No. 612,810.

Patented Oct. 25, 1898.

W. ANDREWS.
RAILWAY SIGNAL.

(Application filed Dec. 20, 1897.)

(No Model.)

2 Sheets—Sheet I.

Fig. 1.

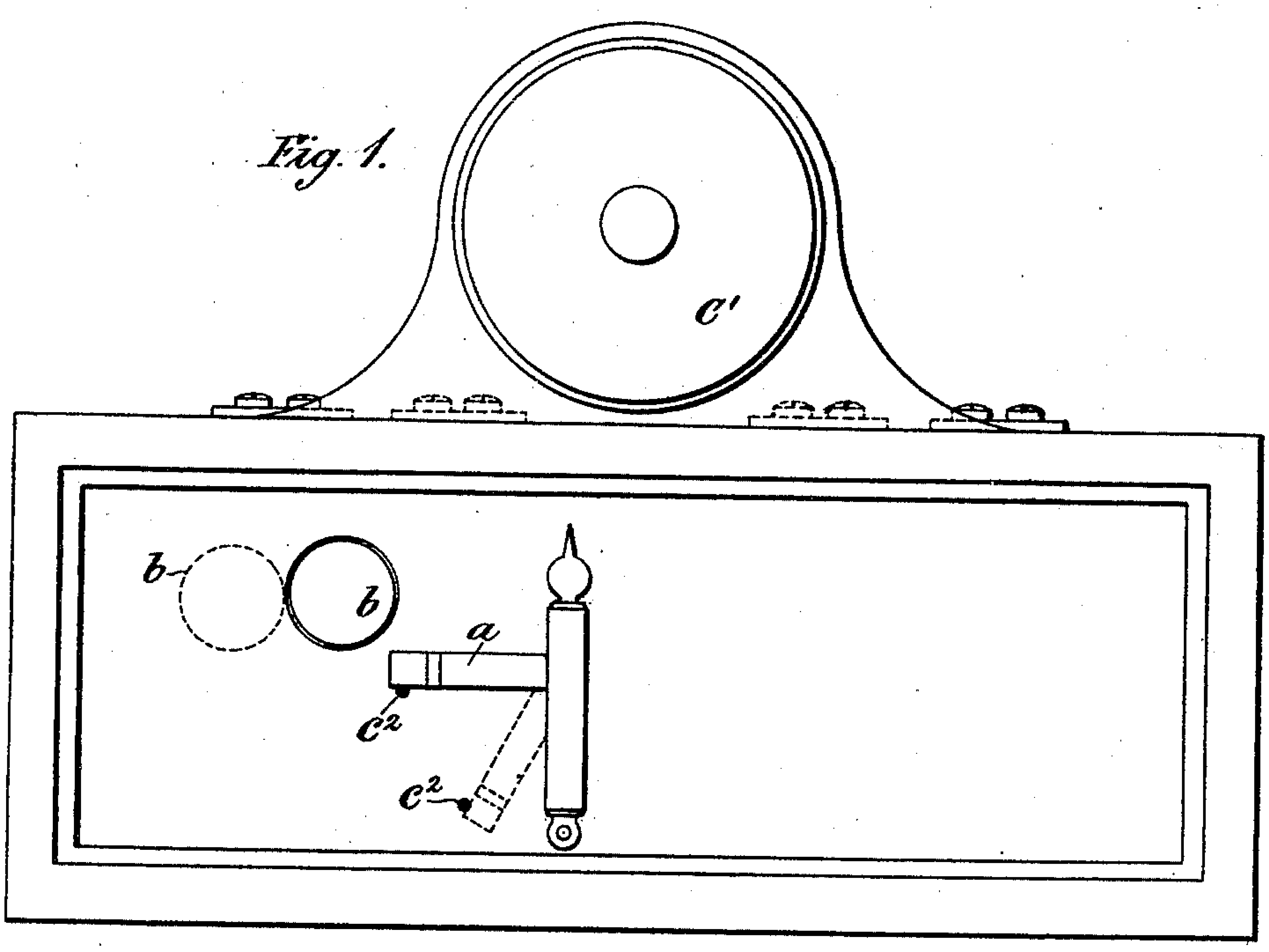


Fig. 2.

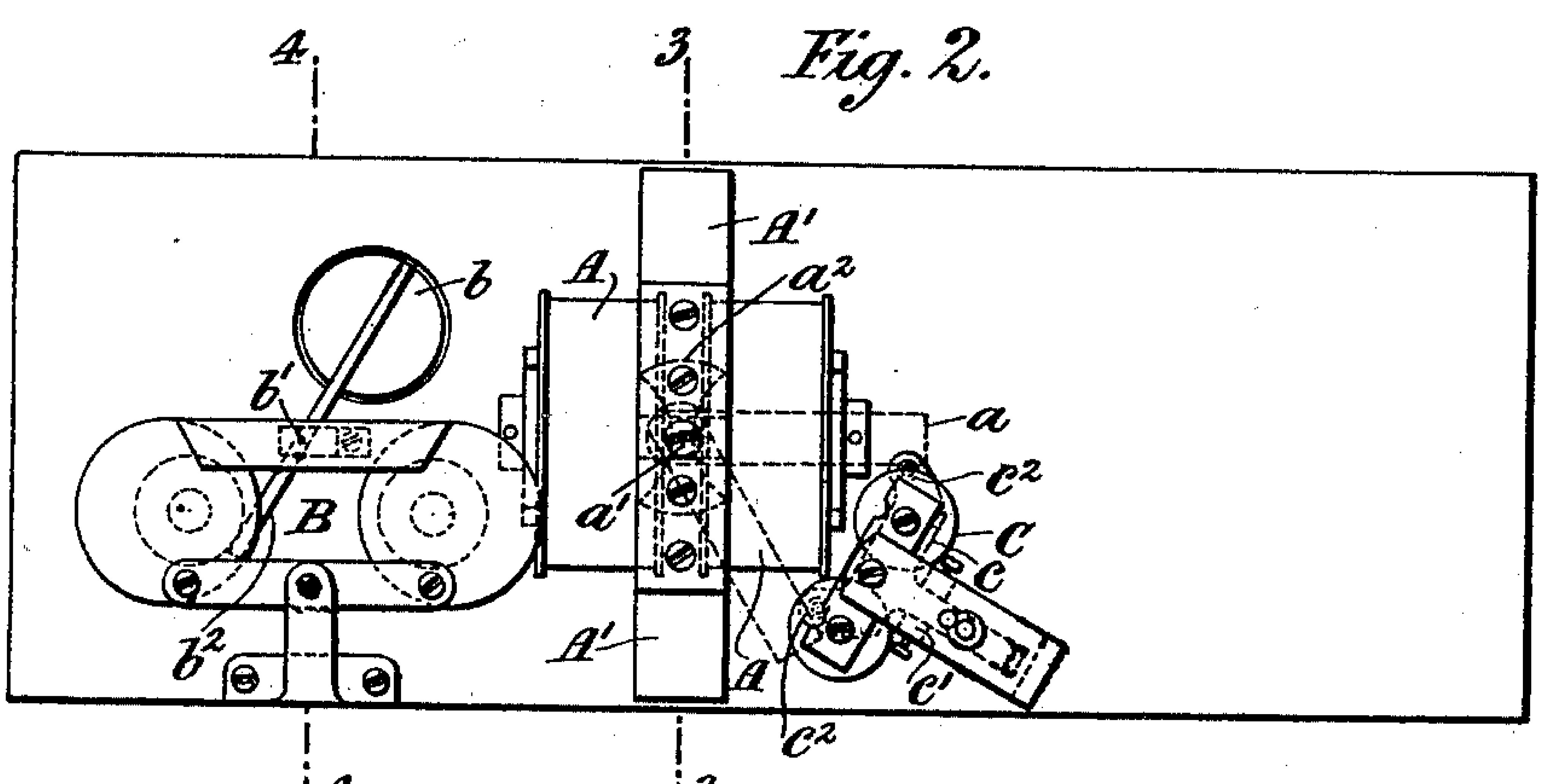


Fig. 3.

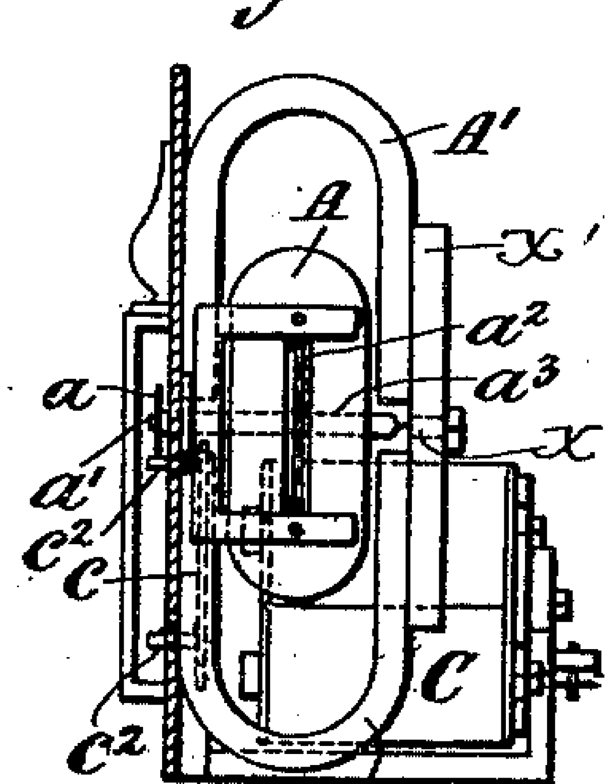
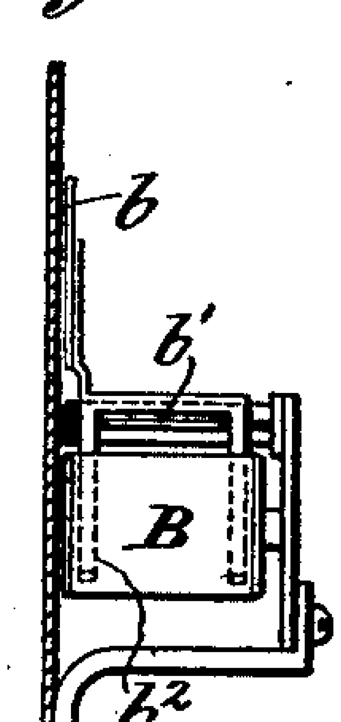


Fig. 4.



Witnesses.
E. A. Ballock
A. M. Parkins

Inventor.
William Andrews
By his Attorneys,
Baldwin, Davidson & Wight.

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Fig. 5.

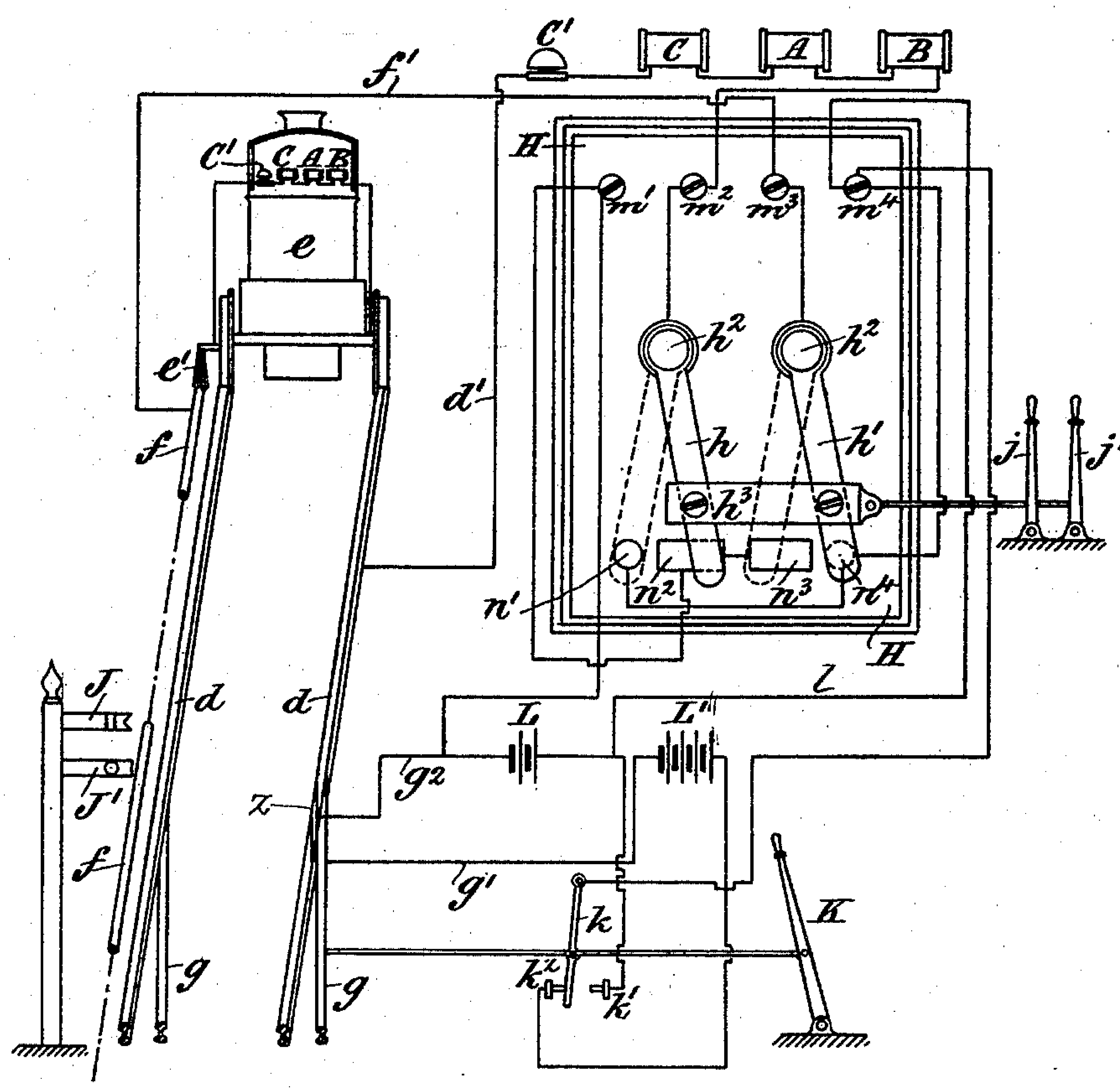
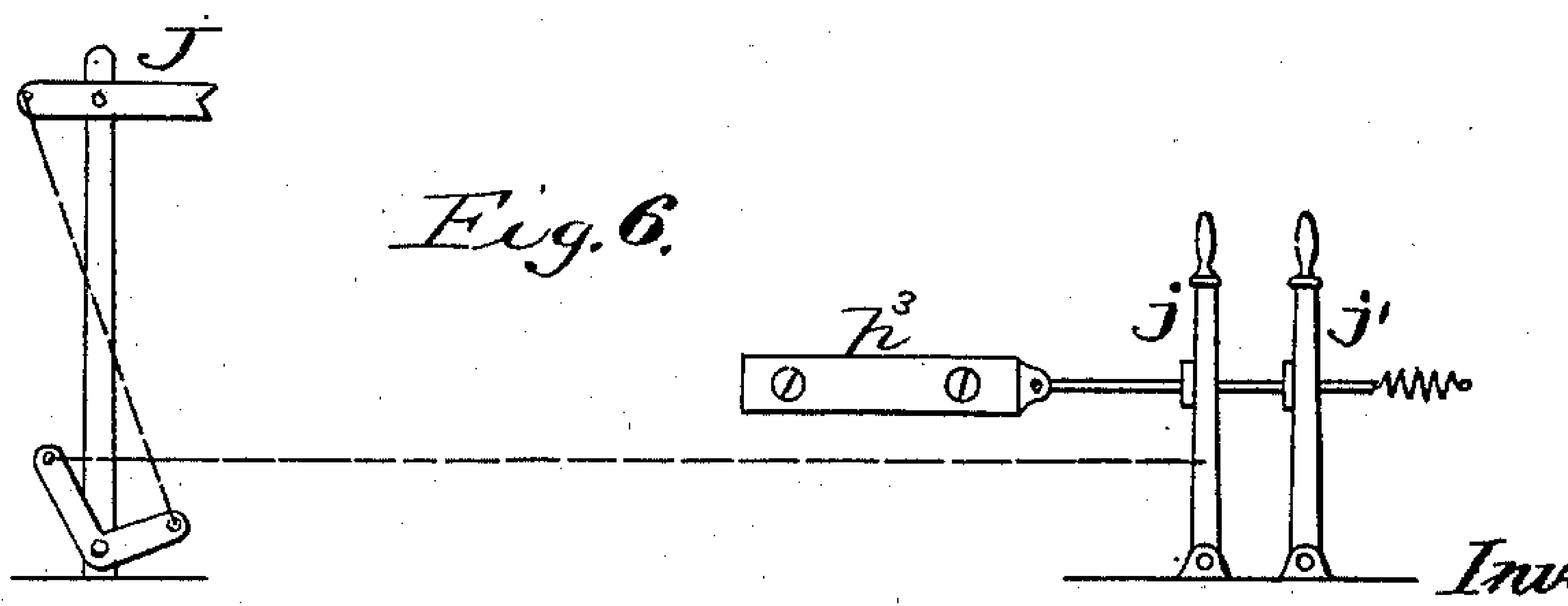


Fig. 6.



Witnesses.
E. A. Balloch
A. M. Parkins

Inventor.
William Andrews,
By his Attorneys
Baldwin, Davidson & Wight

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM ANDREWS, OF LONDON, ENGLAND.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 612,810, dated October 25, 1898.

Application filed December 20, 1897. Serial No. 662,656. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ANDREWS, engineer, a subject of the Queen of Great Britain, residing at Camden Square, Camden Town, London, England, have invented certain new and useful Railway-Signals, of which the following is a specification.

It has often been proposed to establish electrical communication between the signal-stations and the engine, so that the driver may be informed when approaching the station whether the line is clear or not. No great difficulty arises in doing this where there are no branch lines; but in the case of a junction, where the train may be signaled to proceed either along the main line or onto a branch or siding, complications arise. Of course an independent instalment may be used for each signal; but this is costly.

According to this invention two or more independent indicators on the engine are operated through a single conductor along the line, and this is done by employing currents of different strengths.

Figure 1 is a front elevation of an apparatus constructed according to this invention. Similar instruments are employed on the engine and in the signal-station. Fig. 2 is a rear elevation with the casing removed. Figs. 3 and 4 are sections on the lines 3 3 and 4 4, Fig. 2. Fig. 5 is a diagram view of the circuits on the railway and at the signal-station. Fig. 6 is a detail view showing an arrangement for connecting the signal-levers in the cabin with the track-signals and the operating-bar of the electric switch in the cabin.

In Figs. 1 to 4, a is the main-line signal, and b a signal for a branch line or siding. The signal a is pivoted at a' and is worked by a pair of electromagnets A A of elliptical form, as shown in Fig. 3, whose armature a^2 is fixed to the signal and works in central slots in the adjacent ends of the cores of the magnets. The armature a^2 is magnetized by reason of its axis a^3 being between the poles of two permanent magnets A' A'. This axis a^3 has a bearing at x in an iron plate x', connecting corresponding ends of the permanent magnets. The magnets A are wound in opposite directions, so that whatever be the polarity of the current a north pole of one faces a south pole of the other. If, therefore, a current of one polarity through the magnets A turns the armature a^2 from left to right, a current of the opposite polarity turns it from right to left. The signal b consists of a red disk which when in the position shown covers a green disk inside the case. When, however, it is moved to the position shown in dotted lines in Fig. 1, it is hidden by the case and the green disk exposed. The signal b is carried on an arm pivoted at b', to which is fixed a permanent magnet b^2, Fig. 4, forming the armature of a pair of oppositely-wound electromagnets B, and swinging between their poles, as plainly seen in Fig. 2. A current of one polarity therefore causes one magnet to attract b^2 and the other to repel it, while a current of the opposite polarity reverses these effects. C is a magnet whose armature c is pivoted at c' and has fixed to it pins c^2, which project through the case unless the armature is being attracted and prevent the signal a from moving until they are withdrawn by a current being sent. The armature c is not polarized, so that it is attracted by any current.

C' is a bell.

In Fig. 5, d d are the rails; e, an engine upon them; f, a conductor at the side of the rails, which may either be continuous or in sections connected together, as shown, and e' is a brush carried by the engine and in contact with the conductor f. d' and f' are wires connecting the rail d and conductor f with the signal-cabin. g are the switch-rails leading to the branch line or siding. When the right-hand rail g, to which wire g' is connected, is closed against the insulated contact z, to which wire g^2 is connected, a circuit through these wires is established.

In the diagram the switch-rail itself is for the sake of clearness shown as the circuit-closer; but in practice it would only actuate the circuit-closer.

H is a switchboard fixed on the back of the instrument in the signal-cabin, and h h' are two circuit-closers pivoted at h^2 h^2 and connected together by the insulating-bar h^3.

J is the main-line signal, and J' the branch-line signal, located in proper proximity to the track-switch and operated by the levers j j', which are both mechanically connected in any convenient way with the circuit-closers h h', so that the latter are moved from the position shown in full lines to the dotted position whenever either the main-line or the branch-line signal is lowered. This may be conveniently done as shown in Fig. 6, where the track-signal J is shown connected with the lever j, so that when the lever is thrown to the left the signal J falls by gravity, being suitably weighted. The connection between J′ and j' is the same, but is omitted as not necessary to the illustration and as tending to confuse the drawings. Both levers j j' are also connected with the operating cross-bar h^3 of the switch H by a rod that passes loosely through each lever and is connected at its end to a spiral spring that tends to draw it toward the right into the position shown in the drawings. Collars on this rod bear, respectively, against the left-hand side of each lever. Obviously when either lever is moved to the left to lower the signal J or J′ the circuit-closers h h' are thrown into the position indicated by the dotted lines in Fig. 5. Of course suitable detents are to be employed to hold the levers j j' in either of their positions.

K is the track-switch lever operating the points g z, and k is a contact-maker mechanically connected to it in such manner that when the points are open k is against the terminal k' and when closed against k^2.

L L′ are two batteries, the latter being the more powerful.

The magnets A and C are so adjusted that they attract their armatures when either battery is in circuit, whereas the magnets B only respond to the battery L′.

m' m^2 m^3 m^4 are four terminals, and n' n^2 n^3 n^4 four contacts on the board H. The contacts n' n^4 are connected together and to the terminal m^4 and batteries, while the contacts n^2 n^3 are connected together and to the terminal m' and the other pole of the batteries. The terminal m^2 is connected to the contact-maker h and through the magnets B A C and bell C′ to the wire d', and the terminal m^3 is connected to the contact-maker h' and wire f'. The function of the pins c^2 on the armature of the magnet C is to hold the signal a in position when no current is passing, so that it shall not be displaced by jolts.

When the parts are in the position shown, the circuit is from the battery L′, contact k^2, contact-maker k, terminal m^4, contact n^4, circuit-closer h', terminal m^3, conductor f', brush e' on engine, bell C′, magnets C, A, and B on engine, rail d, wire d' to the signal-cabin bell C′ and magnets C A B in it to terminal m^2, contact-maker h, contact n^2, terminal m', wire g^2, contact-maker at points g z, wire g', back to the battery L′. The effect of the current in this direction is to make the neutral magnets C attract their armatures and ring the bells C′, but the direction of current is such that the magnets A and B repel their armatures and hold the signals a and b in their danger positions. If, however, the signal J′ be lowered by the lever j', which simultaneously moves the contact-makers h h' into their dotted positions, Fig. 6, then the circuit is from the battery L′, contact k^2, contact-maker k, terminal m^4, contacts n^4 n', contact-maker h, terminal m^2, magnets B, A, and C and bell C′ in cabin, wire d', rail d, magnets B, A, and C and bell C′ on engine, brush e', conductor f, wire f', terminal m^3, contact-maker h', contacts n^3 n^2, terminal m', wire g^2, contact-maker at points, back to the battery L′. It will be observed that in this case the current passes in the other direction through the magnets, and not only are the bells C′ rung and the magnet C actuated to withdraw the pins c^2, but the magnets A and B attract their armatures and lower the signals a and b.

If the contact-points g z are open instead of closed, the contact-maker k is moved away from the contact k^2 and the battery L is put into circuit instead of L′. Whatever signal therefore is now given the signals b remain at "danger," because the magnet B is so wound and constructed as not to respond to the strength of current delivered by battery L, while the signals a, magnets C, and bells C′ behave as before, the circuits being exactly the same except that the battery is connected directly to the terminal m^4 by wire l instead of through the contacts k k'. It will thus be seen that when the signal is given indicating that the main line is open or clear only the main-line signal a shows "safety," and when the branch line is open or clear both signals a b go to the position of "safety."

It will be obvious that the contact-maker k may be operated by the lever j' in place of the lever K. Indeed in ordinary practice the two are so connected that the former cannot be moved till after the latter closes the points.

When two branch lines are required, an additional conductor may be employed, the magnets A and C and those of the bells C′ each having two coils, one for the circuit of each of the branch lines, the arrangement being in all other respects as above described, or a single conductor may be employed, the signals for one branch line being lowered by a strong current of one polarity and the signals for the other by a current of the other polarity. In this case, however, the armature a^2 should not be polarized, as the signal a ought to respond to currents of either polarity. The advantage therefore of giving a danger-signal by a reverse current is lost; or a single conductor may be employed with currents of three different strengths; but this is usually inconvenient, although it has the advantage of allowing danger-signals being given by a reversal of the current. In this case the arrangement is similar to that first described, the levers operating the points, each putting the weakest battery out of circuit and one putting in the medium battery and the other the strongest.

It is not essential that there should be a complete apparatus in the signal-cabin. In some cases a mere indicator to show that a signal has been given is sufficient.

In place of having a single circuit embracing all the magnets and the bell (if there be one) there may also be a circuit embracing only the magnets A and C and the bell. In this case the circuits are made to pass through an electromagnet so adjusted that it attracts its armature only when a strong current is passing, and this movement of the armature breaks the latter circuit and closes the former.

I claim—

1. The combination of two electromagnetic indicators on the engine, one of which indicators is responsive to a strong current only and the other to current of less strength, circuit connections, two track-signals, and means located at a signal-station to, at the will of an operator, either lower one track-signal and transmit a current of such strength as to effect the actuation of both indicators, or lower the other track-signal and transmit a current of less strength to effect the actuation of one only of said indicators.

2. The combination of two electromagnetic indicators on the engine, one of which indicators is responsive to a strong current only and the other to current of less strength, circuit connections, and means located at a signal-station to at the will of an operator transmit a current of such strength as to actuate both indicators, or a current of less strength to actuate only one of said indicators.

3. The combination of main and branch tracks, two electromagnetic indicators on an engine, one of which indicators is responsive to strong currents only, and the other to currents of less strength, means at a signal-station for at the will of an operator, transmitting a current of one strength when the main track is clear or open and means also at the signal-station, for at the will of an operator, transmitting a current of different strength when the branch track is clear or open, current of one strength serving to effect a signal that the main track is clear and current of another strength serving to effect the signal that the branch track is clear.

4. The combination of two polarized electromagnetic indicators on the engine, one responsive to a strong current only of a given polarity, the other responsive to a weaker current of the same polarity and both irresponsive to any strength of current of opposite polarity, main and branch tracks, electric contacts *g z* controlled by the track-switch of the branch track, sources of electromotive force of two different strengths and electric switch mechanism located at a signal-station, a circuit including said two indicators, switch mechanism, sources of electromotive force and electric contacts of the branch track, circuit connections whereby when the contacts of the branch track are closed and the electric switch mechanism is in one position, a strong current of a polarity to not operate the indicators is sent through the circuit and then when the electric switch mechanism is moved to another position to send through the circuit a current of the same strength but of opposite polarity to operate both indicators, and whereby when the track-switch contacts are opened a current of less strength but of the same polarity as the last-named current is sent through the circuit to operate one only of said indicators, substantially as and for the purpose set forth.

WILLIAM ANDREWS.

Witnesses:
JAMES M. M. ERSKINE,
JAMES COLLINS.