No. 662,833. Patented Nov. 27, 1900.

S. D. STROHM.

RAILWAY SIGNALING.

(Application filed Aug. 29, 1891. Renewed June 5, 1900.)

(No Model.) 5 Sheets—Sheet 1.

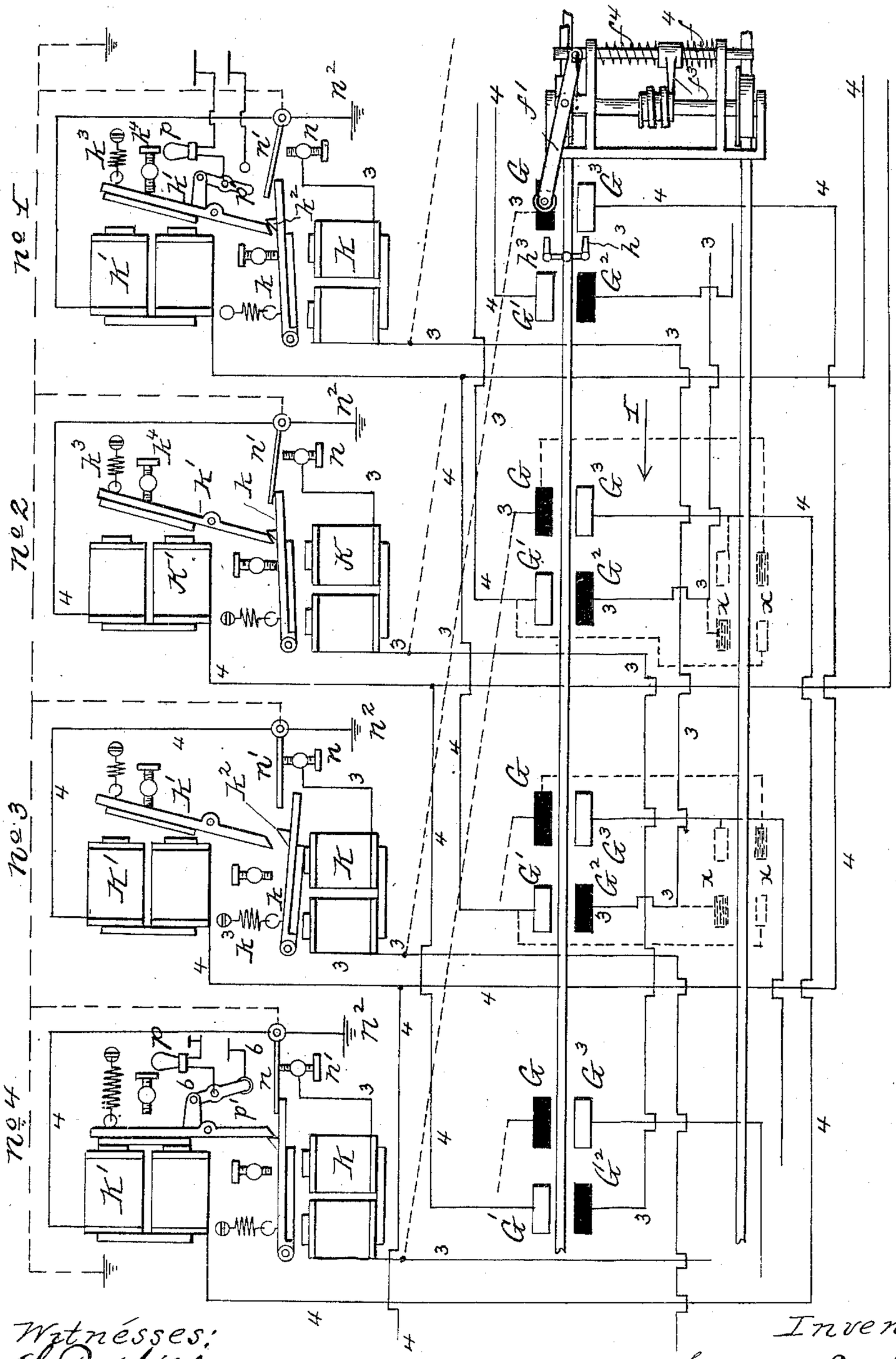

Fig. 1.

Witnesses:
L. R. Miller
V. W. Middleton

Inventor:
Samuel D. Strohm
By A. J. VanSteenburg
attorney.

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S. D. STROHM.

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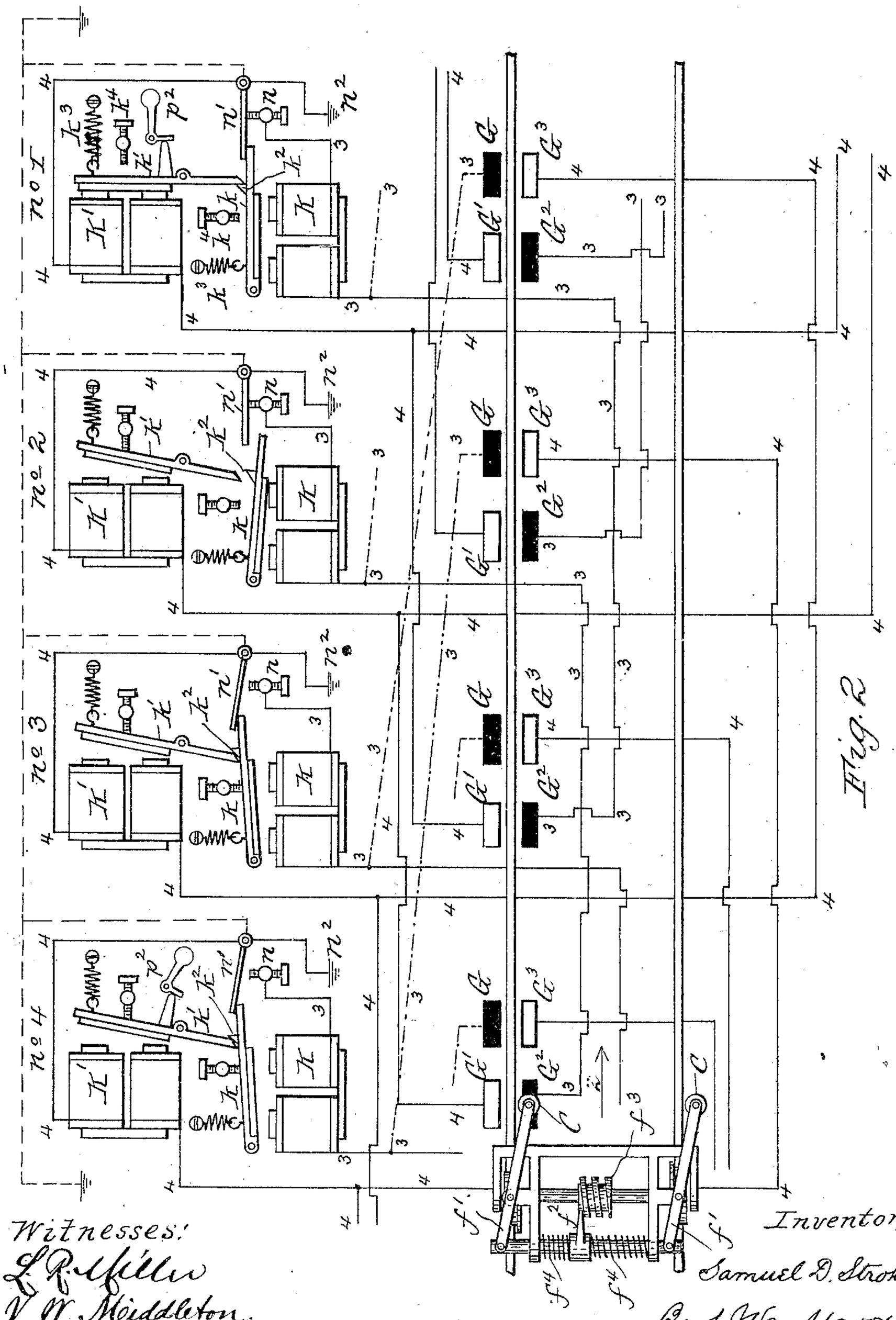
(No Model.) 5 Sheets—Sheet 2.



Witnesses:
L. R. Miller
V. W. Middleton.

Inventor,
Samuel D. Strohm
By S. J. VanStavoren
attorney

No. 662,833. Patented Nov. 27, 1900.

S. D. STROHM.

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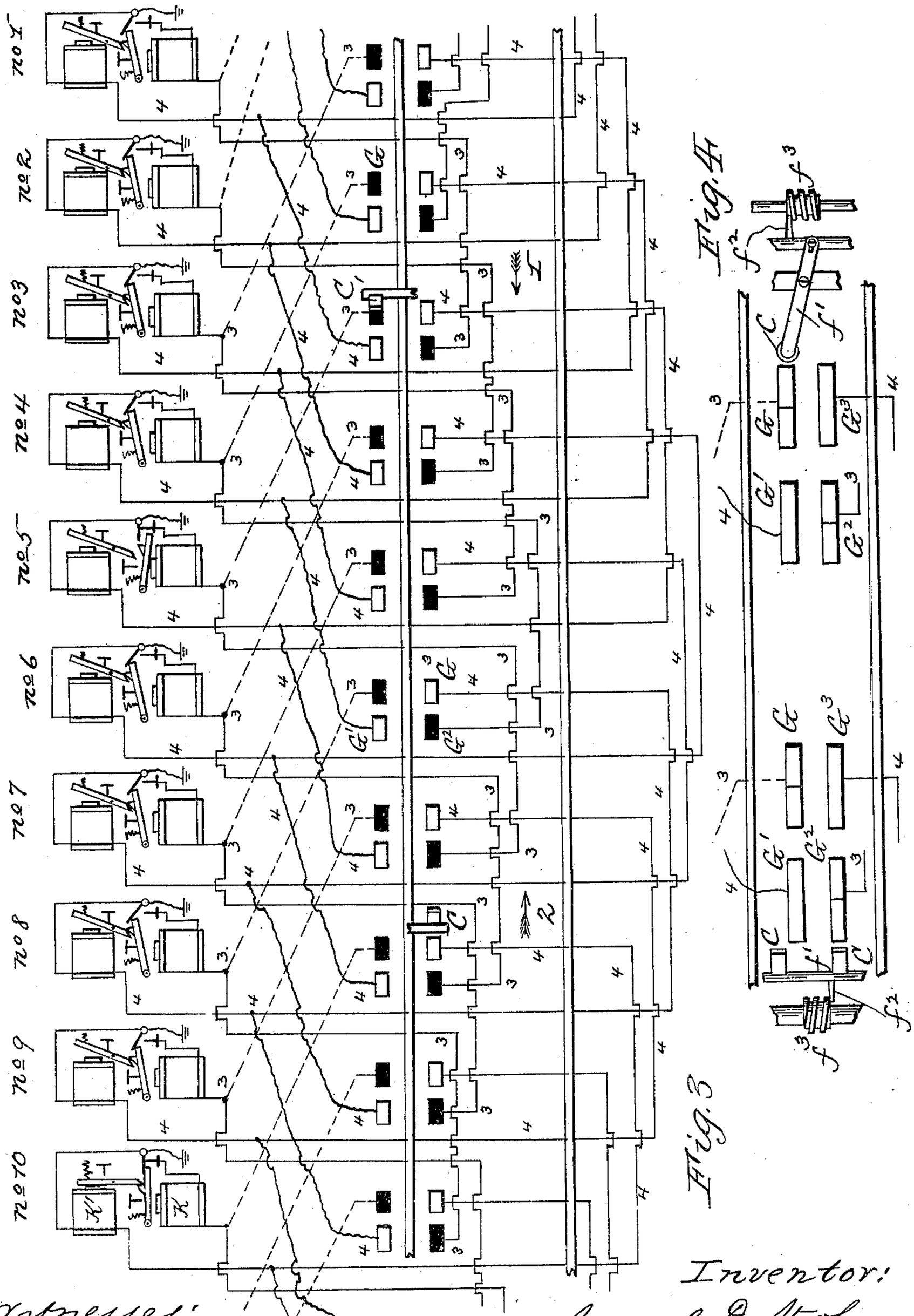

Fig. 3

Fig. 4

Witnesses:
L. Ruffner
F. W. Middleton.

Inventor:
Samuel D. Strohm
By C. J. VanSteenbergen
attorney.

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S. D. STROHM.

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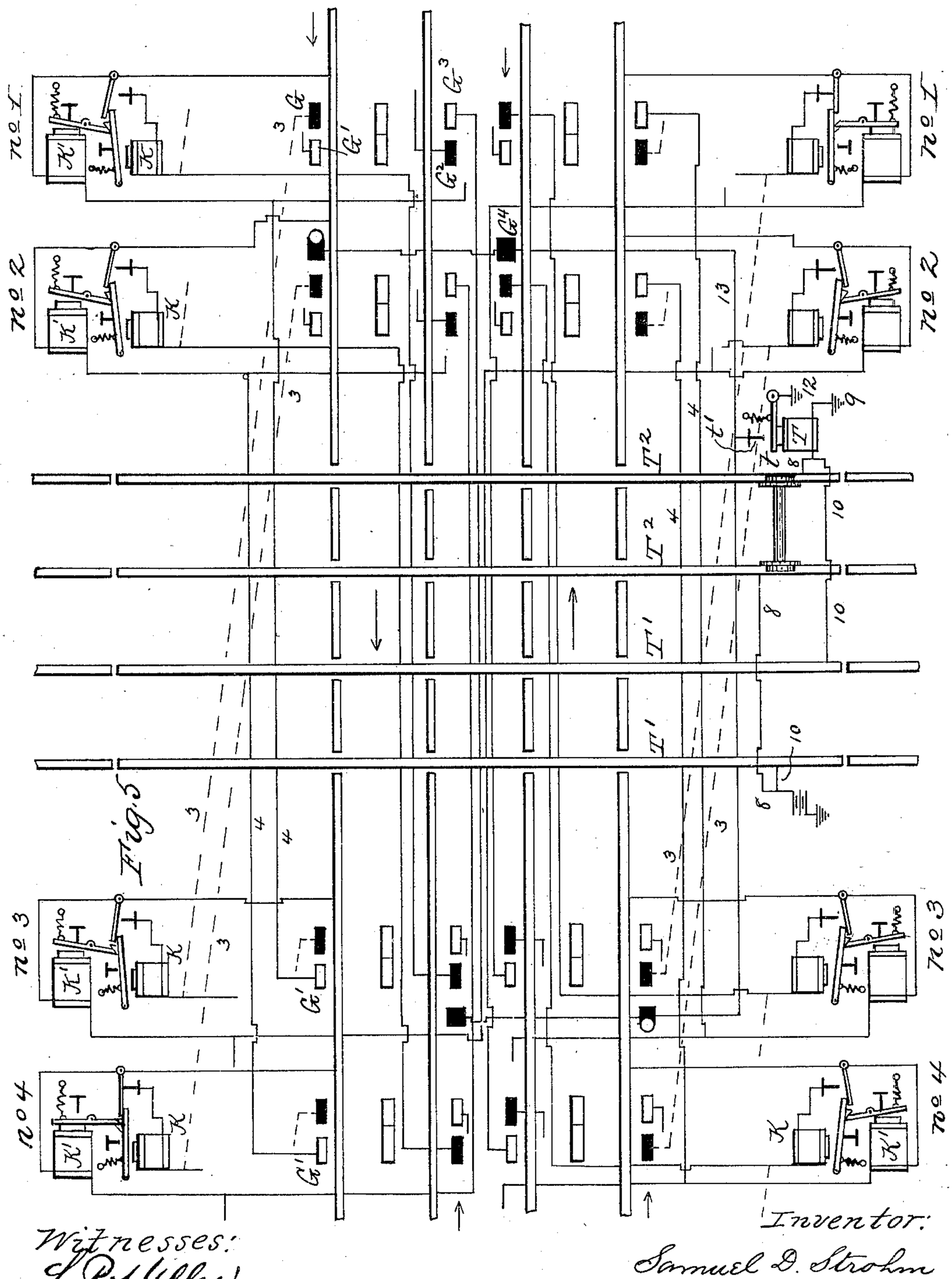
(No Model.) 5 Sheets—Sheet 4.



Witnesses:
L. R. Miller
V. W. Middleton.

Inventor:
Samuel D. Strohm
By S. J. Vanstavoorn
attorney.

No. 662,833. Patented Nov. 27, 1900.

S. D. STROHM.

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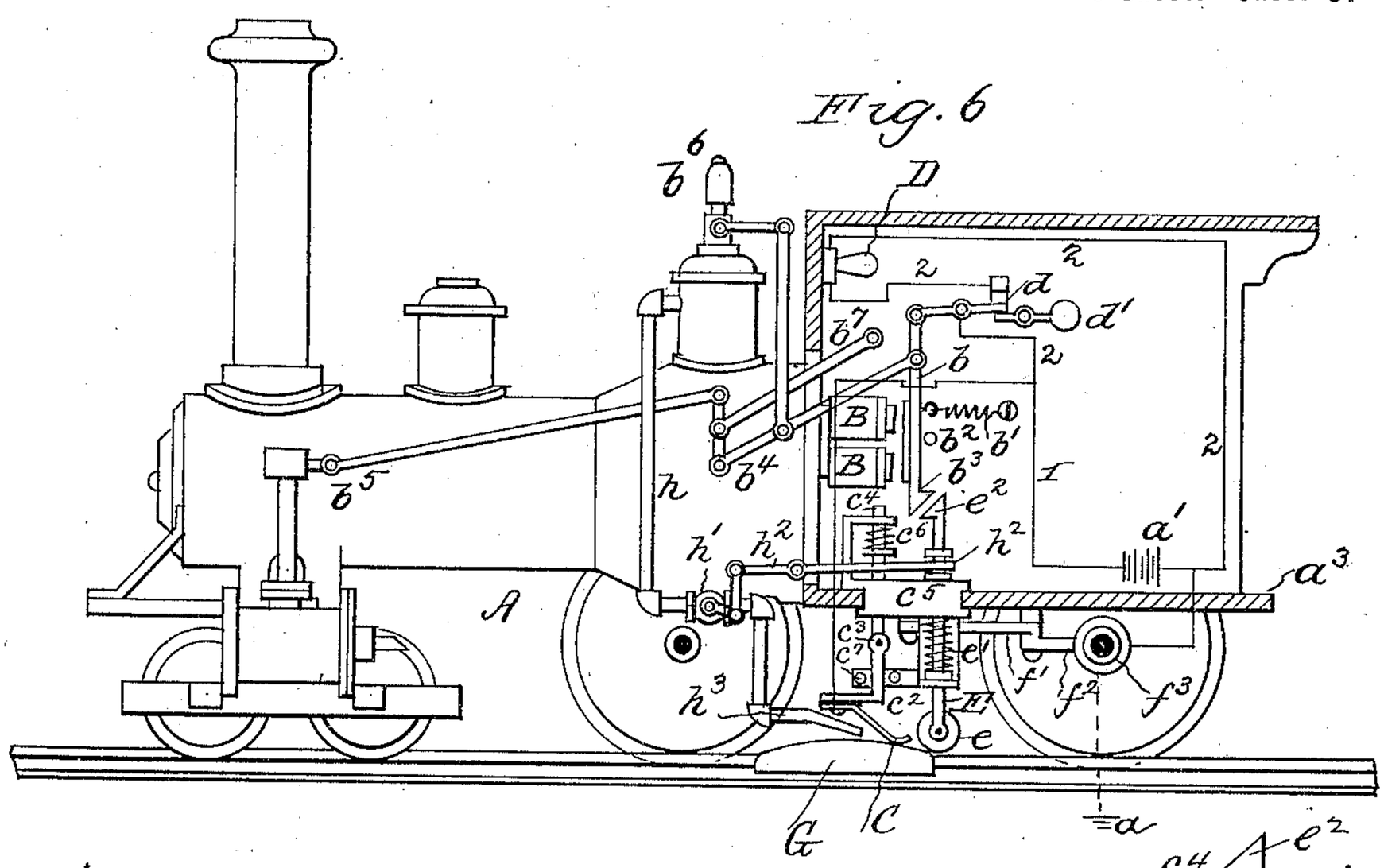

Fig. 6

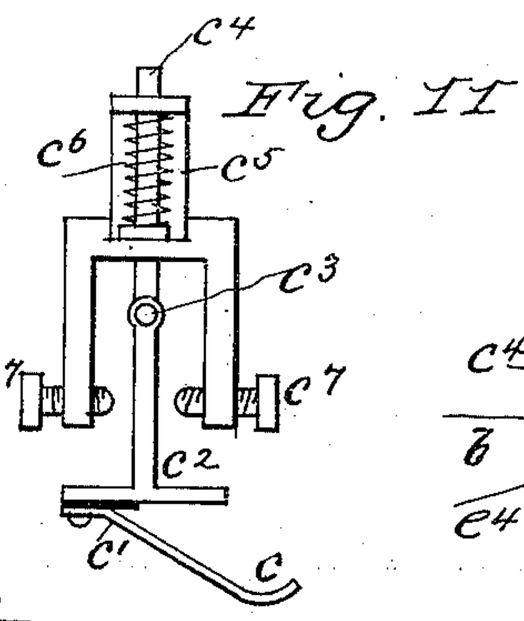

Fig. 11

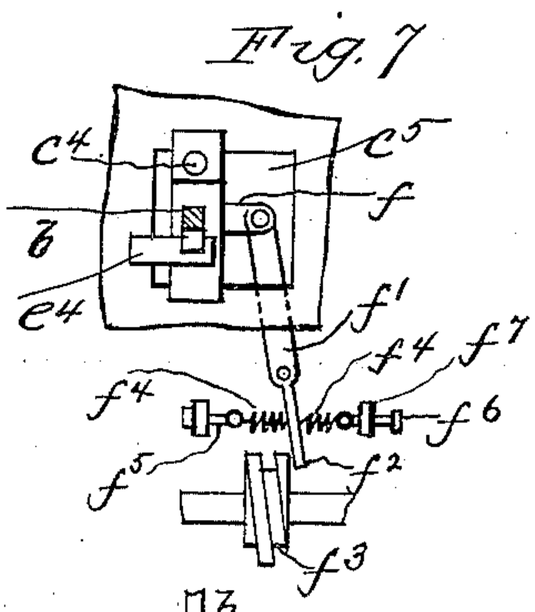

Fig. 7

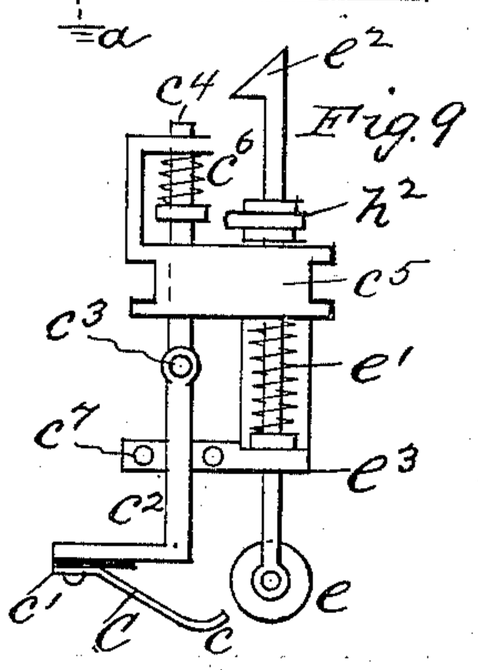

Fig. 9

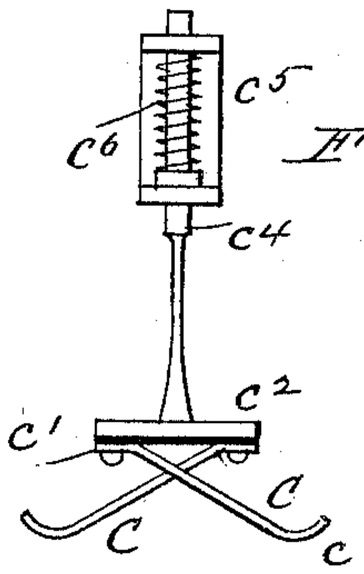

Fig. 12

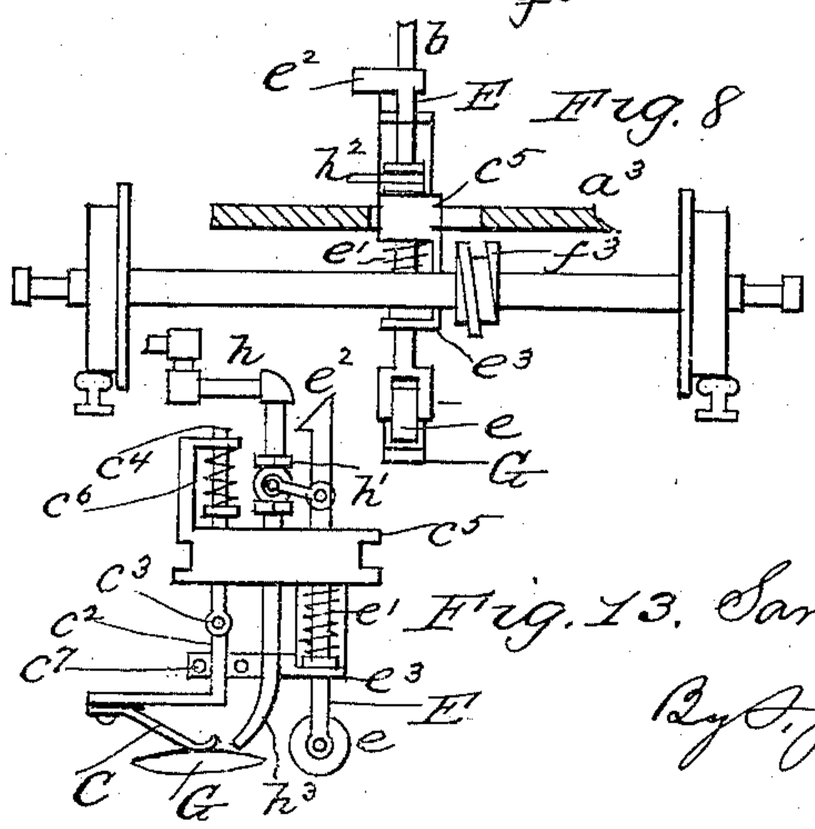

Fig. 8

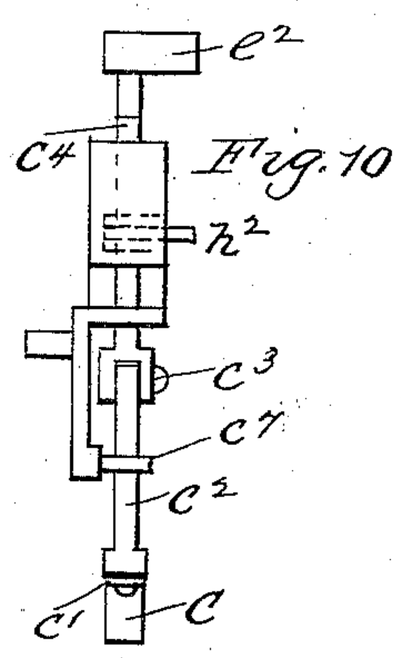

Fig. 10

WITNESSES:

L. R. Miller

V. W. Middleton

INVENTOR

Fig. 13. Samuel D. Strohm

By C. J. Vanstavoren

attorney

UNITED STATES PATENT OFFICE.

SAMUEL D. STROHM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE STROHM AUTOMATIC ELECTRIC SAFETY BLOCK SYSTEM COMPANY, OF SAME PLACE.

RAILWAY SIGNALING.

SPECIFICATION forming part of Letters Patent No. 662,833, dated November 27, 1900.

Application filed August 29, 1891. Renewed June 5, 1900. Serial No. 19,171. (No model.)

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 steam or other railways having their line of way and engines, motor-cars, or trains equipped with electromagnetic appurtenances, contact-plates, and brushes 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 whereon the collisions may occur or wherein the open drawbridges or switches are included or located, and particularly to that form of the same wherein the engine is provided with shifting-brushes or equivalent means for diverting or changing the generator-current on the engine to different sets or pairs of contact-plates at the stations along the line of way for actuating the station appurtenances as the engine or motor-car travels either forwardly or backwardly and wherein also the engine is provided with mechanism moved by elevations or inclines adjacent to the contact-plates at the stations and acting in conjunction with the electromagnetic devices on the engine to control the power-supply to the cylinders or motor of the locomotive or motor-car to control its movement as it passes the stations.

My invention has for its objects a construction of contact plate or plates at the stations which subserve the double purpose of a contact-plate for the brushes on the engine or motor-car and also for an elevation or incline for actuating its power-supply-controlling mechanism, a simple and durable construction of contact-brush for the engine, a single shifting-brush on the engine or motor-car for contact with the plates at the stations or blocks, an apparatus for keeping the contact-plates clean to insure electric contact of the engine or car brushes as they pass over the plates, an arrangement or location of the station contact-plates along the line of way whereby they are aggregated in compact space and least possible movement for shifting the engine contact-brushes is required, and an arrangement of circuit connections between the electromagnetic appurtenances and contact-plates whereby a system of interlocking the stations to break and restore ground for a following or an approaching train is obtained to provide additional security against collision of trains and danger from open drawbridges and switches. By such system of interlocking I mean that a train passing a station finds its safety-ground at two stations ahead, breaks such ground for a following or approaching train, and reëstablishes or restores a like broken ground two stations to the rear.

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 a part of a line of railway equipped with my improvements, showing a train or car moving in one direction. Fig. 2 is a like view showing the train backing or reversing its direction of movement. Fig. 3 is a like view showing two approaching cars or trains on a single-track railway. Fig. 4 is a plan of track and part of cars, showing preferable location of station contact-plates relatively to the tracks, irrespective of the location of the plates on the ground or upon poles or supports above the tracks, and also showing modifications of brushes and mode of shifting them. Fig. 5 is a diagrammatic view of a double-track railway equipped with my improvements and a crossing line or track unequipped with my improvements, but provided with electromagnetic devices at the crossing to prevent thereat collision of trains. Fig. 6 is a sectional elevation of engine or motor-car equipped with a form of electromagnetic ap-

purtenances, a type of contact-plate-cleansing device, and power-controlling mechanism embodying my improvements. Fig. 7 is a plan view, partly sectional, of actuating mechanism for shifting the brush on the engine. Fig. 8 is a sectional front elevation of same. Fig. 9 is a side elevation of brush and part of power-controlling actuating mechanism for the engine, drawn to an enlarged scale. Fig. 10 is an edge view of same. Fig. 11 is an elevation showing modified form of engine-brush frame or support. Fig. 12 is a like view of a modified form of brush; and Fig. 13 is an elevation of brush and part of power-controlling mechanism, with another form or arrangement of cleansing devices for the contact-plates.

A (see more plainly Figs. 6 to 13, inclusive) represents a steam or other locomotive or motor-car, upon which is located a partial circuit 1 1, which, as shown, is an open circuit having one end grounded through the frame of the engine or car by way of its axles and wheels, as indicated at *a*.

The circuit 1 1 includes a source of electric supply *a'* and an electromagnet B, and one terminal leads to a brush C, located, as desired, on the engine or motor-car, which brush may be constructed and arranged for operation as desired. A preferable form of same is shown and will be hereinafter described. The armature-lever *b* for magnet B is shown provided with a retracting-spring *b'* for returning the same to its normal position and a limiting-stop b^2, and at its lower end has a 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 or fixture b^5 for supplying motive power to the motor, the whistle or alarm b^6, or the brake-controlling mechanism b^7, whereby when said lever *b* is drawn down or suitably actuated the steam or power supply is cut off from the motor, the alarm or whistle sounded, and the brakes are applied to stop the train. If desired, lever *b* may be connected with the stopping mechanism for the motor-car or train only, 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 to the trainmen, so that they may at once 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 in the form of a lamp D, an electric incandescent or other one being preferred, and is preferably in a branch or shunt 2 2 from the circuit 1 1, which shunt is shown closed by a switch *d*, engaging with or controlled by the armature-lever *b*, being so arranged that when said armature-lever is in its normal position the switch *d* is in position closing circuit 2 2 to display a light, and when drawn down or actuated to stop the motor-car the switch *d* is moved to open shunt 2 2 and put out the light C, the putting out of the light indicating "danger." Engaging with switch *d*, if desired, and correspondingly actuated is a semaphore-signal *d'*, either or both of which may be used in the motor or other cars of the train, as desired.

E represents a moving bar or rod suitably located, as hereinafter described, and has at one end a shoe or wheel *e* and a reacting spring or other device *e'* for returning the rod to its normal position. Said rod is provided with a latch-head e^2, which is in line with the latch-head b^3 on lever *b* when it is not attracted by magnets B. The brush C is of flexible or spring metal, having an upwardly-curved free end *c*, and is secured at its other end *c'*, Fig. 9, to a bracket rod or support c^2, pivotally connected at c^3 to a standard or bar c^4, so as to move or oscillate on its pivot-point in either direction of the movement of the train. The standard c^4 has its bearings in a block c^5 and is provided with a pressure-spring c^6, which acts to exert its force in the direction of the line of contact-pressure of the brush C. The swinging movement of the brush C and its support c^2 in either direction is limited by stops c^7 on a bracket e^3, secured to or forming part of block c^5. (See more plainly Fig. 9.) The stops c^7 for brush-support c^2 may be fixed, as shown in Figs. 6 and 9, or movable or adjustable, as indicated in Fig. 11, and in which said stops are shown mounted upon arms depending from the block c^5. In the bracket e^3 and block c^5 the rod E is mounted so as to slide therein, the wheel or shoe for said rod being preferably to the rear of brush C.

The block c^5, carrying the brush C and the rod E, has a sliding motion in its bearings in the floor of the cab or other suitable or desired support or frame a^3 and has a connection *f*, Fig. 7, with a pivoted lever *f'*, having at one end a finger f^2, engaging a worm, cam, or equivalent device f^3 on an axle of the engine or motor-car, so that as said axle revolves in different directions as the engine or train advances or backs the finger f^2 is actuated or moved from end to end of the worm f^3 to oscillate lever *f'* for sliding or shifting the block c^5 to correspondingly shift the brush C and rod shoe or wheel *e* into or out of the line or path of two sets of differently-located but preferably parallel contact-plates G G' G^2 G^3, located along the line of way, as and for purposes hereinafter set forth.

The lever *f'* is provided on each side with springs f^4, having attached end rods f^5 with suitable heads f^6, mounted in bearings f^7, so that as said lever is shifted from side to side either of the springs f^4 acts to maintain a pressure upon the rod in a direction the opposite of that in which it is shifted to hold the finger f^2 in such engagement with the worm f^3 that it will shift said finger and in turn said lever as soon as its direction of rotation is changed by reversing the engine from a forward to a

backward motion or reversely. The use of the sliding rods f^5 with heads f^6 for springs f^4 instead of the sliding rod with long springs f^4, as shown in Figs. 1 and 2, admits of the use of short lengths of springs and less opening or straining of their coils, thereby rendering them more durable.

To keep the contact-plates G G′ G² G³ clean for insuring good electrical contact between them and the brush C, a pipe connection h from the steam-supply dome or compressed-air supply for the brakes is made, having a cut-off valve h', controlled by the movements of the rod E or either the brush support or frame c^2 or c^4, respectively, through the medium of a lever h^2 in engagement with the stem of valve h', as shown in Figs. 6, 9, or 13. The nozzle h^3 of pipe h is located adjacent to brush C, as desired, and it may be fixed in position to the engine-frame or other support, as shown in Fig. 6, in which case said nozzle is bifurcated or split to straddle two lines of contact-plates, (see Fig. 1,) or it may be mounted in sliding block c^5, as indicated in Fig. 13, so as to move therewith, and in this case it has only one outlet, and the pipe h has a swing joint or connection in its line or length to admit of such shifting of the nozzle with the brush C and bar-wheel or shoe e. The support or bracket c^2 for brush C, if desired, may consist of a bar of spring or flexible metal, as shown in Fig. 12, in which case the pivotal connection between the parts c^2 and c^4 is dispensed with, and, if desired, two reversely-located brushes may be secured to support c^2, as indicated in Fig. 12. The contact-plates G G² are shown configured as inclines or elevations for actuating bar E in one direction, its weight or spring e' or both together returning it to its normal position. The wheel or shoe e rides on the plates G G² at the same time that the brush C contacts therewith. If the engine partial circuit 1 1 has a ground by way of either of said plates, as hereinafter set forth, the magnets B in circuit 1 1 attract armature-lever b and hold it out of the path of the latch-head e^2 on rod E as it ascends or moves under the influence of the elevations or inclines on said plates, and the engine or car is not stopped. If, however, such ground is not obtained by way of said plates G G², the magnets B do not attract armature-lever b and it remains in the path of latch-head e^2 of rod E, and as it descends or returns to its normal position it moves the armature-lever b and in turn the lever b^4 to stop the engine or car and put out the lamp D and sound or display either signal b^6 or d', as hereinbefore stated.

In Figs. 1, 2, and 3 of the drawings, the plates G G′ and G² G³ are illustrated as located on each side of one of the rails of a track, the plates G G′ being on the outside and the plates G² G³ on the inside of said rail. This arrangement of the plates with the use of the oscillating shifting-lever f' necessitates the employment of two shifting-levers f' and a corresponding number of brushes C and bars E and an additional set of plates G G′ G² G³, similarly located relatively to a rail for the other rail of the track, as indicated by dotted lines x, Fig. 1, in order that no matter in what direction the head or front of the engine or motor-car passes onto the track it will have a brush contact with a line of plates as it advances and in backing or reversing. When a sliding shifting-bar is used, as indicated to the left of Fig. 4, only one shifting device with two brushes need be used. To avoid the duplication of said parts I prefer to locate said plates between the tracks, as indicated in Fig. 4, in which case only one brush C and bar E on a single shifting-lever are necessary.

At the termini of each block or section or at any points or locations as desired along the line of way in conjunction with a set of contact-plates G G′ and G² G³, at 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 to hold the same in their normal positions when not attracted, as indicated at station No. 4, Fig. 1, the stations in the figures being numbered for convenience of description and reference.

A set of plates G G′ and G² G³ in the form of improvements shown is used at each electromagnetic station along the line. On double-track railways (see Fig. 5) there is one set of such plates for each track at such stations, a pair of each set being for the engine-brush to contact with when traveling forwardly and the other pair for said brush to contact with when the engine backs or reverses its direction of travel, and thereby control or guard it or the train against collisions or danger from open drawbridges or switches when traveling in any direction. On single-track railways (see more plainly Fig. 3) a set of plates at each station answers for the advancing and reversing movements of trains or engines traveling in either direction.

The plates G G² are used for completing the grounds of the partial circuit on the engine or train and at the stations to cause their included magnets to actuate or attract their armatures and prevent stopping the train or engine, thereby indicating "safety" and at the same time breaking such ground for the station partial circuit for the following train, until such circuit is restored by contact of engine-brush with plates G′ G³.

Two pairs of plates G G′ and G² G³ of a set are oppositely located, as shown—that is to say, the plate G′ is in front of the plate G, while the plate G², which corresponds to plate G, is in advance of plate G³, which corresponds to plate G′. This reversal of the plates

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. The circuits are arranged relatively to the station appurtenances and to the plates that the engine or train brush C passing a station and successively contacting with a pair of the plates thereat finds ground at a station two blocks ahead, breaks such ground at such distant station for a following train, and reëstablishes or restores ground at a station two blocks or stations to the rear for indicating "safety" for following trains, thus securing interlocking of stations or blocks ahead as well as to the rear of a train, and thereby affording additional security against danger from collisions, open switches, or drawbridges, and this interlocking of blocks or stations ahead as well as to the rear of a train is effected when the engine or train is backing as well as when advancing, for the reason that as the engine or train reverses its direction of motion it automatically shifts the brush C and rod E from the line of the pairs of contact-plates G G′ to that of the plates G^2 G^3. From each plate G for a station—for instance, for station No. 1, Fig. 1—a circuit 3 3 leads directly to the magnets K of station No. 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 for trains traveling in direction of arrow 1, 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 ground n^2 for such circuit 3 3. Each plate G^2 for each station—for instance, station No. 3, Fig. 1—has a corresponding circuit 3 3 with magnets K and to ground n^2 of station No. 1 for trains backing or moving in the direction the reverse of arrow 1, or, as shown by arrow 2, Fig. 2, such last-named circuit 3 3 being a divided or split circuit from the circuit 3 3, leading from station No. 1 to the contact-plate G at the station two blocks to the rear—for instance, as from station No. 3 to station No. 1. The magnets K and its ground n^2 for each station has therefore a split or divided circuit, one part 3 3 leading to a plate G for contact with brushes on trains or engines moving in one direction and the other part 3 3 leading to a plate G^2 for corresponding contact with trains or engines moving in an opposite direction, said plates G G^2 being located at different stations distant two blocks or stations away from the station whose magnet K is controlled by such plates, one of said distant stations being to the rear and the other in advance of such station-magnet so controlled. The plates G′ and G^3 are correspondingly included in divided or split circuits 4 4 for magnets K′ and ground n^2 of the stations, as shown for reëstablishing or restoring ground n^2 for magnets K at each station. The effect whereof is that when a train or engine travels or advances in the direction of arrow 1 and arrives at a station—for instance, station No. 1, Fig. 1—its brush C first contacts with plate G, as shown, 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 up said plate G does not engage armature *b* of magnets B, as the same is attracted out of the path of bar E and the train is not stopped, as the finding of such ground indicates "safety" or that the track between the stations Nos. 1 and 3 is clear.

As soon as brush C passes off of plate G the armature *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 in Fig. 1, which have been previously correspondingly actuated to break ground n^2 for the circuits 3 3 for each of such stations, and in so moving the latch-head k^2 of armature-lever *k* passes into position below and in front of 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 for its circuits 3 3 so 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 lever *b* and in turn lever b^4 to cut off the steam or power supply for the motor, blow the whistles, and apply the air-brakes, or to display either or both the visual signals D *d*′. When the engine-brush C contacts with plate G′ of a station—for instance, station No. 3 of Fig. 2—the circuit 4 4 from such plate of station No. 3, Fig. 2, is closed through the engine and the magnet K′ at station No. 1 attracts its armature *k*′, causing it to press or move down the armature *k* of magnet K until its inclined end engages with or locks itself in front of 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 the ground n^2 for circuits 3 3 for said station. Should an engine or train 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, oscillates lever *f*′ to slide block c^5 and shift brush C and bar E out of the line of contact of plates G G′ into that of plates G^2 G^3, as indicated in Fig. 2, and in going backward in direction of arrow 2 the brush C contacts first with plate G^2 to make ground through circuit 3 3 of a station two blocks to the rear—for instance, from station No. 4 to station No. 2—to actuate magnets K at the latter to break such ground to stop a train arriving at such station and moving in the direction of arrow 1.

The foregoing results described are obtained on a single as well as on a double track railway, (see Fig. 3,) which shows two engines

A A or brushes C C therefore traveling in opposite directions and approaching each other, and either engine may be reversed or backed and is correspondingly controlled.

From the foregoing it will be noted that an engine or train moving in either direction of travel finds ground two stations ahead of a station at which it contacts with plates G G^2, breaks such ground, and reëstablishes or restores such ground two stations to the rear for following or approaching trains, and hence greater security in both directions of travel is obtained; that only one engine-brush is needed for all the contact-plates; that such brush is movable between limiting-stops as it contacts with a plate whereby all shocks of concussion of the brush with said plates are avoided; that such brush has a downward spring-pressure independent of the brush, or any inherent spring-pressure of its own whereby a more forcible and better electric contact between it and the plates is obtained; that part of the motive power—viz., steam, air, or other analogous medium—is employed for cleaning the contact-plates simultaneously with the contact of the engine-brush therewith; that a contact-plate serves for an incline or elevation for actuating the power-supply-controlling mechanism on the engine, and that these plates are preferably located between the tracks either on the ground or elevated on poles or supports, the brush C being located to suit such positions of contact-plates.

The stations may be provided with electric-light signals p in a separate circuit, which is shown normally closed, as indicated at station No. 4, Fig. 1, and opened by a switch p', actuated by armature-lever k' or other suitable moving part in a station, but controlled by the movement of armature k, so that when the latter is actuated to break the ground n^2 for a circuit 3 3 of a station the movement of lever k will actuate switch p' to open the circuit 6 6 and put out the lamp p, the absence of such light indicating danger. If desired, a semaphore-signal p^2, similarly actuated, may be employed in addition to lamp p or in conjunction therewith, or such semaphore-signal p^2 may be actuated directly by the armature k', as indicated at stations Nos. 1 and 4, Fig. 2.

Fig. 5 shows a double-track railway equipped with my improvements upon the interlocking system herein described, and a crossing line or tracks T' T^2, equipped with local battery open circuits 8 8 and 10 10, including magnet T with ground 9, armature t with ground 12, and stop t' for said armature in circuit, with wire 13 leading to separate additional contact-plates G^4 at the stations of the equipped line adjoining the crossing, said open local circuits being bridged or closed by the wheels and axles of a passing train on the equipped road to break the ground 12 for the contact-plates G^4, such ground being restored after said train passes.

The arrangement of contact-plates with separate inclines or elevations for rod E is shown in Fig. 5 instead of the contact-plates with integral elevations or inclines for the purpose of showing that the same can be in circuit to have the interlocking controlling feature for the trains both in advancing and in backing in any direction and not in one direction only.

I do not herein limit myself to the constructions and arrangements of the novel features shown and set forth, as the same may be varied greatly without departing from the spirit of the invention, nor do I confine myself to the constructions and arrangements of the well-known features herein shown and described for use in connection with my improvements, as it is obvious that such features will be disposed of or constructed as the requirements of the service demand.

It will be noted from the foregoing that the two sets of plates G G' and G^2 G^3, respectively, are not only oppositely located, but that the partial circuit connections for one set of plates leading to distant ahead and rear stations have a direction the opposite for such connections for the other set of plates. It is this provision of oppositely-located sets of plates and circuit connections that admit of the engine or train being controlled in its forward and backward motions. It will be also noted that only one set of magnetic devices is employed for each track at each station.

What I claim is—

1. In a railway signaling system, the combination of station electromagnetic devices, two series of pairs of contact-plates arranged along the line of way and parallel therewith, the plates of each pair extending end to end, connections between said plates and the station electromagnetic devices, an engine or car, a laterally-adjustable frame carried thereby, means for adjusting said frame, a brush elastically mounted in said frame and making contact with either of said series of plates, and circuit connections for said brush, substantially as described.

2. In a railway signaling system, the combination of station electromagnetic devices, to each of which extend two partial circuits from contact-plates in the front and rear thereof, one of said circuits being permanently grounded and the other having a ground which is broken by the operation of the permanently-grounded circuit, two series of pairs of contact-plates to which said partial circuits are connected, the plates of each pair extending end to end, an engine or car, and a brush carried thereby and adjustable laterally to engage either series of contact-plates, substantially as described.

3. An engine or motor-car having a partial circuit including a source of electrical supply, a contact-brush, power-controlling mechanism, a separate closed lamp or signal circuit including an electric switch under the

control of said power-controlling mechanism, and a visual signal under the control of said electric switch, substantially as described.

4. An engine provided with a movable or shifting contact-brush, a movable or shifting injection pipe or nozzle adjacent to and in line with said brush and having communication with the steam-supply, and means for shifting both the brush and injection-pipe together, substantially as described.

5. In an engine, the combination of a brush C, pipe h, having valve h' and nozzle h^3, sliding rod E, and the lever h^2 connecting the rod E and valve h', substantially as described.

6. The combination of track electrical contact-plates, an engine having a shifting contact-brush for said plates, a shifting steam or air ejector nozzle provided with a cut-off, devices operated by the backward and forward movements of the engine for shifting said brush and ejector-nozzle together, and mechanism for said cut-off actuated during the contact of said brush and a plate, to eject a blast of air or steam on the plate, substantially as described.

7. An engine having a movable support c^5, an electrical contact-brush C, a vertically-moving bar E, and a pipe h adjacent to and in line with brush C, mounted on said support, a normally-closed cut-off for said pipe h, and means for opening said pipe h when the brush C makes an electrical contact with a contact-plate, substantially as described.

8. In combination with a line of contact-plates located at intervals along the line of way of a railroad, an engine having a contact-brush and a steam pipe or nozzle adjacent to and in line with said brush, a normally-closed cut-off in said steam-pipe, and means for automatically opening said cut-off when the brush makes contact with said plates, substantially as described.

9. A railway having station electromagnetic devices in partial circuits and having contact-plates, and an engine or train having electromagnetic devices in a partial circuit with contact-brushes for said plates, means for controlling the power-supply for the engine or train in connection with devices automatically controlled by the forward and backward motion of the engine or train for automatically controlling the movement of the train or engine as it passes the stations in either direction of its movements, substantially as described.

10. A railway having station partial circuits including electromagnetic devices and contact-plates, and engines having partial circuits including electromagnetic devices and contact-brushes for said plates, power-supply mechanism controlled by said electromagnetic devices on the engine, and devices automatically controlled by the motion of the train or engine and all arranged to operate to control the forward and backward movements of the engine or train as it passes a station, substantially as described.

11. A railway provided with station partial circuits including electromagnetic devices and two sets of contact-plates and an engine or train having partial circuits with electromagnetic devices and contact-brushes for said plates, devices automatically controlled by the forward and backward motion of the engine or train for changing the electrical contact of said brushes with said plates, substantially as described.

12. In a railway, track-contacts therefor, an engine or train having contact-brushes and devices automatically controlled by the backward and forward movements of the engine or train for changing the electrical contact of said brushes with respect to the track-contacts, substantially as described.

13. An engine or train having shiftable contact-brushes and mechanism controlled by the forward and backward motions of the engine or train for automatically shifting said brushes when the engine reverses its direction of travel, substantially as described.

14. A railway having station electromagnetic devices, two separate parallel circuits for said devices, one of which circuits is always grounded, and the other is normally grounded and adapted to be broken, two separate sets of contact-plates for said station electromagnetic devices, a brush carried on the engine or car and making contact with either of said sets of plates, and automatic means controlled by the movements of the engine or car for shifting said brush to either of said sets of contact-plates, substantially as described.

15. A railway-station provided with two or more magnets, partial circuits and contact-plates located adjacent to the tracks, a train or engine having a partial circuit, magnetic devices, power-controlling mechanism, contact-brushes, and mechanism controlled by the forward and backward movements of the engine or train for changing the contact of said brushes, substantially as described.

16. A railway-station provided with magnets having interlocking armatures, partial circuits and contact-plates, and an engine or train having a partial circuit, magnetic devices, power-controlling mechanism, contact-brushes and devices controlled by the forward and backward motion of the engine or train for changing the contact of said brushes, substantially as described.

17. A locomotive or train provided with a battery or generator circuit, one or more contact-brush circuit connections between said source of electrical power and brushes, and mechanism controlled by the forward and backward movements of the locomotive or train for automatically changing the contact of said brushes, substantially as described.

18. The combination with a locomotive or train, of an electromagnet and armature, an electrical generator, a lever having connection with the power-supply of the locomotive and the brakes and which is also connected

to said armature and designed and adapted to be moved by mechanism on the engine, which mechanism is actuated by elevations or inclines along the railway, brushes on said engine and devices under the control of the forward and backward movement of the locomotive or train for changing or diverting the current of said electric generator as the train or engine reverses its direction of travel, substantially as described.

19. The combination of a railway having two sets of oppositely-located contact-plates, circuit 13 connecting therewith, the said circuit including stop t', movable circuit-closer t, and a ground connection, a crossing line of railway having its tracks in an open circuit including a generator and magnet controlling said movable circuit-closer t, and closed by a passing train, and contact-brushes on said train, substantially as described.

20. In a system of railway signaling, the combination of electromagnetic devices, a brush carried by the engine or car, two series of contact-plates in the line of way with either of which said brush makes contact to complete a circuit to actuate said electromagnetic devices, automatic means controlled by the movements of the engine or car for shifting the brush to either of the series of contact-plates, an electric lamp-signal controlled by said electromagnetic devices, and a source of electric supply for said signal, substantially as described.

21. In a system of railway signaling, the combination of electromagnetic devices, a brush carried by the engine or car, two series of contact-plates in the line of way with either of which said brush makes contact to complete a circuit to actuate said electromagnetic devices, automatic means controlled by the movements of the engine or car for shifting the brush to either of the series of contact-plates, a partial circuit in the engine or car connected with said brush, an electric lamp-signal in said partial circuit, and a source of electric supply for said signal, substantially as described.

22. In combination with electromagnetic station appurtenances for a railway, two series of contact-plates connected with said station appurtenances, a lamp-signal at each station controlled by said station appurtenances, a brush carried on the engine or car and making contact with either series of contact-plates to operate said appurtenances, and automatic means controlled by the movements of the engine or car for shifting the brush to either of the series of contact-plates, substantially as described.

23. In a railway, station electromagnetic devices, contact-plates, circuit connections, and an engine or motor-car, a brush thereon, means automatically actuated by the reverse movements of the engine for shifting said brush, electromagnetic devices, and circuit connections, substantially as described.

24. A railway having station electromagnetic devices in partial circuits, two sets of oppositely-arranged contact-plates at differently-located stations and included directly in said circuits, an engine or train having partial circuits and a contact-brush, and mechanism automatically controlled by the forward and backward motion of the engine for shifting said brush for different lines of said contact-plates, substantially as described.

25. A railway having station electromagnetic devices, two sets of oppositely-located contact-plates and circuit connections arranged to directly interlock said plates and magnetic devices, and an engine, motor-car or train having a partial circuit with a contact-brush automatically controlled by the forward and backward motion of the engine and adapted to be shifted for contact with different lines of said contact-plates, substantially as described.

26. In a railway, contact-plates therefor, an engine or motor-car, a contact-brush thereon, motive-power-controlling devices, means under the control of the forward and backward movements of the engine for automatically shifting said brush, and controlling devices in relation to said contact-plates, substantially as described.

27. In an engine or motor-car, a contact-brush, motive-power-controlling devices, a sliding support for said brush and device, and mechanism for automatically shifting said support when the direction of travel of the engine or car is reversed, substantially as described.

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

SAMUEL D. STROHM.

Witnesses:

CHAS. F. VAN HORN,

R. W. VAN STAVOREN.