch and operating mechanism, and illustrating means embodying my invention for operating and controlling the indicator therefor. In this view the parts are in the position they assume after a preliminary movement has been given the controlling lever, to be referred to, and the circuits arranged thereby to supply current to the switch operating mechanism to move the switch points in one direction, and also to supply alternating current to effect a release of the controlling lever to permit of its being moved to another position. Fig. 1ª, is a detail diagrammatic view of the indication mechanism showing the controlling lever in a position just prior to the preliminary movement thereof. In this view the circuits are open and the supply of current to both the switch operating and the indication mechanisms is cut off. Fig. 2 is a view similar to Fig. 1 the controlling lever being moved to a second position and the circuits thereby re-arranged to supply current to the switch operating mechanism to move the switch points in an opposite direction, and also to supply current to the indication mechanism to release the controlling lever so as to permit it to be moved to a final position. Fig. 3 is a view similar to Figs. 1 and 2, illustrating the controlling lever in its final position and the circuits to the switch operating and indication mechanisms cut off. Fig. 4 is a view similar to Fig. 2 of a modified form of my invention. Fig. 5 is a detail diagrammatic view of a still further modification.

Similar reference characters designate corresponding parts in all the figures of the drawings.

Referring to said drawings, A designates a portion of a railway track section comprised in an electric interlocking railway system; B, the switch points, and C, the rod or other connection leading to the switch operating mechanism and by which the switch points are moved from one position to the other, in the usual manner. The switch operating mechanism may be any desired, and for purposes of illustration I have herein shown it in the form of an ordinary solenoid D comprising a core d and two magnets d^1, d^2, spaced sufficiently apart to provide a space between them for the free movement of a connection c, extending from the rod C, to core d of the solenoid D. The magnets d^1, d^2, are wound, and the circuits so arranged, that current will alternately flow through the magnets and so effect a movement of the core d in one direction or the other, thereby moving the switch points, through the intermediary of the connection c and rod C, to one position or the other. This arrangement is entirely arbitrary, however, as any other suitable or approved mechanisms may be used for accomplishing the movements of the switch points and which are well understood in the art.

E, designates an indication mechanism which is usually comprised in an interlocking machine arranged in a cabin or tower located, generally, at some distance away from the switch. These levers are usually arranged in rows and control the operation either of switches or signaling devices and, as here shown, one of these levers, designated F, is connected to a slide bar G, upon which are arranged contact plates g, g^1, g^2, g^3, properly insulated therefrom and adapted to engage contacts f, f^1, f^2, f^3, f^4, f^5, f^6, as the slide bar is moved back and forth, to close and open certain circuits leading to the switch operating and indication mechanisms. The slide bar is provided with shoulders h, h—^{1}, with which a tappet or locking device i is adapted to engage, in order that the slide bar may be locked,

and its movement limited, under certain conditions to be described, in both directions, and this tappet or locking device is controlled by any ordinary or desired electromagnetic device.

As here shown, the controlling device is diagrammatically illustrated as an ordinary electro-magnet H, the armature of which may constitute the tappet or locking device referred to, and upon the end of which is formed a nose or projection which, when the magnet H is deënergized, will rest upon the slide bar G, at times between the shoulders h, h—^{1}, as shown in dotted lines in Fig. 2, and at other times beyond the respective shoulders h, h^1 as shown in Figs. 1—2 and 3, to permit of a limited to and fro movement of the slide bar G. This limited to and fro movement is known in the art as a "preliminary movement."

I do not limit myself to this form of indicating device, as this is a diagrammatical representation only and as such is used. Any form of indicating device can be used and the controlling device may be of any appropriate form capable of operating an armature by means of current used and can be constructed in numerous ways well known in the art.

J designates a source of electric energy for the switch operating mechanism which may comprise an ordinary battery, as shown, or it may be of any other desired character, such for example as a generator, preferably of the direct current type and which is intended to alternately energize the magnets d^1 and d^2, so as to move the switch points from one position to another.

Referring to Fig. 1 it will be seen that the slide bar G has been moved to a position incident to a preliminary movement of the controlling lever F, thereby causing the contact plate g^3 to engage the contacts f^5, f^6, included in the circuits for controlling the magnets d^1, d^2. Thus current from the source of supply J, will flow from the positive side of battery along wires 2, 3, contact plate g^3, wire 4, winding of magnet d^1, wire 5, back to negative side of battery. A further movement of the controlling lever will bring the slide bar into position to open the circuit just described, and bring the contact plate g^2 into engagement with the contacts f^3, f^4, thereby closing a circuit leading to the magnet d^2, energizing that magnet, and causing it to effect a movement of the switch points in the opposite direction. This is clearly illustrated in Fig. 2, where it will be observed that current from the source of supply J will flow through wires 2, 6, contact plate g^2, wire 7, to winding of magnet d^2, thence by wires 8 and 5 back to the source of current supply. When now a further movement is given to the controlling lever, and which is generally termed in the art, a "final movement," (see Fig. 3), the contact plates g^2 and g^3, (together with other contact plates g, g^1 for controlling the operation of the indicated mechanism, and to be hereinafter fully described) will be moved out of engagement with the contacts f^3, f^5, f^6, or at least will be so placed with relation to said contacts as to open both circuits leading to the magnets d^1 and d^2, thereby cutting off the supply of current therefrom. Obviously, a reverse movement of the controlling lever and slide bar G will reverse the order of making and breaking contacts between g^2, g^3, and f^3, f^4, f^5, f^6; that is to say, the contact plate g^2 will first engage the contacts f^3, f^4 and close the circuit leading to the magnet d^2, as shown in Fig. 1, which will temporarily energize it, but will in no way effect a movement of the switch points (as they had previously been moved to the limit of their throw) but a continued movement of the controlling lever will open the circuit leading to the magnet d^2 just described and bring the contact plate g^3 into engagement with the contacts f^5, f^6, thus closing the circuit leading to the magnet d^1 and thereby effecting a movement of the switch points to bring them back to their former position, shown in Fig. 1.

K designates an alternating current generator for supplying current to any number of indication mechanisms, usually comprised in an interlocking machine for controlling the operation of switch and lock movements in an electric interlocking railway system, and the circuits for which may each have included in them a transformer L, condensers M, M^1 and impedance coils N, N^1, as shown in Figs. 1, 2 and 3, or as shown in Figs. 4 and 5, the transformer may be omitted in the former instance, and a condenser alone used, or the condenser may be omitted in the latter instance and an impedance coil alone used. These changes, which in themselves are slight, are illustrated merely for the purpose of showing the scope of my invention, and by which other means the results sought to be obtained may be accomplished, *i. e.*, the various means by which the operation of the indication mechanism may be effected by a current of predetermined frequency only.

It is well understood that where a condenser alone is used in a circuit, a current of high frequency will traverse the circuit readily, while it will offer a high resistance to a current of low frequency. Conversely, where an impedance coil alone is used in the circuit, a current of low frequency is permitted to readily traverse the circuit, while it offers a high resistance to a current of high frequency.

In the arrangement shown in Figs. 1, 2 and 3, the transformer L is wound with two primary coils l, l^1, so connected with the generator K that the current therefrom will magnetize the core on which they are wound, in opposite directions.

l^2 designates a secondary winding on the transformer in which a current is induced to supply current for the controlling device. These windings although shown as located each on a separate leg of the core, may also be wound upon a single leg or core which, for practical purposes may be more desirable. A wire 9, leads from one pole of the generator K to, and connects with, the terminals of the primary windings, l, l^1, the opposite terminals thereof being connected respectively to the impedance coils, N, N^1, and condensers M, M^1, from which latter they pass to and connect with a wire 10, which terminates in the contact f^1 previously mentioned, and adapted to engage and disengage the contact plates g and g^1 on the slide bar G, as I shall presently describe. The impedance N is of less value than the impedance N^1 and consequently will offer less resistance to a current of high frequency, and most of such current will, therefore, follow the path of least resistance. A wire 12 leads from the opposite pole of the generator K and terminates in a front and back contact 13, 14, respectively, which are adapted to alternately engage a contact piece 15 located on and insulated from the switch rod C, as the latter moves back

and forth when the switch points are moved from one position to the other. Similar front and back contacts 16 and 17 are provided at the terminals of wires 18 and 19 which are also alternately engaged by the contact 15, and, with the contacts 13 and 14 serve to establish circuits leading to the indicator mechanism. The opposite terminals of the wires 18 and 19 are provided with the contacts f, f^2, previously referred to, which, with the contacts f^1 serve to make and break contact with the contact plates g, g^1, and thus open and close the circuits leading from the generator K to the transformer L and thereby governing the operation of the indication mechanism.

Assuming the parts to be in the position shown in Fig. 1 and the generator K is generating an alternating current of a predetermined frequency, most of the current will flow through wires 9, 9^a, through the primary winding l, through impedance coil N and condenser M, wire 10, contact plate g^1, wire 19, contact piece 15, and wire 12 to opposite pole of generator. This will induce a current in the secondary coil l^2 of just sufficient amount to energize the controlling device causing the magnet H to attract its armature i and release the slide bar G, thereby permitting the latter to be moved to another position. When the parts are in the position shown in Fig. 2 the current will flow from the generator K, in the same manner, but will pass through the contact plate g and return by wire 18, contact piece 15 and wire 12 to the generator.

The frequency of the current for producing operation of the controlling device through the medium of transformer, condensers and impedances being determined upon and the condensers and impedances being tuned to pass current of one frequency only, and which may be that of a high frequency compared with surrounding stray currents of a low frequency, it will be obvious that the low frequency will not operate the device. Conversely, if the apparatus is tuned to pass current of predetermined low frequency a current of high frequency will not pass to operate the controlling device.

In brief, let it be assumed that a high frequency is desired for purposes of controlling the indication device, and it is desired to guard against its operation by a current of low frequency, then the condensers M, M^1 and impedances N, N^1, will be so proportioned or tuned that a current of low frequency, and of equal or nearly equal value, will pass through the two circuits and, therefore, will not induce a sufficient amount of current in the secondary winding l^2 to operate the controlling device; but the apparatus is out of tune for currents of high frequency, therefore there will be an unbalancing in the two circuits and current will be induced in the winding l^2, sufficient in amount and frequency to operate the controlling device.

Claims.

1. The combination with a railway switch and lock movement having means for moving the switch points from one position to another, of an indication mechanism comprising an electro-magnetic device, a source of alternating current supply for the indication mechanism, and means whereby the indication mechanism is permitted to be operated only by an alternating current from the said source and of one predetermined frequency.

2. The combination with a railway switch and lock movement having means for moving the switch points from one position to another, of an indication mechanism comprising an electro-magnetic device, a lever under the control of the electro-magnetic device for controlling the movement of the switch points, a source of alternating current supply for the indication mechanism, and means whereby the indication mechanism is permitted to be operated only by the alternating current from said source and of one predetermined frequency.

3. The combination with a railway switch and lock movement having electro-magnetic means for moving the switch points from one position to another, of an indication mechanism comprising an electro-magnetic device, a source of direct current supply for the switch moving means, and a source of alternating current supply for the indication mechanism, and means whereby the indication mechanism is permitted to be operated only by the alternating current from the said source and of one predetermined frequency.

4. The combination with a railway switch and lock movement having means for moving the switch points from one position to another, of an indication mechanism comprising an electro-magnetic device, a lever for controlling the movements of the switch points, a locking device for said lever, a source of alternating current supply for the indication mechanism, and means whereby the locking device is permitted to be operated to release the lever only by the alternating current from said source and of one frequency.

In testimony whereof I have signed my name to this specification in the presence of two subscribed witnesses.

LOUIS H. THULLEN.

Witnesses:

D. J. McCarthy,

W. L. McDaniel.