(No Model.)

3 Sheets—Sheet 1.

W. G. ROOME.

RAILWAY SIGNAL.

No. 558,566. Patented Apr. 21, 1896.

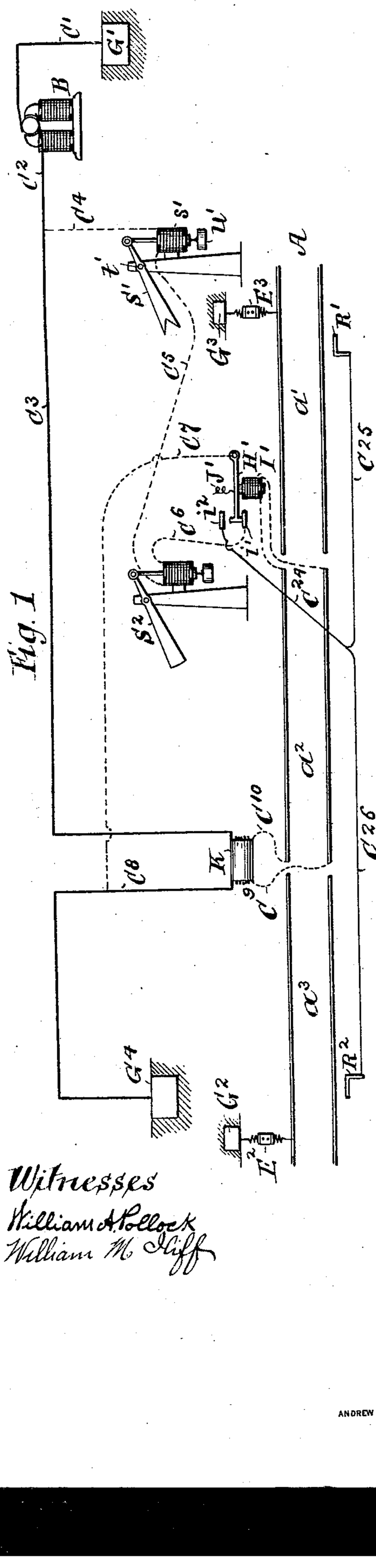

Fig. 1

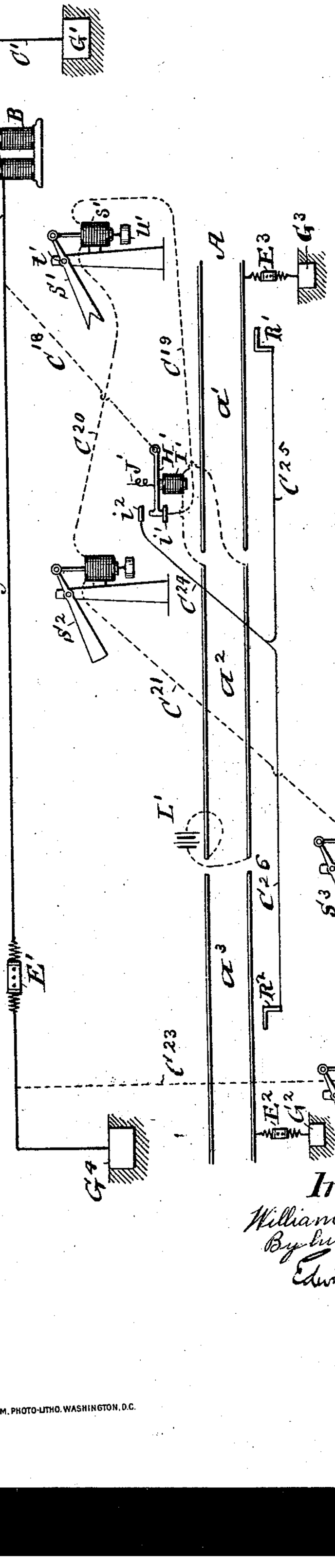

Fig. 2

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William G. Roome
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(No Model.)

3 Sheets—Sheet 2.

W. G. ROOME.

RAILWAY SIGNAL.

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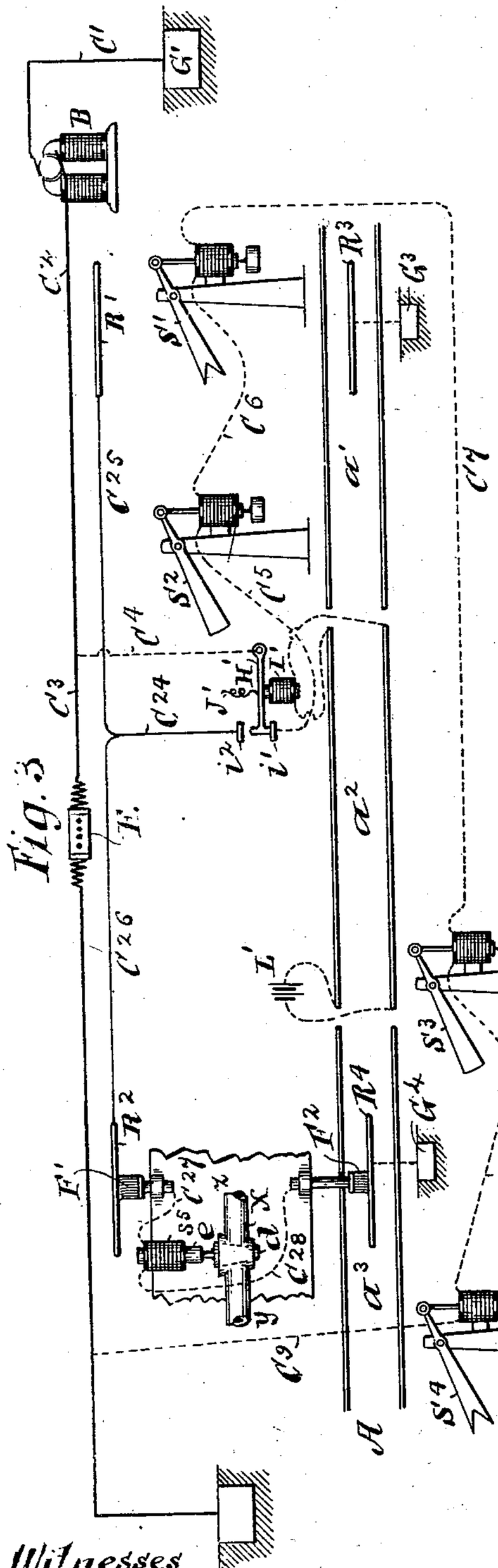

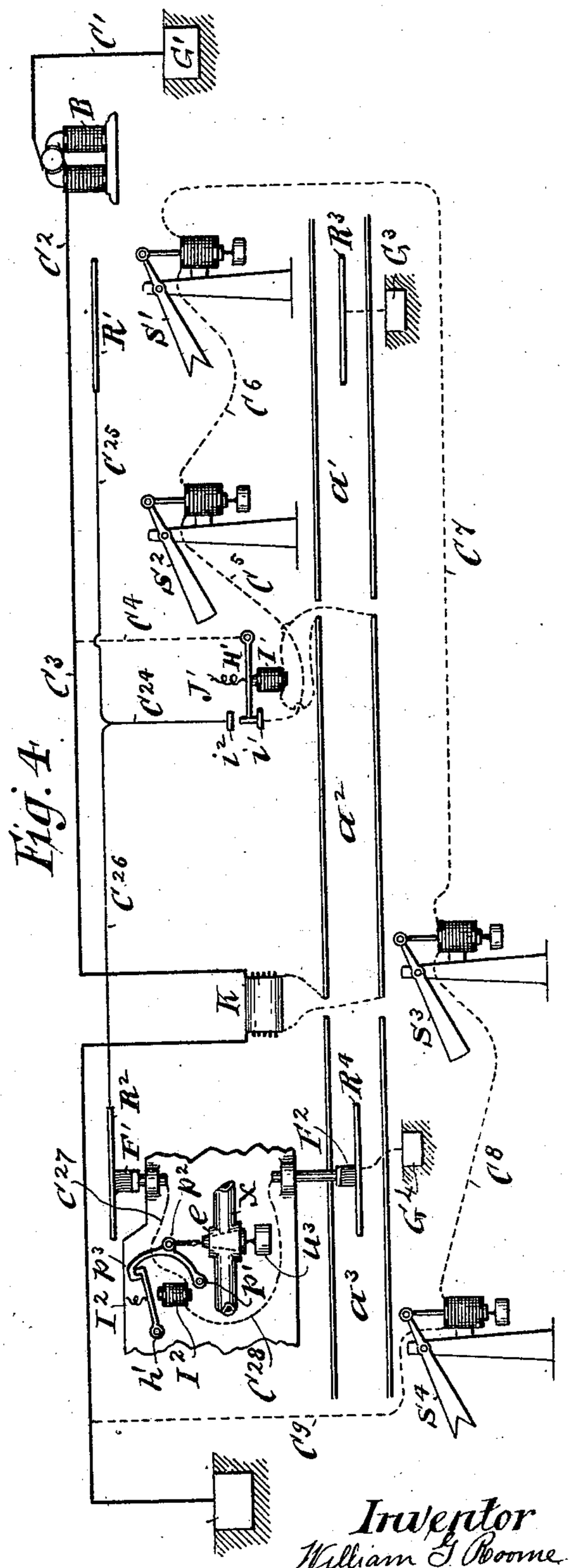

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Fig. 5

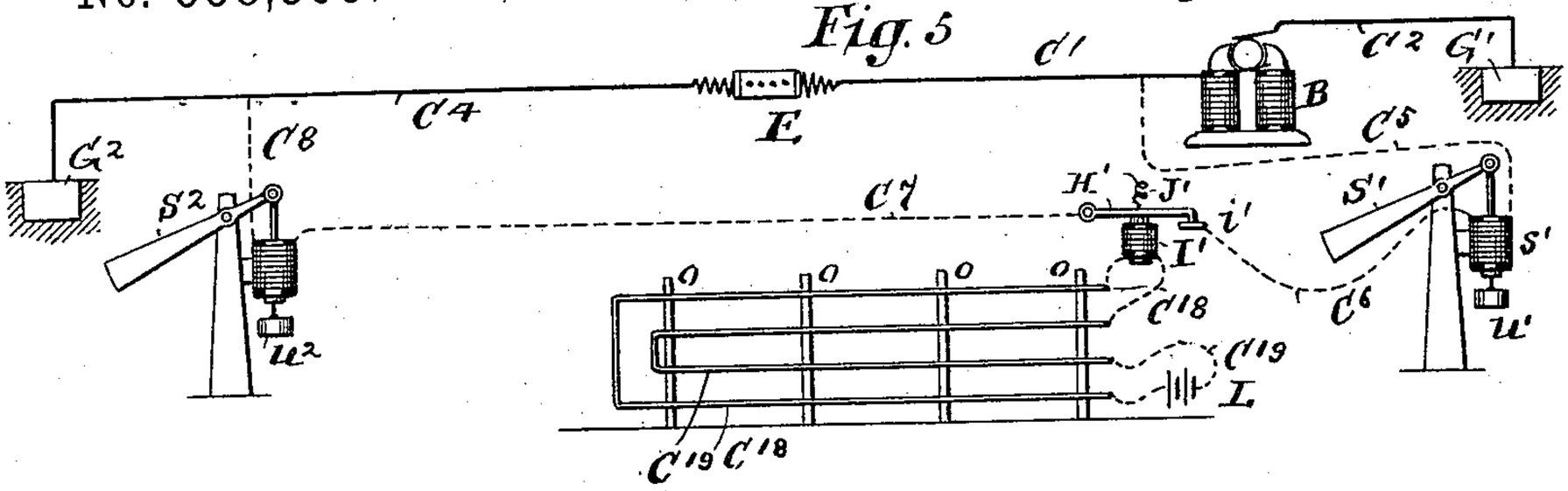


Fig. 6

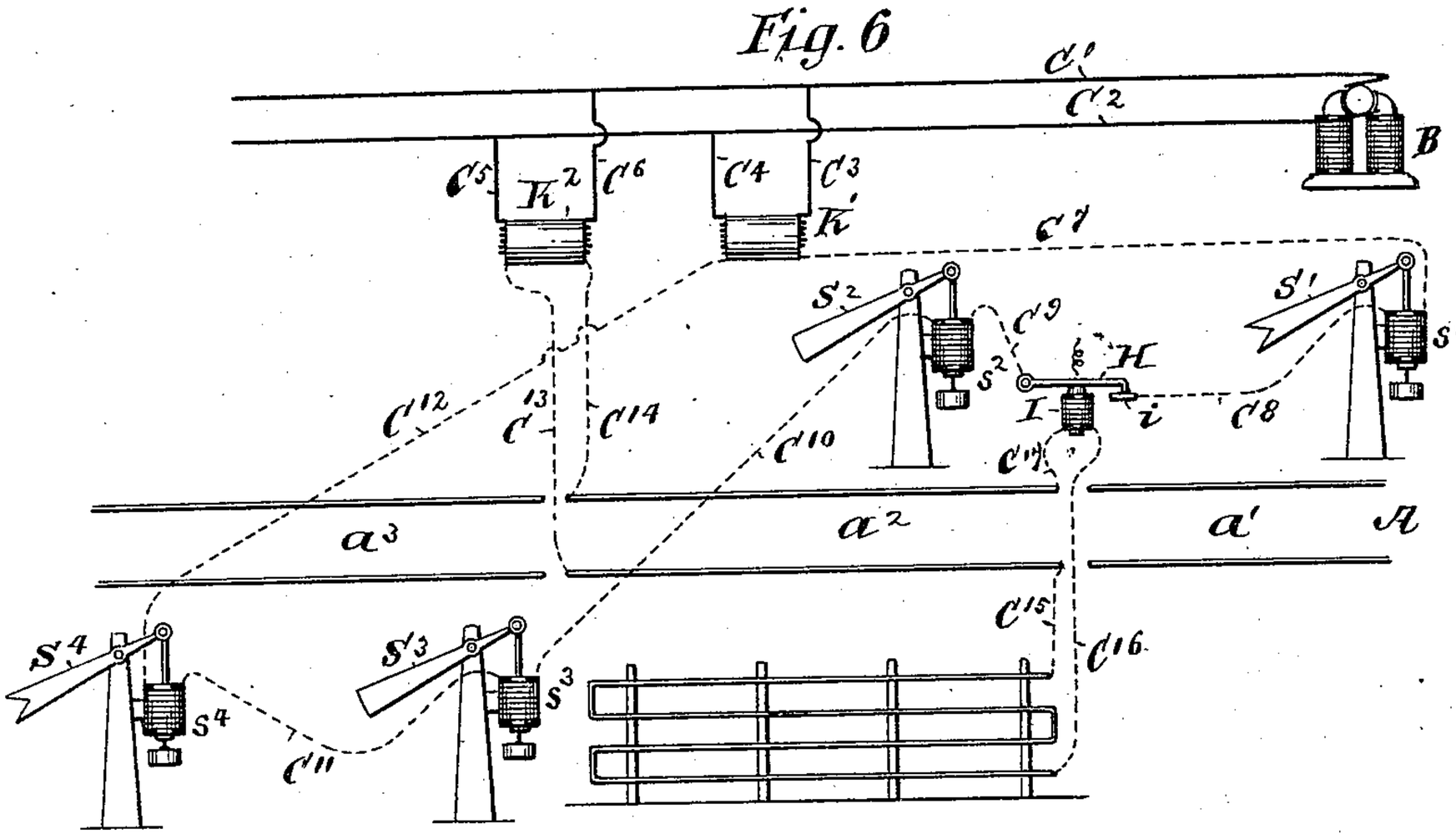
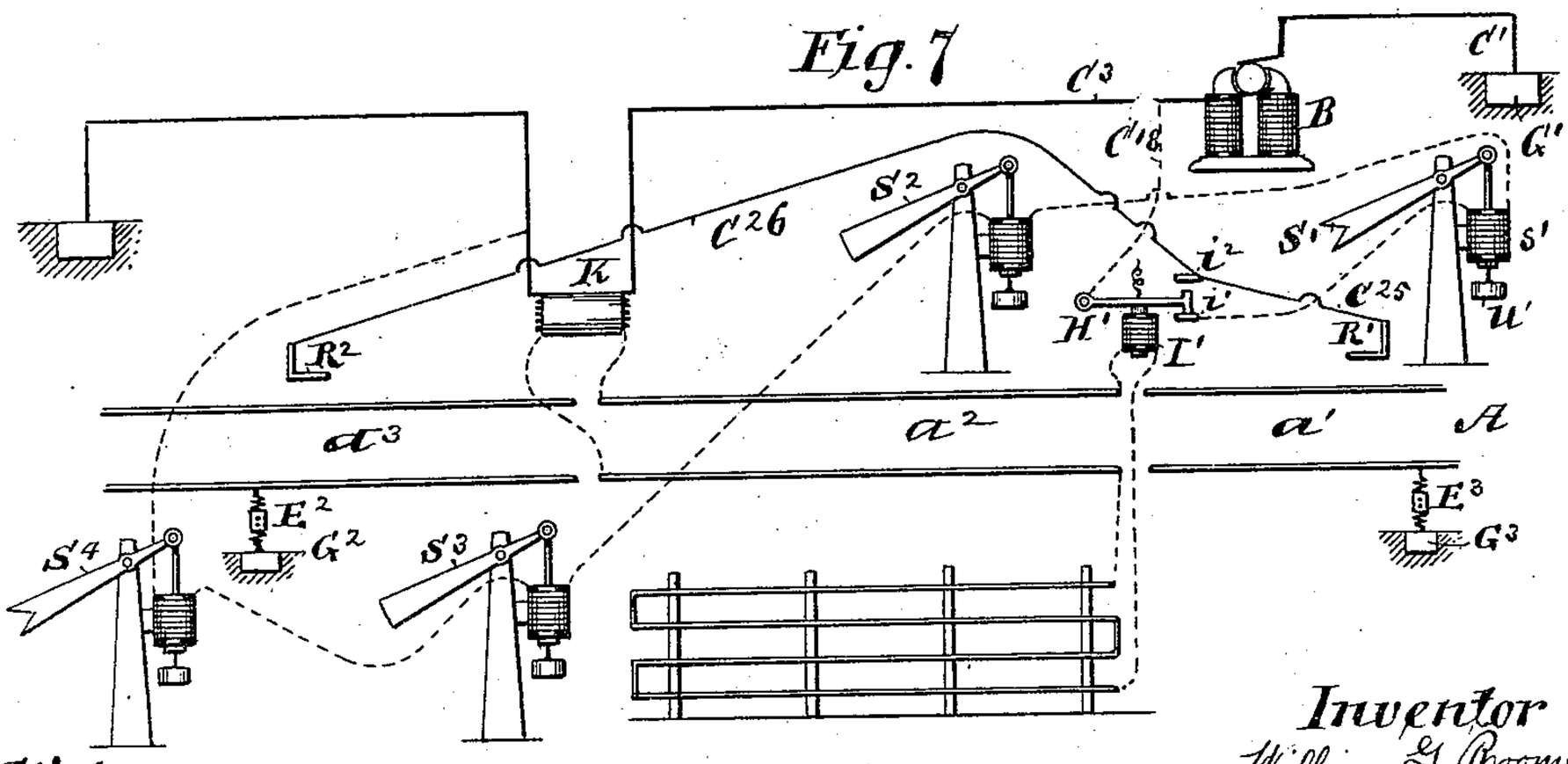


Fig. 7



Witnesses
William A. Pollock
William M. Iliff.

Inventor
William G. Roome
By his attorney
Edwin H. Brown

UNITED STATES PATENT OFFICE.

WILLIAM G. ROOME, OF JERSEY CITY, NEW JERSEY.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 558,566, dated April 21, 1896.

Application filed November 17, 1893. Serial No. 491,257. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. ROOME, of Jersey City, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Railway-Signals, of which the following is a specification.

I will describe my improvement in detail, and then point out the novel features in claims.

In the accompanying drawings, Figure 1 illustrates, diagrammatically, features which will give an engineer a signal in the cab of his locomotive. Fig. 2 is a diagrammatic view illustrating modified means for doing the same. Fig. 3 illustrates, diagrammatically, features designed to control the brakes on a train. Fig. 4 is a diagrammatic view illustrating modified means for doing the same. Fig. 5 illustrates, diagrammatically, features designed to protect a train from a washout, land-slide, or other foreign substance. It may also be placed on a bridge or trestle, so as to indicate a break of the bridge or trestle. Fig. 6 is a diagrammatic view illustrating modified means for doing the same. Fig. 7 illustrates, diagrammatically, modified means for doing the same, and also illustrates its connection with a train so as to give a signal in the cab or put on the brakes, as may be desired.

Similar letters of reference designate corresponding parts in all the figures.

Referring first to Fig. 1, A designates a railway-track of ordinary or any suitable construction comprising track-sections a' a^2 a^3.

B designates an arbitrary representation of a dynamo-electric machine. The machine I use may be of any desired type. This dynamo is intended to supply current for certain signaling devices employed in a block system.

The track-section a' may be regarded as a section extending from a depot or station. The rails comprised in each track-section are intended to be made continuous electrically. This may be done by means of fish-plates, chairs, or other devices made of metal and electrically connecting the ends of abutting rail-sections. A simple way of connecting adjacent rail-sections comprised in the track-section is to fasten the ends of a wire between each pair of adjacent rail-sections. The rails comprised in each track-section are, in this example of my improvement, electrically independent of those comprised in every other track-section. Their electrical independence may be secured by employing chairs or fish-plates of insulating material, such as wood, between the rails comprised in one track-section and those comprised in each adjacent track-section. In this example of my invention I use what may be regarded as a "main circuit," comprising all the signals and protecting devices, and I also use a track circuit or circuits. In each track-circuit the rails of one of the track-sections is comprised.

I will first describe the main circuit and its appurtenances.

C′ designates a wire leading from one pole or electrode of the dynamo-electric machine B to the ground. As here shown, it is represented as connecting with a ground-plate G′.

C^2 designates another wire extending from the other pole or electrode of the machine. This wire extends to a point where the main circuit branches, one branch, C^3, extending to one terminal or contact-point of a transformer K, and the other branch, C^4, extending to one end of the coil of an electromagnet s', belonging to a cautionary signal S′. This signal may be like any of the signals I have explained in my other patents. It consists of a lever fulcrumed between its ends on a pin t' and combined with a weight u'. From the other end of the coil of this magnet a wire C^5 extends to the coil of a danger-signal S^2, which may be similar to the signal S′. From the other end of the coil of the signal S^2 a wire C^6 extends to the contact-piece i' of the circuit-changer H′. This circuit-changer H′ has combined with it contact-pieces i' i^2, a spring J′, and a magnet I′. From the other end of the circuit-changer H′ a wire C^7 extends to the wire C^8.

The wire C^3 extends to one end of the high-potential coil of a transformer K. This transformer may be of any suitable construction comprising high and low potential coils. If a direct-current dynamo be used, a dynamotor (sometimes called a "motor-dynamo") or direct-current transformer would be preferable. In other cases the alternating-current transformer or any other kind may be used.

From the other end of the high-potential

coil of the transformer K a wire C^8 extends to the ground. (Here represented by the ground-plate G^4.)

From the end of the low-potential coil of the transformer K wires C^9 and C^{10} extend to and contact with the rails of the track-section a^2 of the track A. The opposite ends of the rails at the other end of this section are connected by wires to the coil of the magnet I′ belonging to the circuit-changer H′.

From the contact-piece i^2 a wire C^{24} extends, and from the wire C^{24} wires C^{25} and C^{26} extend in different directions along the track. One terminates at a contact-piece adjacent to the track-section a' and the other at a contact-piece adjacent to the track-section a^3. These contacts will preferably be of some considerable length and are intended to be touched by a contact-piece which will preferably be made in the form of a brush and carried by the locomotive or some convenient place on the train. It will be insulated from the metal part of the locomotive or train and put in communication with the signal in the cab or other convenient point on the train.

The signal of the cab will be connected with the metal of the locomotive so that it may be grounded. In any ordinary railroad the tracks would be sufficiently grounded normally, but if necessary one rail may be connected with the ground-plate G^2 or G^3 and have combined with it a resistance device E^2 or E^3, as shown in the drawings. This resistance device would preferably be of a heavy resistance, so as not to interfere with the working of any of the track-circuits.

Obviously, whenever the magnet I′ is short-circuited out by a train, car, or locomotive traveling along the track-section a^2 the circuit-changer will continue the circuit through the contact-piece i^2 to the wires C^{24} C^{25} C^{26} and adapt it to be continued to the signal of a locomotive passing along the track-section a' or along the track-section a^3 of the track A.

Fig. 2 is similar to Fig. 1, just described, with the exception that the transformer K is dispensed with and current is supplied to the track-section a^2 of the track A by means of a track-battery L′. A resistance device E′ is also added to compensate for the removal of the transformer and to equalize the circuits, the transformer K in Fig. 1 being wired to equalize the circuits, or, if desirable, artificial resistance could be added. I have also shown another danger and another cautionary signal as connected in my signal-circuit C^{18} C^{19} C^{20} C^{21} C^{22} C^{23}.

An engineer approaching the protected track-section A^2 from either direction would be notified by either of the cautionary signals S′ or S^4 that there was a train, car, or locomotive located upon the track-section a^2, or that there was a broken rail therein, long before reaching this section. He will again receive this notification on the signal in his own cab on passing either of the contact-pieces R′ or R^2 before reaching the track-section a^2 on which the "danger" is located. He will again receive notice of "danger" in this section when he arrives at the beginning of it by means of the danger-signals S^2 or S^3. It will be thus seen that this section is fully protected in both directions.

I may add that the electrical current that is conveyed to the cab of the locomotive may be connected with the air or other brakes in such manner as to put on the brakes on the train and compel its stoppage without the assistance of the engineer.

In Fig. 3 I have illustrated this feature of my invention. The main circuit, comprising the dynamo B and wires C′ C^2 C^3, may correspond with the same. (Shown in Fig. 2.) The signal-circuit, comprising the wires C^4 C^5 C^6 C^7 C^8 C^9, as well as the signals S′ S^2 S^3 S^4 and the circuit-changer H′, may also correspond with those shown in Fig. 2. The wires C^{24}, C^{25}, and C^{26} lead from the contact-point i^2, as in the previous figure, to the contact-pieces R′ R^2. The track-circuit a^2 is supplied by current from the track-battery L′, as in the preceding figure.

The figures shown inside of the rectangle on the left side of the drawings represent connections in the interior of the cab of the locomotive or some other suitable place on the train.

X is an arbitrary representation of a piece of pipe of any suitable construction. It is intended to be connected with the train-pipe of the train, so that whenever the magnet s^5 is energized through the wires C^{27} C^{28} it will—being a solenoid—draw in its movable core *e*, which slides through the pipe X at a point *d*, thereby opening a passage in the pipe and allowing the air to escape out of the train-pipe and thus putting on the air-brakes. In case of vacuum-brakes it might be arranged to allow the air to enter the train-pipe breaking the vacuum, thus putting on the brakes. The end *z* of the pipe *x* may be connected with the train-pipe or other convenint part of the brake system, and the end *y* would preferably be left open. If a common whistle were placed at the end *y*, it would also give a signal to the engineer as the brakes were put on.

The wire C^{27} extends from one end of the coil of an electromagnet s^5 to a brush F′, carried by the train and adapted to coact with the contact-piece R^2, and continuing the circuit by wires C^{26} C^{24} to the contact-piece i^2 of the circuit-changer H′.

The wire C^{28} may be fastened to the metal of the locomotive so as to reach a ground connection through the rails; but in this example of my improvement I show it as insulated from the metal of the locomotive and connected with the ground through a brush F^2, carried by the train, and adapted to coact with a contact-piece R^4, which would preferably be placed on the ties but not connected with the rails.

The contact-pieces R^3 and R^4 would be a

piece of rail or metal laid on the ties and connected with the ground. (Here represented as connected to ground-plates G^3 and G^4, respectively.)

When the circuit-changer H′ shifts its contact from the contact-piece i' to that of the contact-piece i^2 by an interference of the track-circuit a^2, caused by a train, broken rail, wire, or otherwise, the magnet s^5 of a train while passing the contact-piece R^2 R^4 is energized through the wires C^{24} C^{26}, contact-piece R^2, brush F′, wires C^{27} C^{28}, brush F^2, contact-piece R^4, and ground-plate G^4. This causes the magnet, which is preferably in the form of a solenoid, so as to be capable of a long range of movement, to move its armature and open a valve in the train-pipe, thus allowing the air to escape and putting on the brakes. If a whistle is attached to one end of the pipe, the engineer's attention is also called to the fact that there is danger in the section a^2.

It would be preferable to have the contact-pieces R^2 R^4 placed near to the meeting ends of the track-sections a^2 a^3, so that after he had passed the cautionary signal S^4 his brakes would be put on the train, so as to stop his train just as he arrives at the danger-signal S^3. This would also apply to trains running in the reverse direction, through the signals S′ S^2 and contact-pieces R′ R^3. It will thus be seen that it would be impossible for the engineer of a train to enter the section a^2 while there was danger therein.

I do not wish to be confined to the use of any particular kind of magnet on the train, or to any particular kind of application to the train-pipe, as the magnet might do its work by letting steam or compressed air into a cylinder, which in turn would operate the brakes, or it might be a common magnet and release a weight which would do the work. I have endeavored to show this modification in Fig. 4, which may be similar to Fig. 3, with this exception and with the exception that I show my track-circuit a^2 as energized by the transformer K instead of the track-battery L′. The resistance device E is also dispensed with, as the transformer may be wired to correspond with the other branch of the main circuit containing the signals, or artificial resistance may be added. In this figure X represents the piece of pipe similar to Fig. 3, the magnet s^5 being dispensed with, and a common annunciator-magnet I^2 taking its place. The armature of this magnet is pivoted at a point h' and is normally held away from the magnet by a spring I^2, while in this position it holds a catch pivoted at a point p' and keeping the valve e of the pipe closed. This valve is hung on the catch at a point p^2, and its connection is movable at the points p^2 p^3, or a piece of rope might be used for this connection without movable points. From the other end of the valve e a weight u^3 is hung, which is adapted to open the air-valve when the magnet I^2 is energized and so put on the brakes. This is done by the magnet releasing its catch and allowing the weight u^3 to open the valve.

In Fig. 5, B is an arbitrary representation of a dynamo-electric machine of any desired type. It is intended to operate certain signals in the system. It may be replaced by a battery, if desirable. From one of its poles or electrodes a wire C′ extends to a resistance device E. From the other pole or electrode a wire C^2 extends to the ground. (Here represented by a ground-plate G′.) From the wire C′ a wire C^5 extends to one end of the coil of an electromagnet s', belonging to a signal S′, which may be similar to other signals in my system. From the other end of the coil of this magnet a wire C^6 extends to a contact-piece i', which is adapted to coact with a circuit-changer H′ and has combined with it a spring J′, adapted to move it away from the contact-piece i'. It is held against this contact by the magnet I′, which is in a local circuit which I will describe later on. From the other end of the circuit-changer H′ a wire C^7 extends to one end of the coil of an electromagnet belonging to a signal S^2. From the other end of the coil of this magnet a wire C^8 extends to a wire C^4, which extends from the resistance device to the ground, (here represented by a ground-plate G^2,) or this wire may extend to other devices beyond, thence to the ground.

The resistance device E is intended to equalize that branch of the main circuit, so as to correspond with the branch containing the signals.

The ends of the coil of the magnet I′ are connected with a local circuit. This local circuit is here represented as being in the form of a fence, the wires being attached at intervals to posts of wood or other insulating material, the wires in this example of my improvement being arranged parallel to each other and at a convenient distance, the ends being connected to a track-battery L.

The conductor is normally in circuit, and the wires extending from each pole of the battery are placed alongside of each other, so that if they should become crossed they would shunt out the magnet I′, or if they should become broken they would cause the magnet I′ to also operate, the spring J′ pulling the circuit-changer away from the contact-piece i' whenever the magnet I′ is deprived of current or the strength of the current altered by shunting out the magnet. This conductor is designed to be placed near the track at a point where a washout or land-slide is likely to occur. It may be only a single wire, if necessary, and may be tacked or nailed to the ties in a place where there is danger of weakening of the road-bed, or it may be placed in any convenient position on a bridge, so that if the bridge or trestle is burned, wrecked, or swept away an alarm would be given. The battery L would preferably furnish a current of low potential. I may also use a transformer to sup-

ply this circuit, as shown in some of my following drawings. For convenience I have marked the wires forming this local circuit as C^{18} and C^{19} and the post or supports by the letter *o*.

It will be observed that if the wires C^{18} C^{19} were to become broken from any cause or if a land-slide should occur not strong enough to break them, but by washing out the posts cause the wires to touch each other, the magnet I′ would be deënergized sufficient to allow its armature to be pulled away from the contact-piece *i*′ by the spring J′. This would open the circuit supplying the signals S′ S^2 and their weights *u*′ u^2 would set these signals at "danger." In the event of an accident or other collision any debris thrown against one of these wires would break it or would operate to twist it to the adjoining wire, thus setting the signal at "danger."

In Fig. 6 A represents a track of any ordinary or suitable construction, and comprising sections *a*′ a^2 a^3. B represents a dynamo. This dynamo may be of any of the ordinary types; but I may add that if it be a direct-current dynamo a direct-current transformer I sometimes called a "motor-dynamo" I or "dynamotor" would be preferable. In other cases the ordinary alternating-current transformer or any other kind may be used. From the poles or electrodes of the dynamo B wires C′ and C^2 extend. From these wires wires C^3 and C^4 extend to one of the coils of a transformer K′. From the other coil of this transformer a local circuit is formed by wires C^7 C^8 C^9 C^{10} C^{11} C^{12} and the coils of the magnets *s*′ s^2 s^3 s^4 belonging to their respective signals, together with the circuit-changer H and its contact-point *i*. This circuit, as represented, would be normally closed and the signals therefore set at "safety."

From the high-potential coil of the transformer K^2 wires C^5 and C^6 extend to the wires C′ and C^2. From the low-potential coil of this transformer wires C^{13} and C^{14} extend to one end of the rails of the track-section a^2. From the other end of this track-section a wire C^{15} extends to the conductor for protecting the track from land-slide, &c. (Here shown as a fence, as in the former drawings, with the exception that there is only a single circuit comprising the fence and not a double circuit, as shown in Fig. 5.) The other end of this conductor would be connected by a wire C^{16} to one end of the coil of an electromagnet the other end of this coil of this magnet being connected by a wire C^{17} with the other rail comprising the track-section a^2. It will be noted that in this example of my improvement I have connected the conductor with my track-circuit of the track-section a^2, and it will be found that if the wire were to become broken by a land-slide, washout, or other cause, the signals S′ S^2 S^3 S^4 would set at "danger," and as an interruption of the track-circuit or a breaking of one of the wires of the conductor would cause the circuit-changer H to shift away from the contact-point *i* by means of the spring J′ and the local circuit of the signals would be opened at this point, causing them to set at "danger."

Fig. 7 shows this last application as being connected in such a manner as to give a signal in the cab of the locomotive, or arranged to put on the brakes, if desired. It is similar to Fig. 2, with the exception that the track-battery L′ and the resistance device E′ are dispensed with and a transformer K supplies current of low potential to the track-circuit a^2 instead of the track-battery L′. The transformer may be wired to equalize the resistance of this branch of the main circuit, or artificial resistance may be used. I have also added the conductor arranged in the form of a fence, as in the previous drawings. It is looped in as a part of the track-circuit comprising the track-section a^2. Thus in my example of my invention it will be seen that the signals will be set at "danger" if a land-slide, washout, burning of bridge or trestle or breaking down of the same, or, if the conductor be fastened to the ties, would show a sinking of the road-bed. This would set the signals S′ S^2 S^3 S^4 at a position indicative of "danger" and would warn the engineer in his cab or cause a complete stoppage of the train by putting on the brakes before the danger was reached.

I am aware that Patent No. 288,480, granted November 13, 1883, to W. P. Phelps for an improvement in electrical train stopping and signaling apparatus for land-slides, shows a conductor made in the form of a fence comprising movable sections, the sections being intended to be moved by the land-slide to break the circuit. I do not therefore claim, broadly, a circuit to be broken by this means, but claim a continuous length of wire, meaning thereby a rigid conductor without movable contacts or springs.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a railway signal system comprising a number of sections, the combination of a number of signals in said sections, a common source of electricity supplying said signals, means substantially such as described for conveying a part of the electricity from said common source to a moving train to operate a signal on the train and a track-circuit controlling the train-signal, substantially as specified.

2. In a railway signal system comprising a number of sections, the combination of a number of signals in said sections, a common source of electricity supplying said signals, means substantially such as described for conveying a part of the electricity from said common source to a moving train to operate a signal on the train and a track-circuit receiving its energy from a transformer and controlling the train-signal, substantially as specified.

3. In a railway signal system comprising a

number of sections, the combination of a number of signals in said sections, a common source of electricity supplying said signals, means substantially such as described for conveying a part of the electricity from said common source to a moving train to operate a device on the train so as to secure a stoppage of the train before the protected block or section is reached and a track-circuit controlling the device on the train, substantially as specified.

4. In a railway signal system, the combination of a circuit containing the signal or signals and a circuit comprising a continuous length of wire arranged near the track of a railway and adapted to be broken or disarranged by a land-slide or similar disturbance thereby controlling the signal-circuit, substantially as specified.

5. A visual block system having normally-closed controlling-circuits connected to sections of the track, visual-signal circuits, normally-closed relays controlling said visual-signal circuits and normally energized over the track-circuits, contact devices placed upon the road-bed in position to close the circuit upon the locomotive in case the latter passes a semaphore when set against it, and a normally-open relay-contact governing the circuit of said contact devices and adapted to close a break in said circuit when there is a break in the section of track-circuit.

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

WILLIAM G. ROOME.

Witnesses:
ANTHONY GREF,
WILLIAM M. ILIFF.