No. 808,223. PATENTED DEC. 26, 1905.

S. D. STROHM.

RAILWAY SIGNALING.

APPLICATION FILED AUG. 29, 1891.

3 SHEETS—SHEET 1.

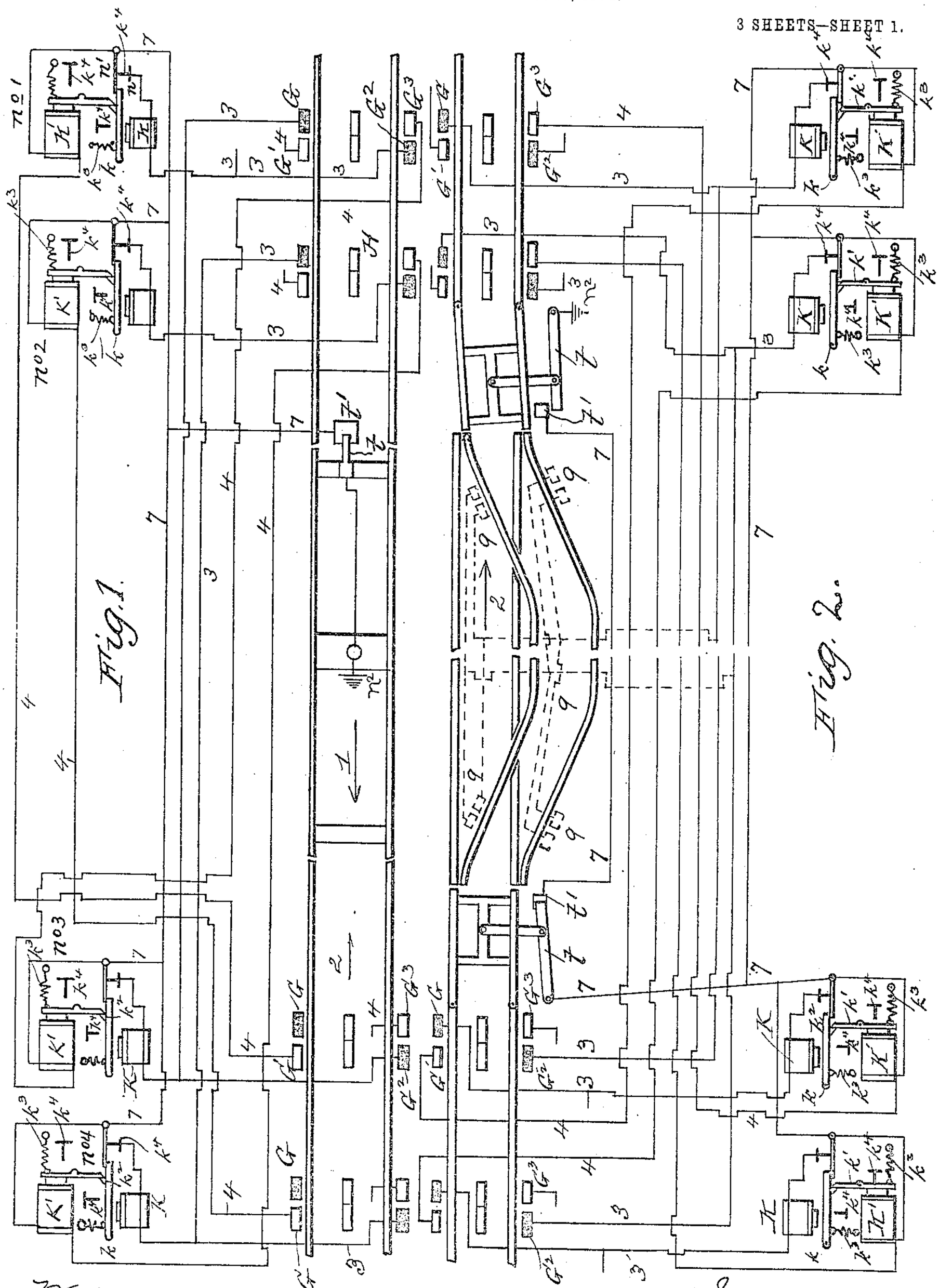

Fig. 1.

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3

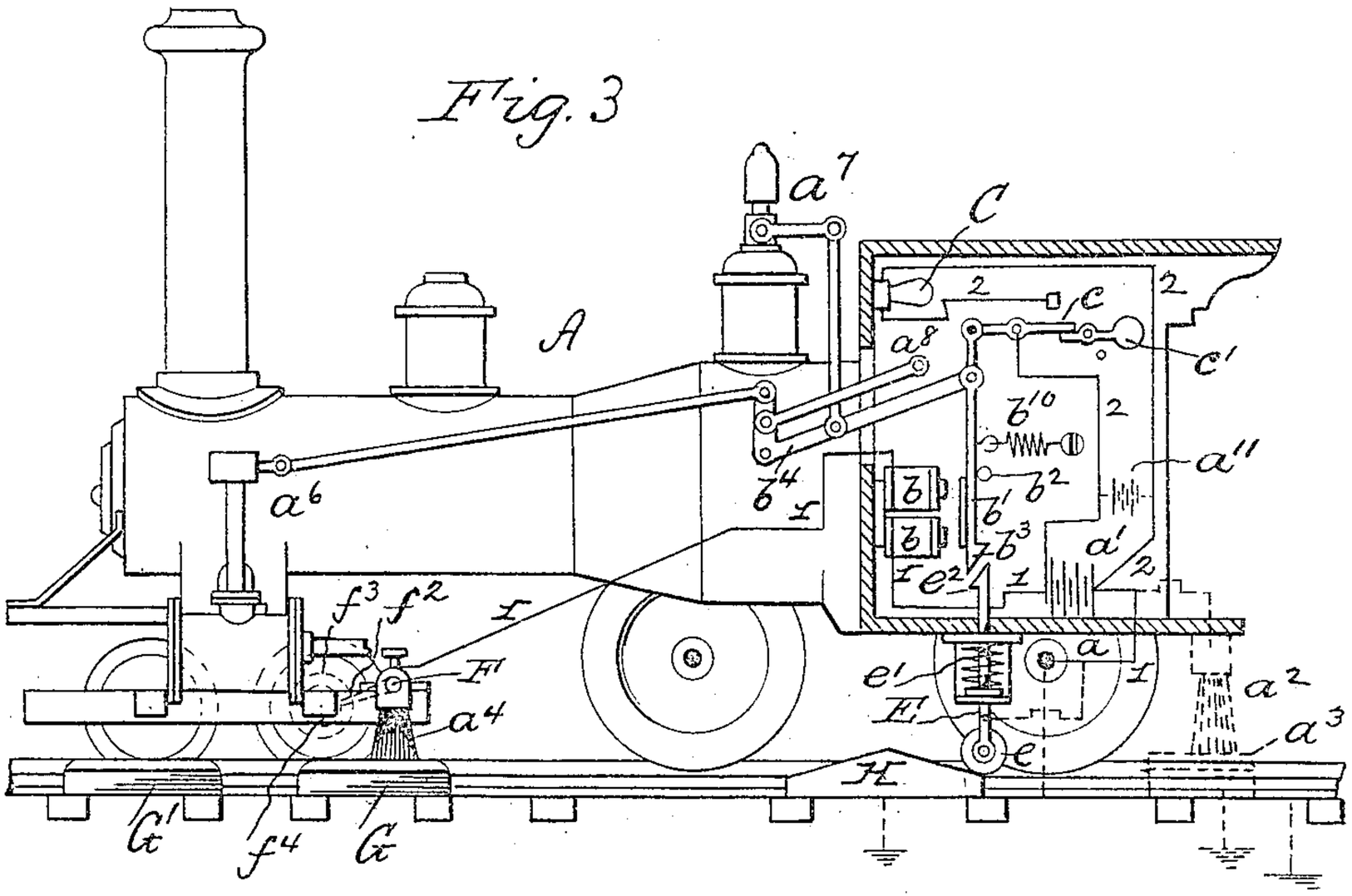
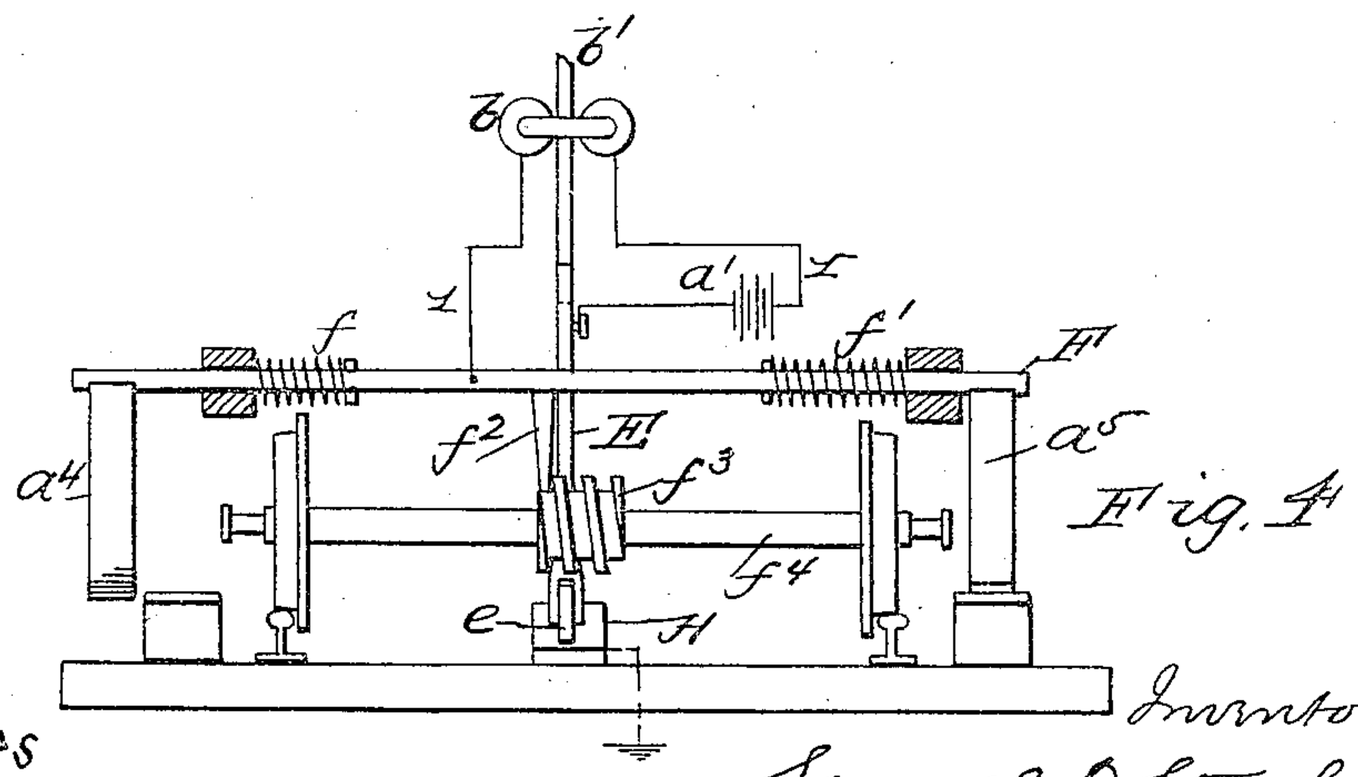


Fig. 4



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3 SHEETS—SHEET 3.

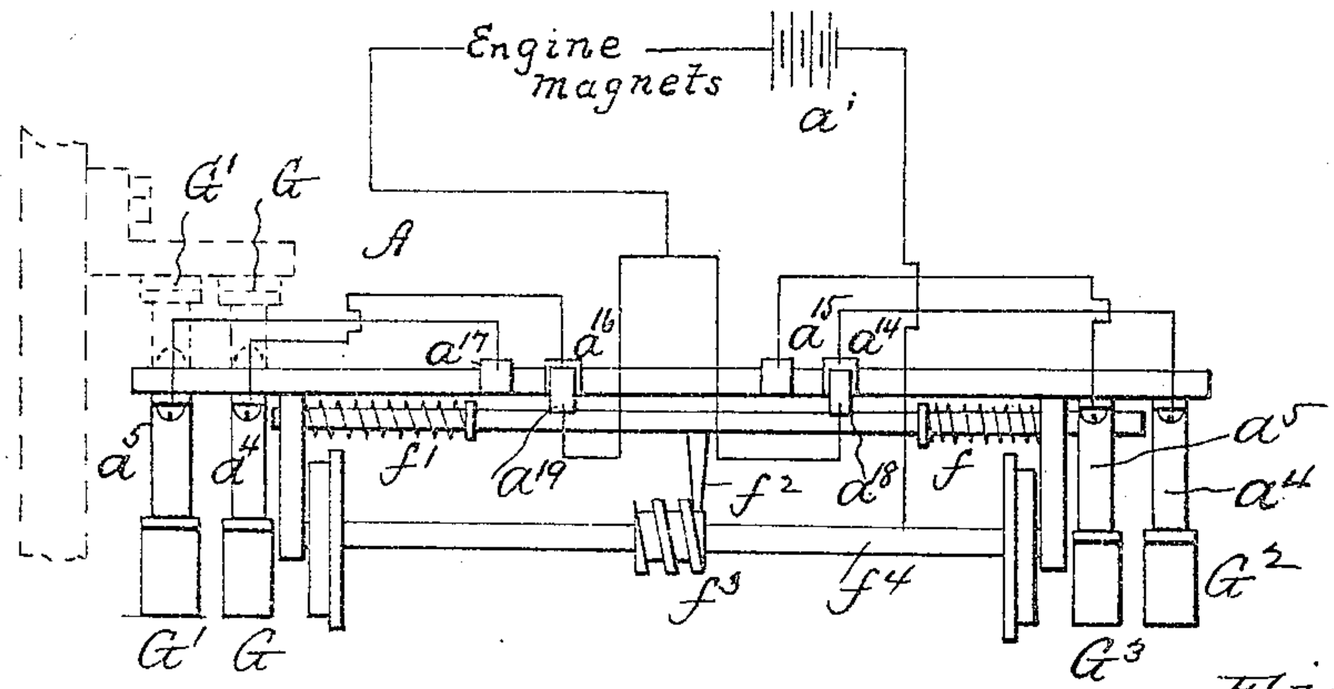

Fig. 5

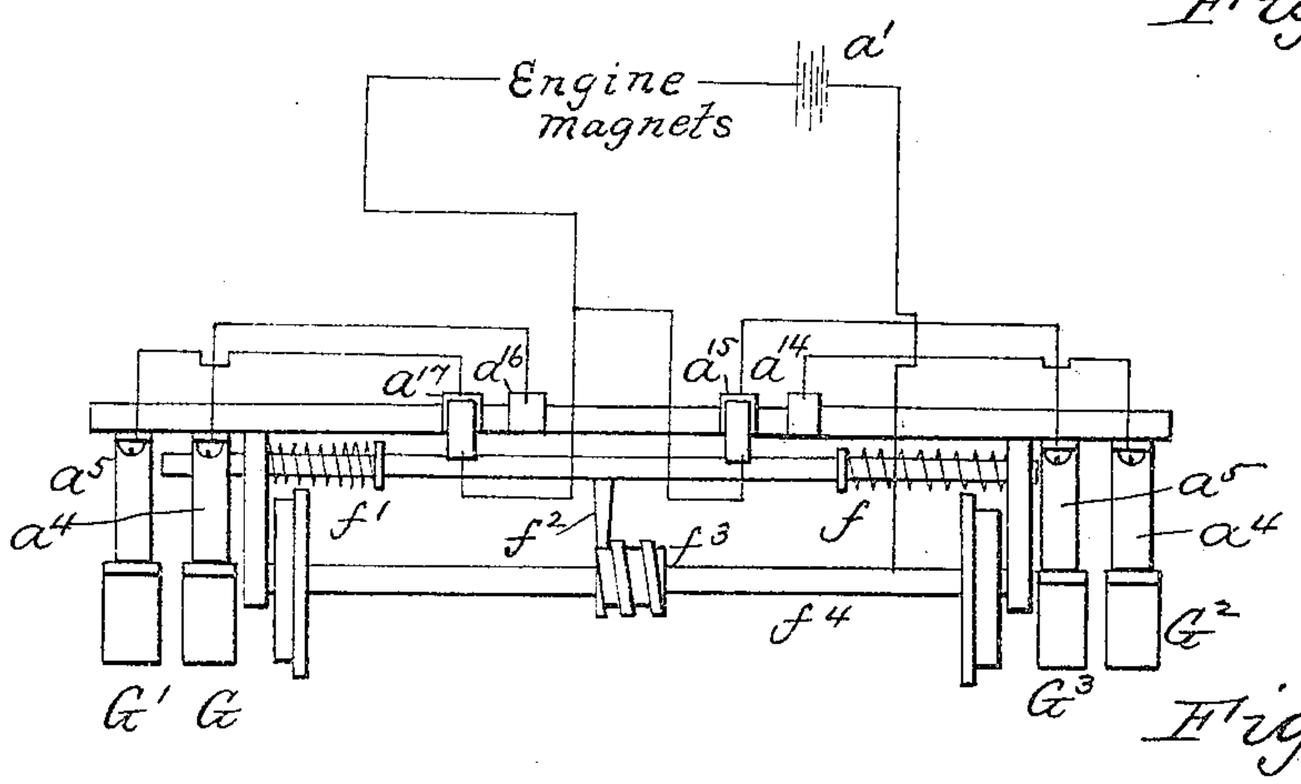

Fig. 6

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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNALING.

No. 808,223. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed August 29, 1891. Serial No. 404,144.

To all whom it may concern.

Be it known that I, SAMUEL D. STROHM, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Railway Signaling; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation generally to railways having their line of way and engines or trains equipped with electromagnetic appurtenances for preventing collisions of trains and for avoiding danger from open drawbridges or switches by automatically stopping the engine or train before it enters upon a block or section of the line of way wherein the collisions may occur or wherein the open drawbridges or switches are included or located, and particularly to that form of the same shown, described, and claimed in United States Letters Patent, dated May 25, 1886, No. 342,499, wherein the stations are equipped with partial circuits including contact-plates and electromagnetic devices which make and break ground for such partial circuits and the engines or trains are equipped with partial circuits including brushes for contact with said plates, electromagnetic devices, and means for controlling the steam or motive power supply to the engine, and, if desired, the alarm or whistle and air-brake controlling mechanism all coacting to admit of a train passing a station finding ground at such station to indicate "safety" or clear track ahead, break such ground at such station for a following train to indicate "danger" on track ahead, and to automatically stop it independently of the engineer at such station and to reëstablish or restore such ground at a distant station to indicate "safety" for following trains.

My invention has for its object to provide for controlling the engines or trains in backing as well as advancing along the line of way, thereby protecting the same from collisions and dangers from open drawbridges or switches upon single or double track railways irrespective of the direction of their movement or travel.

My invention has for its further object a simple and effective arrangement and construction of automatically-acting electromagnetic appurtenances, contact-plates, and partial circuits at the stations and on the trains for permitting the latter to protect themselves from collisions and danger from open switches or drawbridges while advancing or while backing along the line of way.

My invention accordingly consists of the combinations, constructions, and arrangements of parts, as hereinafter described in the specification, and more particularly pointed out in the claims.

Reference is had to the accompanying drawings, wherein—

Figure 1 is a diagrammatic view of track with drawbridge equipped in accordance with my invention. Fig. 2 is a like view of track and siding. Fig. 3 is a sectional elevation of engine or locomotive and part of line of way with electromagnetic appurtenances and steam or motor supply, whistle or alarm, and brake-controlling mechanism. Fig. 4 is a transverse section of part of engine, showing mechanism for shifting its brushes automatically as it reverses the direction of its travel or in changing from a forward to a backward movement, or vice versa. Figs. 5 and 6 are like views showing the brushes stationary and shifting circuit connections with the engine-battery, the said shifting connections being shown in two different positions.

A represents a steam locomotive, engine or other motor or movable car upon which is located a partial circuit 1 1, which, as shown, is an open circuit having one end grounded through the engine-frame, as indicated at a, Fig. 3, or such ground may be made by way of an engine-brush and line-of-way contact-plates, as indicated at a^2 and a^3, respectively, Fig. 3. The circuit 1 1 includes a source of electric supply a' and electromagnet b, and its other end leads to engine-brushes a^4 a^5, located, as shown, upon the engine, or said brushes may be mounted upon the tender or other desired place on the train. The armature-lever b' for magnet b is shown provided with a reacting-spring b^{10} for returning the same to its normal position in engagement with a limiting-stop b^2 and is also provided at its lower end with a hook or latch-head b^3. Its upper end engages a lever b^4 of any suitable form having connection as desired with the throttle, steam-port, or other controlling-valve a^6 for supplying steam to the cylinders, the whistle or alarm a^7, or the air-brake-controlling mechanism a^8, whereby when the armature end of said lever is drawn down or suitably actuated the steam or power supply is cut off from the cylinders, the alarm or

whistle is sounded, and the brakes are applied to stop the train. If desired, said lever may be connected with the stopping mechanism for the train, in which case the alarm or whistle is not sounded; but I prefer to use the latter, as it gives warning in advance of the train coming to a state of rest, so that meanwhile the brakesmen or attendants on the train may actuate the usual hand devices to assist in applying the brakes or perform such other duties as are required when the train is signaled "danger ahead" and before it is stopped.

Instead of an aural signal a visual one may be substituted, and this may be of any suitable kind. In the drawings I have shown a lamp C, an incandescent electric one being preferred, in a branch or shunt 2 2 from the circuit 1 1, which shunt is shown open and is closed by a switch *c* engaging with or controlled by the armature-lever *b'*, being so arranged that when said armature-lever is in its normal position the switch is in position to open circuit or shunt 2 2, as indicated in Fig. 3, and when drawn down or actuated to stop the engine the switch *c* is moved to close the shunt 2 2 through the lamp to light it, and thus indicate the danger-signal. If desired, the lamp-circuit 2 2 may be separated from circuit 1 1 and have its separate source of electric supply, as indicated at *a''*, Fig. 3. Engaging with switch *c*, if desired, and correspondingly actuated is a semaphore-signal *c'*, the former being used by night and the latter by day when both are provided. In case the former only is used it indicates the signal both day and night. If a semaphore-signal is used in the lamp-circuit 2 2, the light or lamp is only used as needed.

E represents a moving bar or rod suitably located and is shown carrying at its lower end a shoe or wheel *e* and a reacting-spring or other desired device *e'* for returning the rod to its normal position. Said rod is provided with a latch head or end e^2, which is in line with the latch-head b^3 on the armature-lever *b'* when it is unattracted by its magnet.

The brushes a^4 a^5, as more plainly indicated in Fig. 4, are mounted upon a horizontal sliding or movable rod F, having suitable bearings in the engine or other frame of a car in the train. Said rod is provided with springs *f* and *f'* and a finger f^2, which engages with a worm-cam or equivalent device f^3 on an axle f^4 of a car or engine, so that as said axle revolves in different directions, due to changing or reversing the direction of travel of the engine, the finger f^2 is actuated or moved from side to side the full length of the worm f^3 to slide the bar F and shift one or the other of the brushes a^4 a^5 into or out of the line or path of two sets or pairs of differently-located but alining contact-plates G G' and G^2 G^3, located along the line of way, as and for purposes hereinafter set forth. As said rod F and its brushes a^4 a^5 are shifted one or the other of the springs *f* and *f'* act to maintain a pressure upon the rod in a direction the opposite of that in which it is shifted in order to hold the finger f^2 in such engagement with the worm f^3 that it will shift said finger and rod as the direction of rotation of the worm is changed by reversing the engine from a forward to a backward motion, or vice versa.

H represents inclines suitably located along the line of way adjacent to the plates G, G', G^2, and G^3 for the wheel or shoe *e* of rod E to contact with for raising or moving said rod in one direction, its weight or spring *e'* oppositely moving it. The wheel or shoe *e* rides upon an incline H at the same time that a brush a^4 or a^5 contacts with a plate G or G^2. If the engine-circuit 1 1 has a ground by the way of either of said plates G or G^2, as hereinafter set forth, the magnets in circuit 1 1 attract the armature-lever *b'* and hold it out of the path of the latch-head e^2 of rod E as it ascends or moves under the influence of the incline H and the engine or train is not stopped. If, however, such ground is not obtained when said brush contact is made with either of the plates G or G^2, the engine-circuit magnets *b* do not attract armature-lever *b'*, and it remains in the path of the latch-head e^2 of rod E, and as it descends or returns to its normal position it moves the armature-lever *b'* to actuate the steam or power supply cut-off a^6, sound the whistle or alarm a^7, and operate the brake mechanism a^8 to stop the engine or train, the signal C or *c'* being also actuated.

At the termini of each block or section or at any points or locations as desired along the line of way, in conjunction with the two sets of contact-plates G G' and G^2 G^3 and an incline H for each such point or location, are suitably supported electromagnetic appurtenances in open circuits 3 3 and 4 4. The type of such appurtenances shown consists of two magnets K K', having armature-levers *k k'* respectively provided with retracting-springs k^3 and stops k^4 and located at right angles to one another, the one having a latch-head k^2 for interlocking with the other.

The two sets of plates G G' and G^2 G^3 in the form of improvements shown are used at each electromagnetic-appurtenance station along the line of way.

The plates G G^2 of the two sets of contact-plates are used for completing the grounds of the partial circuit on the engine or train and the partial station-circuit 3 3 to cause their included magnets to actuate or attract their armatures and prevent stopping the trains or engines, thereby indicating "safety" and at the same time breaking ground at the station partial circuits 3 3 for the following trains until such circuits are restored by contact of engine-brushes with the plates G' G^3. The plates G G' of one set and the plates G^2 G^3 of the other set are oppositely arranged, as

shown—that is to say, on one side of the tracks the plate G′ is in front of the plate G, while on the other side of the tracks the plate G^2, which corresponds to plate G, is in advance of plate G^3, which corresponds to plate G′. This reversal of the plates of each set as described is provided to admit of controlling the trains or engines in reversing or backing. The plates G G^2 are included in the station-circuits 3 3 and the plates G′ G^3 in the corresponding circuits 4 4. These circuits may be arranged to make connection with the magneto appurtenances at the station whereat the plates G G^2 are located or at a distant station. When the latter arrangement is used, I obtain what I call the "interlocking system" of controlling the trains, as the engines or trains in passing a station find ground and break it at two stations ahead, thereby affording still greater security against collisions and danger from open drawbridges or switches.

For trains or engines traveling in the direction of arrow 1 in the drawings the engine-brushes a^4 are automatically shifted to be in line and contact with the plates G G′, the brushes a^5 being out of line and not contacting with the other plates G^2 G^3, all of said contact-plates being suitably insulated. Each circuit 3 3 leads from a plate G of a station—as, for instance, station No. 1—to plate G^2 of station No. 3, or two stations ahead, thence to magnets K of said station 3, thence to contact-post n, thence to spring or movable plate n', normally contacting with post n, as indicated at station No. 4, to ground n^2, the free end of plate n' normally being in impingement with or in the path of the free end of armature-lever k, so that when the latter is retracted by its spring k^3 it raises plate n' from post n to break the ground 7 for circuit 3 3. Each circuit 4 4 leads from a plate G′ of a station—as, for instance, station No. 3—to magnets K′ of station No. 1, or two stations to the rear, and thence to a line 7, leading to a common ground n^2. The plates G^3 at each station—as, for instance station No. 1—have a conductor connection 5 with the circuit 4 of station No. 3, or two stations ahead, the effect whereof is that when a train or engine traveling or advancing in the direction of arrow 1 arrives at a station—for instance, station No. 1, Fig. 1—its brush a^4 first contacts with plate G, as shown, and finds ground through circuit 3 3 and magnets K at station No. 3 the magnets K and engine-magnets b attract their armatures. Hence the bar E on the engine riding upon the incline H at station No. 1 does not engage the armature b' of magnets b, as said armature is attracted out of the path of said bar, and the train is not stopped, as the finding of such ground indicates that the track ahead of station No. 1 or between the latter and station No. 3 is clear. As soon as brush a^4 passes off of plate G the armature-lever k of magnets K at station No. 3 is retracted and moves plate n' off of stop or post n, as indicated at stations Nos. 1 and 2, which have previously been correspondingly actuated to break ground 7 for the circuits 3 3 for each such stations, and in so moving the latch-head k^2 of armature-lever k passes into position below the inclined face of the lower end of armature-lever k'. A following train or engine arriving at any one of said stations having the ground of its circuit 3 3 broken finds no ground. The magnets b on the engine do not then attract the armature b', and its latch-head b^3 is then in the path of the moving rod E, and the latter in falling or returning to its normal position engages the latch-head b^3 and moves the lever b' and in turn the lever b^4 to cut off steam or power supply to the cylinders, blow the whistle, and apply the air-brakes, or to display either or both of the visual signals C C′.

When the engine-brush a^4 contacts with the plate G′ of a station—for instance, station No. 3—the circuit 4 4 of station No. 1 is closed through the engine-circuit and the magnets K′ at station No. 1 attract its armature k', causing it to press or move down the armature k of magnets K until its inclined end engages with or locks itself with the latch-head k^2 on armature k to lock the latter in position and permit the plate n' to contact with post n for restoring or reëstablishing the ground 7 for circuit 3 3 for said station No. 1. Should an engine moving in the direction of arrow 1 reverse its direction of motion or go backward, the reverse rotation of worm f^3 through the medium of finger f^2 shifts bar F to automatically move the brush a^4 out of line of contact with plates G G′ and the brush a^5 into line of contact with plates G^2 G^3, and in going backward in direction of arrow 2 the brush a^5 contacts first with plate G^2 to make ground through circuit 3 3 of a station—for instance, station No. 4—to actuate magnets K therein to break such ground, so that a train traveling in the direction of arrow 1 arriving at plate G station 2 finds no ground through circuit 3 3 of station No. 4 and is stopped, while the train backing from station No. 4 when it arrives at station No. 3 finds its ground broken, it having been so done by the train stopped at station No. 2 as it passed and contacted with the plate G at station No. 1. As the brush a^5 of the backing train contacts with the plates G^3 its conductor connection 5 closes or grounds circuit 4 4 of station two blocks ahead of backing train to restore or reëstablish ground n^2 for circuit 3 3 at such station.

From the foregoing it will be noted that an engine moving in one direction or that of arrow 1 finds ground at two stations ahead for safety, breaks such ground for a following train, and restores or reëstablishes such ground two stations to the rear; that in finding and breaking such ground the partial circuits of the engine and station are completed through

two contact-plates G; that in restoring or re-establishing such ground such circuits are completed through one contact-plate G′; that such train in backing finds and breaks such ground through contact-plate G^2 at the station whereat such contact is effected and restores such ground two stations ahead; that a train moving or advancing in the direction of arrow 2 finds and breaks ground similar to a train backing or reversing from a direction indicated by arrow 1, and that a train moving in direction of arrow 2 in backing finds and breaks ground similar to a train moving in the direction of arrow 1, and such described action takes place upon either a single or double track railway.

To prevent a train or engine running into an open drawbridge ahead or back of it, the ground n^2 for the circuits for one, two, or more stations on either side of the drawbridge are continued or conducted to a ground-line 7 including a switch t and contact-plate t' on the drawbridge, so arranged that when the latter is closed such ground is made (see Fig. 1) and when opened, such ground is broken, and an engine arriving at said stations, having their ground n^2 continued through the ground-wire 7, are stopped, as no ground for the engine-circuit is found when the drawbridge is opened. Open switches or sidings having switches at one or both ends are similarly equipped with continued ground-wires 7 and switch and contact plates t and t', respectively, as shown in Fig. 2, and the sidings or branches are also equipped with station appurtenances, as indicated by dotted lines 9 9, so that trains or engines passing into said sidings or branches are protected and are also locked therein against danger from collisions by trains on the main line, as the engine or cars on the sidings cannot find ground or safety until the adjoining blocks or sections of the main line are clear or set for "safety."

Instead of shifting the brushes a^4 a^5 on the engine or train in reversing its movements said brushes may be stationary, in which case they are duplicated, as shown in Figs. 5 and 6, and additional contact-plates are provided for such duplicate brushes, which plates are included in the partial circuits of the station appurtenances, as hereinbefore described. These fixed brushes have connections with fixed contact-plates a^{14}, a^{15}, a^{16}, and a^{17}, as shown, and upon the rod F are contact-plates a^{18} a^{19}, which are shifted into and out of contact with the plates a^{14}, a^{15}, a^{16}, and a^{17} to divert the battery-circuit of the engine from one pair of brushes a^4 a^5 to the other in the backing or advancing movements of the engine or train. It will be noticed, therefore, that I do not limit myself to the shifting of the engine or train brushes for the reversing of the same nor to the means used for automatically accomplishing such shifting, as it is evident that the same may be greatly varied without departing from the spirit of my invention.

What I claim is—

1. The combination with a railroad switch or drawbridge, of an electric switch in circuit with a contact-plate and a ground connection, station magnetic devices, partial circuits and contact-plates, and an engine or train having a partial circuit, including magnetic devices and contacts, power-controlling mechanism, operating means therefor, and appliances in engagement with said contacts automatically actuated by the forward-and-backward movement of the engine or train for changing the position of the engine-contacts, substantially as set forth.

2. The combination with a switch or drawbridge, of an electric switch in circuit with a contact-plate and a ground connection, station magnetic devices, partial circuits and contact-plates, and an engine or train having a partial circuit including magnetic devices and contact-brushes, power-controlling mechanism, operating means therefor, and appliances for changing the passage of the current through the contact brushes and plates, according to the direction of travel of the engine or train, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL D. STROHM.

Witnesses:

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