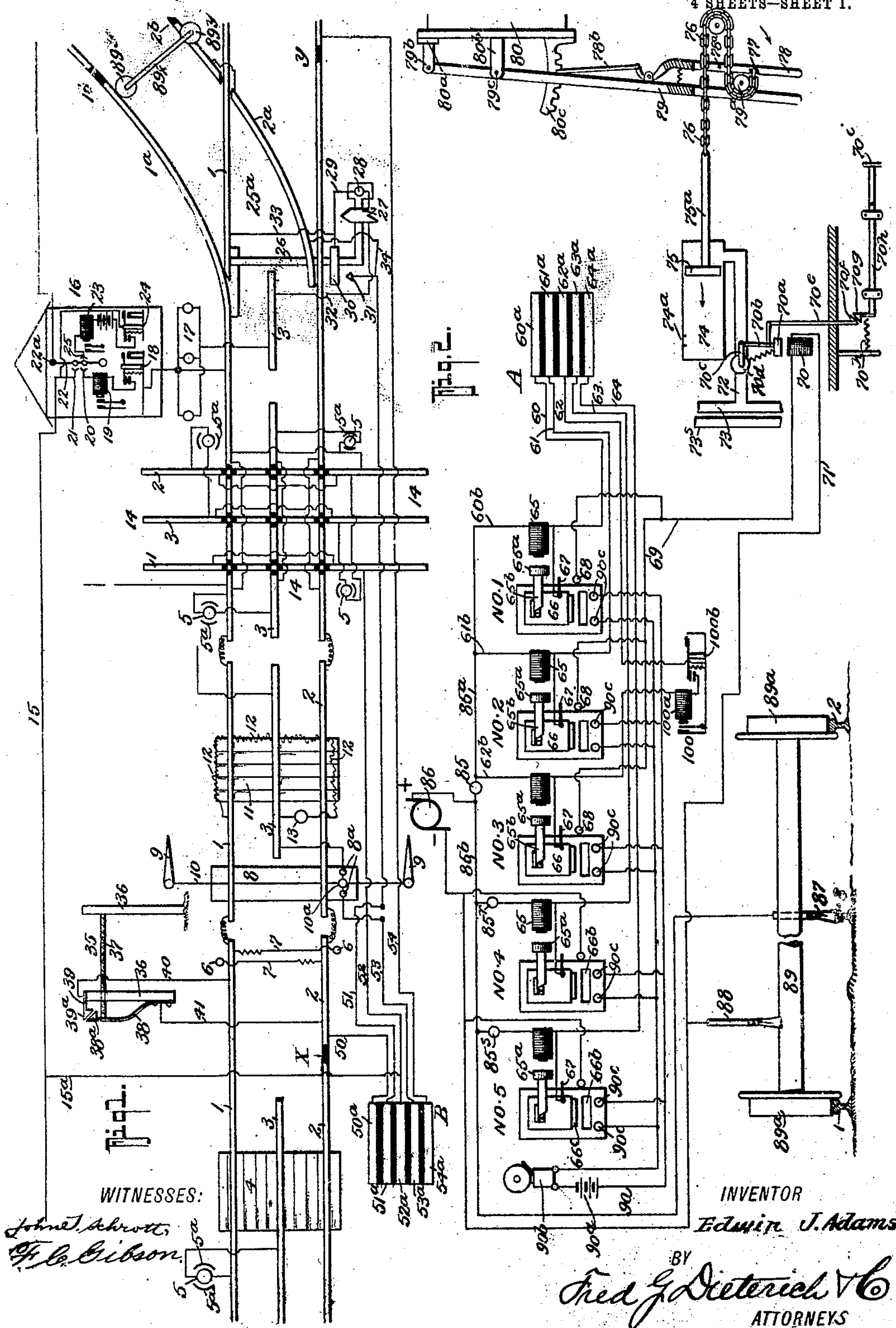


E. J. ADAMS.

RAILWAY SIGNALING MECHANISM.

APPLICATION FILED MAY 3, 1906.

4 SHEETS—SHEET 1.



WITNESSES:

John Schmitt,
F. L. Gibson.

INVENTOR

Edwin J. Adams

BY

Fred G. Dietrich & Co.
ATTORNEYS

No. 841,607.

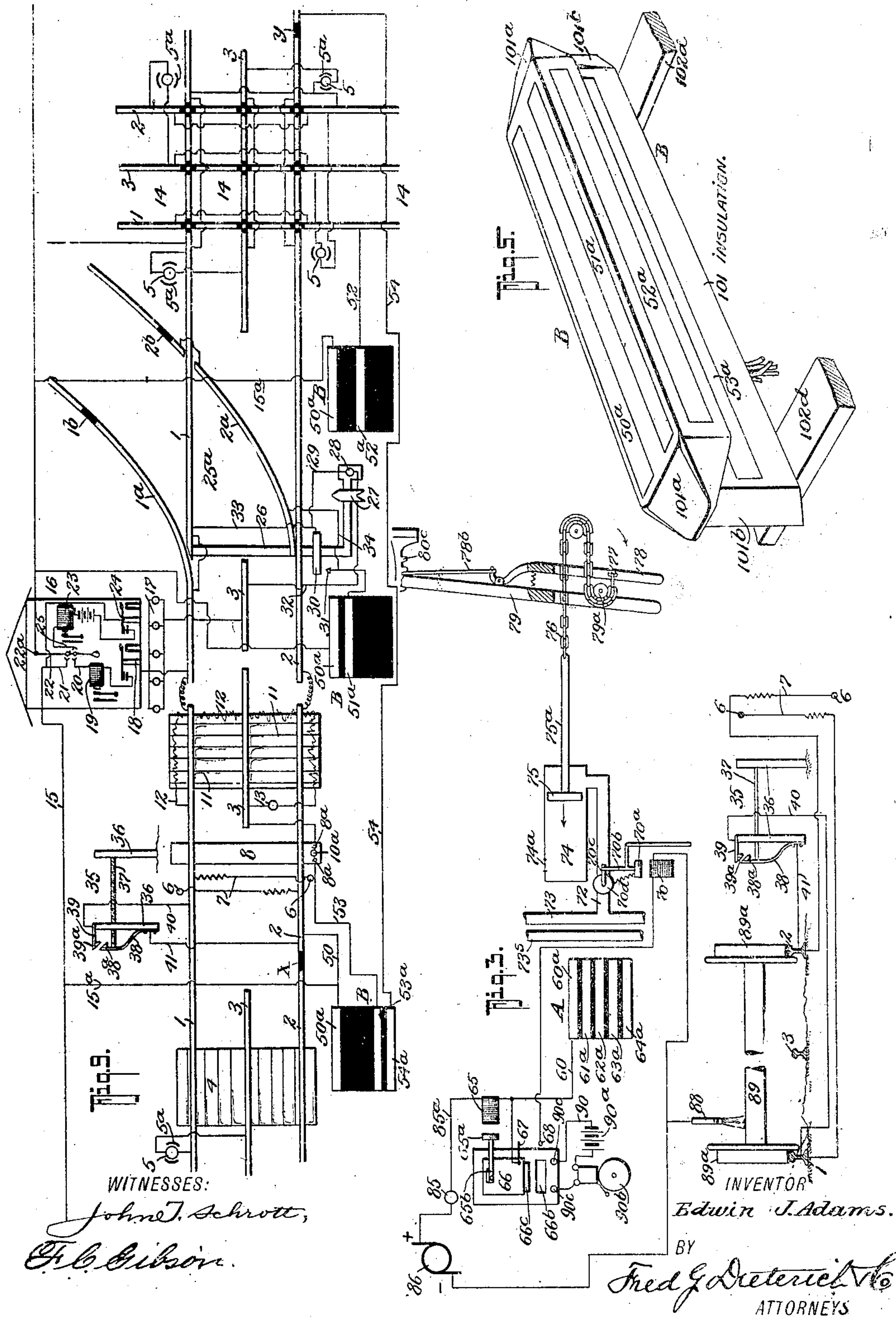
PATENTED JAN. 15, 1902.

E. J. ADAMS.

RAILWAY SIGNALING MECHANISM.

APPLICATION FILED MAY 3, 1906.

4 SHEETS—SERIES 3.



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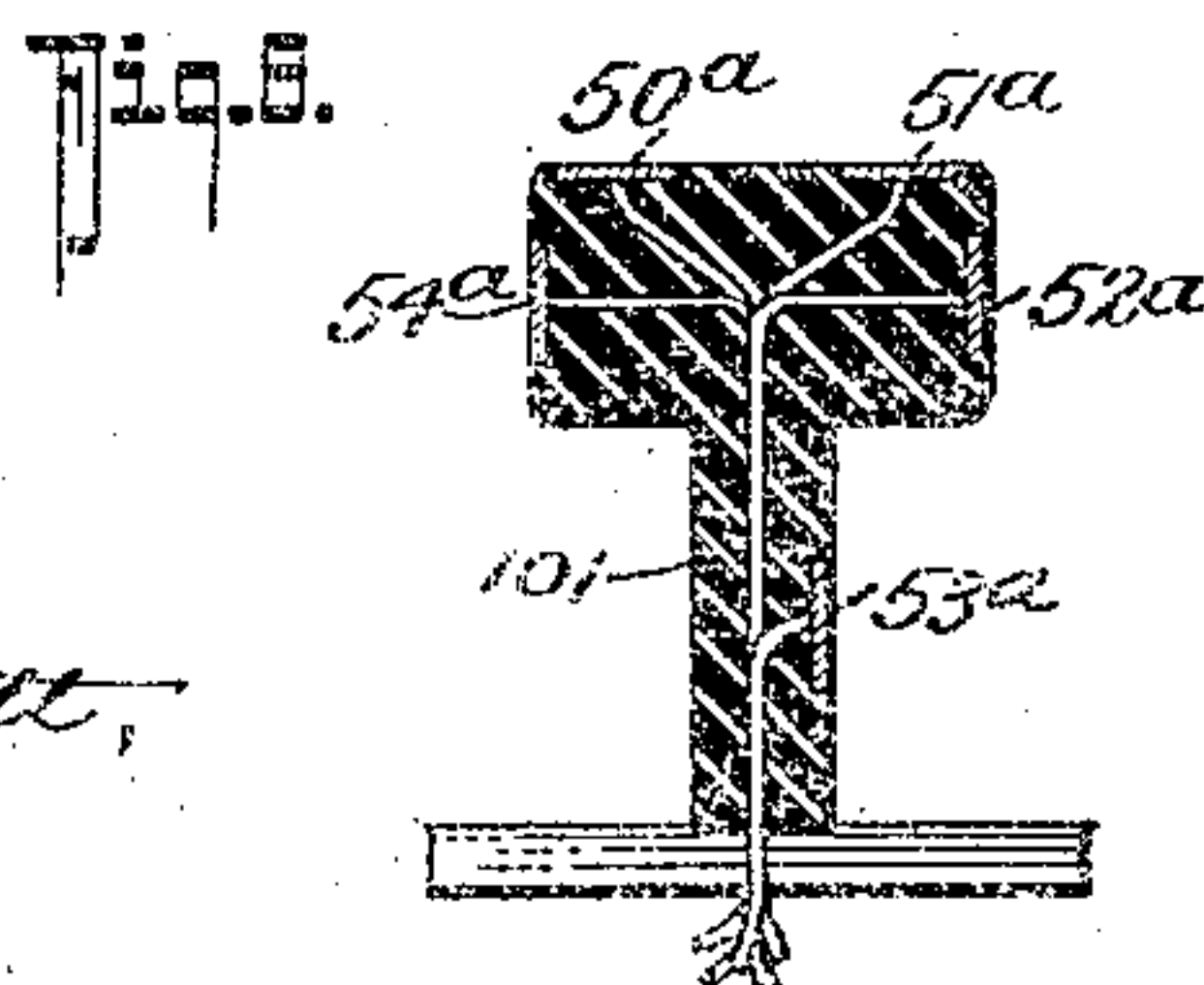
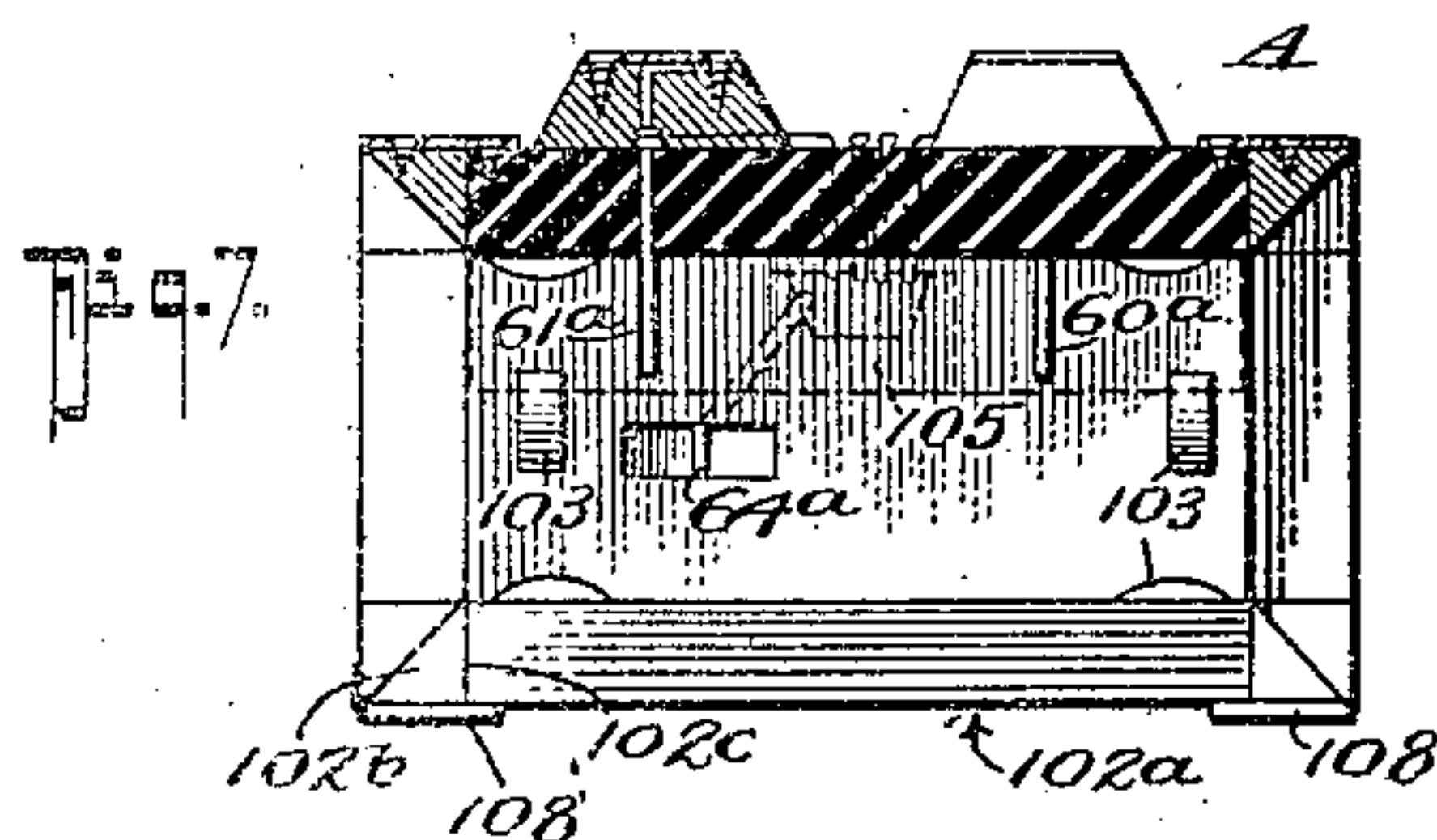
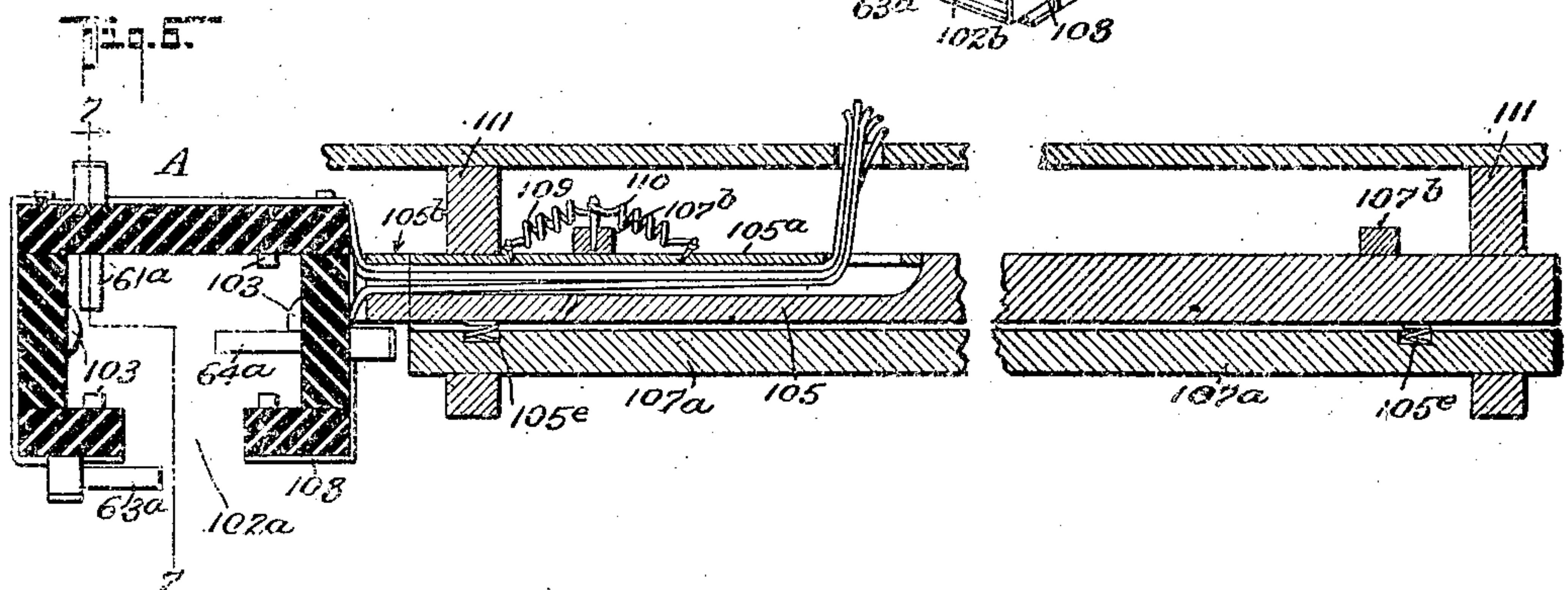
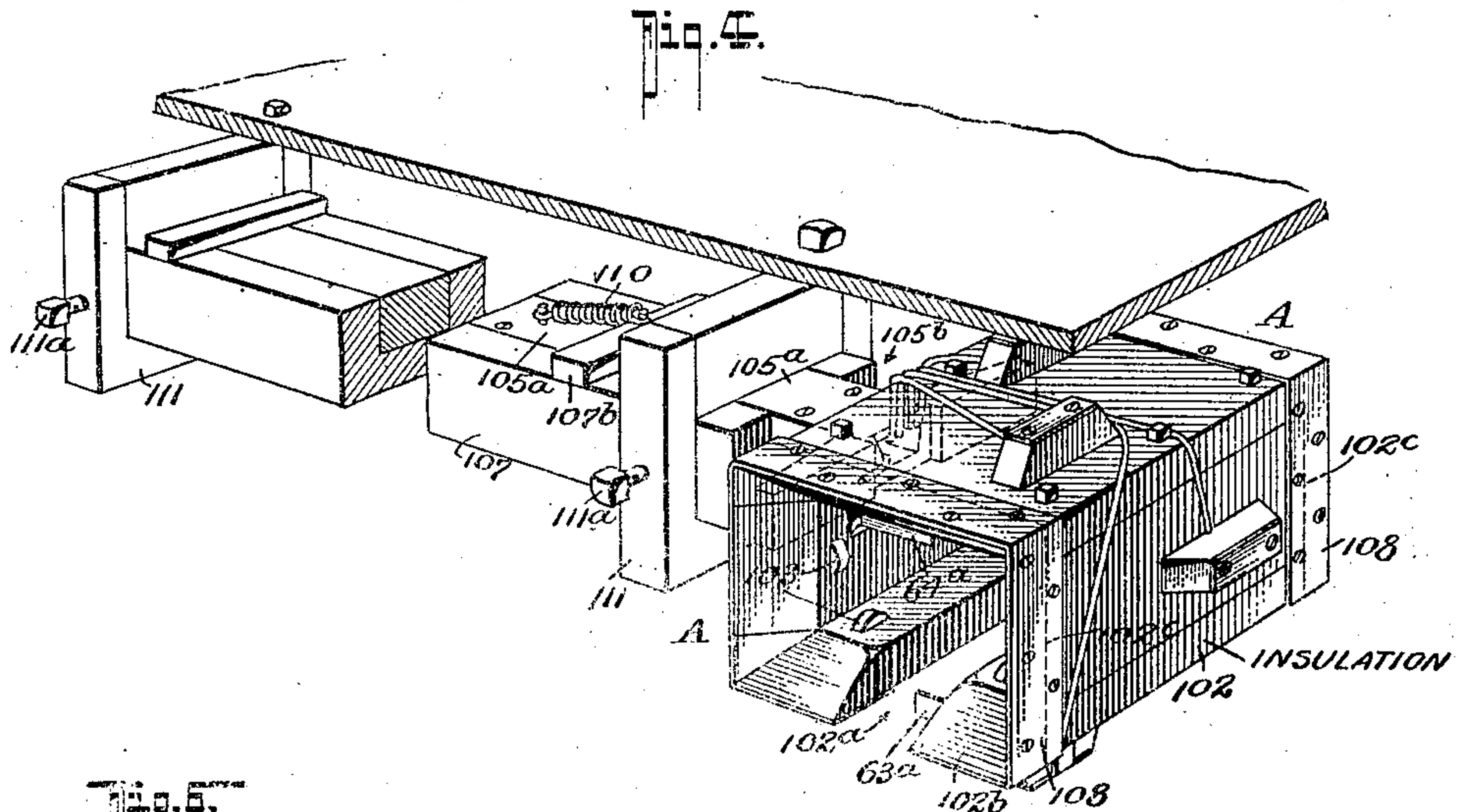
E. J. ADAMS.

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4 SHEETS—SHEET 3.



WITNESSES:

John T. Schrott,
E. B. Gibson.

INVENTOR

Edwin J. Adams.

BY

Fred G. Dietrich
ATTORNEYS

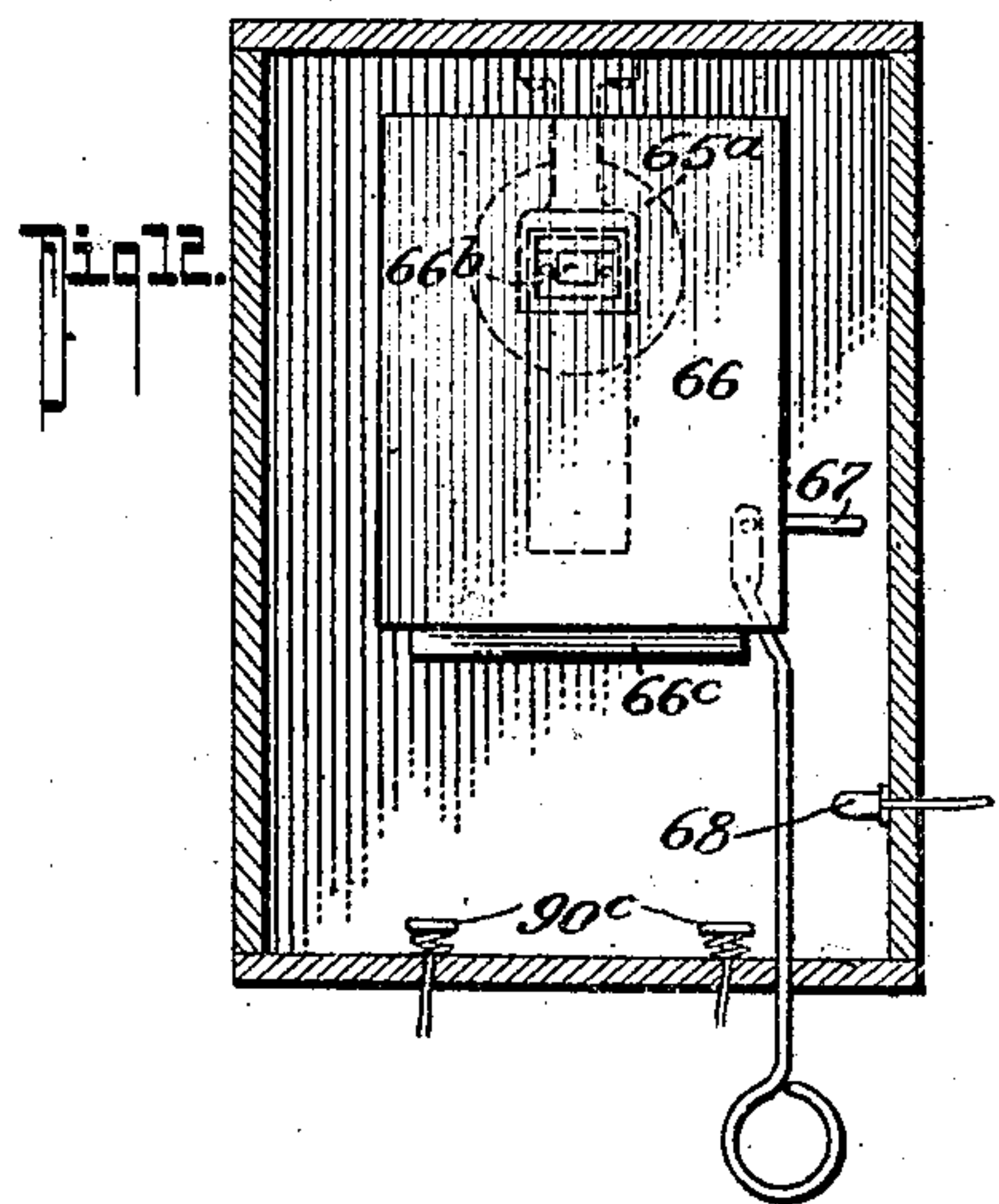
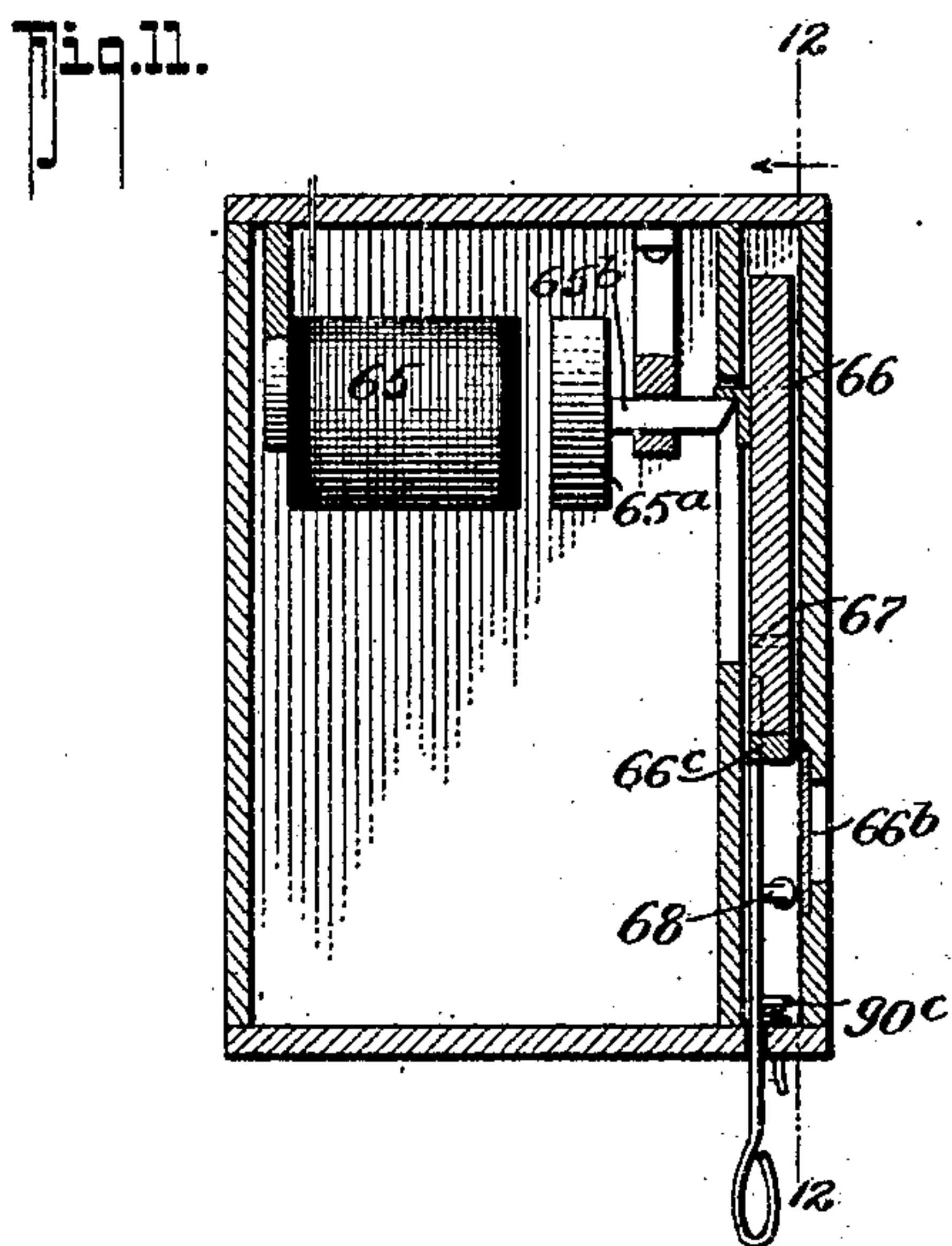
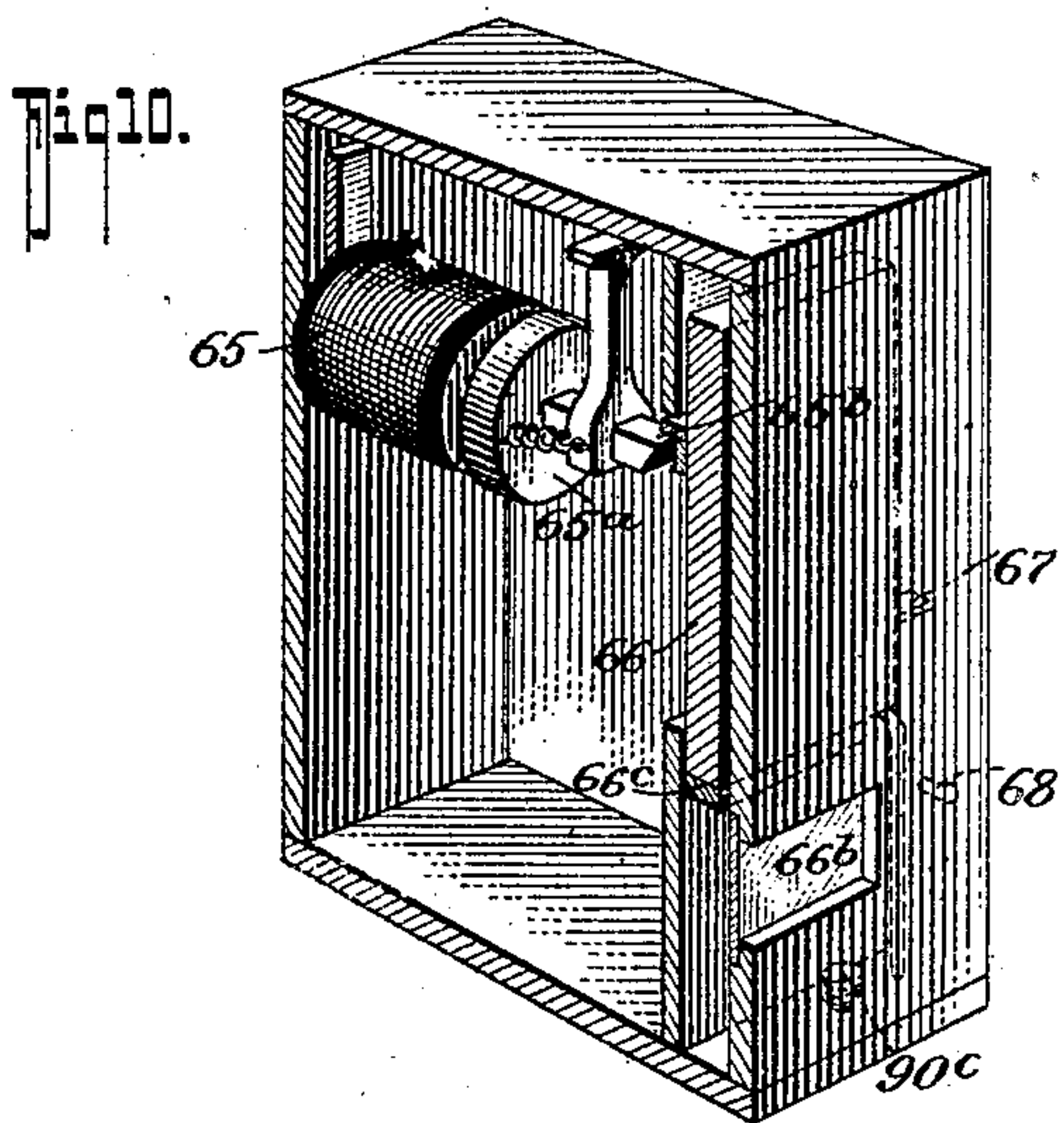
No. 841,607

PATENTED JAN. 15, 1907.

E. J. ADAMS.
RAILWAY SIGNALING MECHANISM.

APPLICATION FILED MAY 3, 1906.

4 SHEETS—SHEET 4.



WITNESSES:

John T. Schrott,
Chas. Gibson.

INVENTOR

Edwin J. Adams.

BY

Thos. J. Deterick
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWIN JOHNSON ADAMS, OF WACO, TEXAS.

RAILWAY SIGNALING MECHANISM.

No. 841,807.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed May 3, 1906. Serial No. 315,036.

To all whom it may concern:

Be it known that I, EDWIN JOHNSON ADAMS, residing at Waco, in the county of McLennan and State of Texas, have invented certain new and useful Improvements in Railway Signaling Mechanisms, of which the following is a specification.

My invention relates to certain new and useful improvements in electric railway and block signaling in which means are provided for indicating in the engine-cab to the engineer the condition of the road ahead and in which means are provided whereby land-slides, spread rails, washouts, broken bridges, open switches, &c., may be indicated on various annunciator mechanisms within the engine-cab and means coöperatively connected with one or more of said annunciator mechanisms whereby when the annunciator is operated said action will serve to automatically apply the air and close the throttle-valve of the engine, and thereby automatically stop the train. Means are also provided in connection with the annunciator mechanisms for establishing a local alarm-circuit to call attention to the operation of the annunciators, and means are also provided in connection with the annunciator mechanisms for lighting the engine-cab to indicate danger, caution, and safety signals.

My invention also seeks to provide an improved signaling system of the character stated, in which means are also provided whereby the approach to a station will be indicated at the depot, and means are also provided in the engine-cab and the station whereby telegraphic communication may be had between the train and the station at times.

With other objects than have been heretofore specified my invention comprises certain novel construction, combination, and arrangement of parts, all of which will be first described in detail, then be specifically pointed out in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a portion of the trackway, illustrating one complete block and the adjacent ends of adjoining blocks. Fig. 2 is a diagrammatic view of the engine-carried portion of the signaling system. Fig. 3 is a detail view of one of the annunciator mechanisms and its complete circuit, including its coöperative portion of the track-circuit. Fig. 4 is a detail perspec-

tive view showing the engine-carried contact-maker and the method of mounting the same on the engine. Fig. 5 is a detail perspective view of the track-contact member. Fig. 6 is a vertical cross-section of the engine-carried track-contact member. Fig. 7 is a vertical section thereof on the line 7 7 of Fig. 6. Fig. 8 is a cross-section of the track-contact member. Fig. 9 is a detail diagrammatic view of a modified arrangement of signal mechanisms. Fig. 10 is a detail sectional perspective view of one of the annunciator mechanisms. Fig. 11 is a vertical longitudinal section thereof. Fig. 12 is a vertical cross-section on the line 12 12 of Fig. 11, looking in the direction of the arrow.

Referring now to the accompanying drawings, in which like numerals and letters of reference indicate like parts in all of the figures, 1 designates one of the track-rails, which is continuous and bonded to form a continuous electrical conductor. The other main track-rail 2 is blocked in sections insulated one from the other, the respective rails which form each individual section of course being bonded together, as shown. Disposed between the main track-rails 1 and 2 at suitable intervals apart are a series of sectional conductor-rails 3, for a purpose presently understood.

4 indicates a road-crossing, alongside of which a signal-lamp 5 is mounted and is provided with shutters 5^a, so that the light thereof can be seen only by any one coming along the road that crosses the track and so that the light from the lamp 5 will not be visible to the engineer of an approaching train. The light 5 is in electrical connection with the track-rail 1 and also with one of the sectional conductors 3, through which the light-circuit is made when the train is approaching the road-crossing, the circuit being made from the positive pole of the dynamo 86 on the engine through a conductor 85^b to a brush 87, that engages the sectional conductor 3, and from thence through the lamp 5 to the rail 1, and from thence through the wheel 89^a of the engine and axle 89 to a brush 88, and from thence to the negative pole of the dynamo 86, thus leaving the light 5 lighted during the entire time the brush 87 is in contact with the specific sectional conductor 3 that coöperates with the road-crossing 4, and thereby indicates to one approaching the track from the road that a train is coming. It should be understood

that the sectional conductor 3 for the road-crossing should be of sufficient length on each side of the bridge to enable the light 5 to be lighted while the train is still some distance from the crossing and not extinguished until it has passed the crossing.

In carrying out my invention the road is equipped with one or more devices 35 for indicating land-slides and the like, which devices comprise a pair of posts 36, to one of which a rope or cable 37 is secured, and the cable 37 passes through the other post 36 and engages a spring-arm 38, carried by said latter post 36, which spring-arm is drawn toward the post 36 should fallen rock or earth engage the cable 37 and move the same out of alignment with the posts. To enable the circuit to be made through the latch 38, which is in electrical connection through a wire 41 with the respective block-section of the rail 2 that controls the land-slide device, I provide a second latch member 39, having a latch portion 39^a for cooperating with the latch portion 38^a of the latch 38, so that when the cable 37 moves the latch portion 38^a toward the post 36 it will move under the latch member 39 and become locked in such position, thus closing the electrical circuit from the latch 38 to the latch member 39, which latch member 39 is in electrical contact through a wire 40 with the rail 1.

Arranged at a suitable position along the track, at one side thereof, is a fixed contact-maker B, that cooperates with a similarly-formed contact-maker A, carried by the engine, and the contact-maker B in the form of my invention shown in Fig. 1 carries a plurality of contact-strips 50^a, 51^a, 52^a, 53^a, and 54^a, which connect with the wires 50, 51, 52, 53, and 54, respectively, for a purpose presently explained, the wire 50 connecting with the block-section of the rail 2, that cooperates with the land-slide devices.

In order to indicate spreading rails, the track is provided at suitable intervals with a pair of contact members 6 6, which may be in the nature of spikes driven into the ties at a short distance from the rails 1 and 2, which spikes are in electrical connection through wire 7 with the opposite rails, as shown, so that should the rails spread the rails will contact with the spikes or contact members 6 6 and short-circuit the rails.

In order to indicate washouts along the line, I provide the ties 8 at suitable intervals with a pair of contact members 8^a, electrically connected together by a wire that is drawn taut between them and to which the wire 53 is attached. The contact members 8^a are in electrical connection with the sectional conductor 3 of suitable length running across a bridge 11, the purpose for which will be presently explained. Stretched across the track beneath the same is a cable 10, that is secured to the posts 9 9, and the cable

10 is fastened to the wire which connects the two contact members 8^a, so that should a washout occur and the tie 8 move out of its position the wire between the contact members 8^a will be broken, and hence the circuit interrupted, which will prevent a safety-signal from being given in the engineer's cab when A contacts B, as will be presently explained.

11 indicates a bridge over which the rails 1 and 2 pass, and this bridge has a taut wire 12 running over all its different parts and forming a complete network thereover, the wire 12 being securely fastened to the various parts of the bridge, so that should any part of the bridge become broken or injured the wire 12 will break, and hence open the circuit therethrough and prevent the clear-signal in the engineer's cab that would have been prevented had the washout occurred to break the circuit between the contacts 8^a 8^a, as before stated.

The wire 12 is secured at one end to the rail 1, and the other end is secured to the sectional conductor 3, that runs across the bridge and to a certain distance on each side thereof, a lamp 13 being placed in circuit with the wire 12, so that when the bridge is in good condition and the circuit through the wire 12 unbroken the lamp 13 will become lighted as soon as the engine arrives at the beginning of the section 3, by reason of the current from the dynamo 86 passing through the brush 88, axle 89, and wheels 89^a from the rail 1 and from the dynamo through the brush 87 and rail 3 and through the lamp 13 and wire 12 to the rail 1, as will be clearly understood by reference to the drawings. Should the wire 12 break after the engine has left the vicinity of the contact member B, then as soon as it enters the section in which the rail 3 of the bridge-section is located it will fail to light up the lamp 13, and hence the engineer will be aware that something is wrong at the bridge.

14 designates a railroad-crossing, the respective rails of the two roads being insulated from one another, so as to not interfere with the electrical circuits. The sections of the rail 1 of each side of the crossing are bonded together, as are also the sections of the rails 2 and 3, as shown in Fig. 1. The railroad-crossing is also provided with a series of lights having shutters 5^a, arranged so that the lights operated by a train on one track will not be visible to said train, but only to the engineer of the train on the other track approaching at right angles thereto in a manner similar to the one in which the lamp 5 is lighted for the road-crossing hereinbefore specified.

15 designates a telegraphic wire that connects several stations 16 along the railroad, (one station 16 only being shown in the drawings,) and the wire 15 at a place opposite the contact-maker B has an electrical connection through a wire 15^a with the wire 52, that co-

operates with the contact member 52^a, before mentioned. The station 16 is provided with one or more sets of telegraph instruments, (two being shown,) one of which comprises the sounder 19, of any approved type, and the key 18, likewise of any approved type, which set of instruments are constructed to withstand the current furnished by the dynamo of the engine, while a second set of telegraph instruments, comprising the sounder 23 and key 24, also of any approved pattern, is adapted to operate only under the power of the usual telegraphic circuit.

20 21 designate contact members connected, respectively, to the sounder 19 and to the wire 15, so as to normally leave an open circuit between the two, a switch 22, pivoted at 22^a, being provided, so that when drawn over the contacts 20 21 it will short-circuit such contacts, and thereby close the circuit from the sounder 19 to the wire 15. Also, when the switch 22 is drawn into engagement with the contact 25—that is, in connection with the sounder 23—then the sounder 19 and key 18 will be cut out of circuit and the instruments 23 and 24 cut in circuit for telegraphic communication between the respective stations, a suitable battery being provided at each station for the interstation telegraphic circuit.

The telegraph-circuit in the case when the switch 22 is in contact with contact member 25 is as follows: from battery in one telegraph-station through telegraph instrument 23, contact 25, switch 22, to contact 22^a, and through line 15 to the next station, and thence through sounder 24 and battery to instrument 23 of the second station, and so on through all the stations, it being understood that the respective stations have their apparatus connected in series and normally have their switch-levers 22 in contact with their contacts 25, the end stations having their line-wire grounded in the usual manner. (Not shown.)

25^a designates a switch leading to a siding from the main track, the switch-rails 1^a 2^a corresponding, respectively, to the rails 1 and 2 of the main line, and the rails 1^a and 2^a are separated into sections insulated from the remainder of the siding by insulating-strips 1^b 2^b for a purpose presently understood. The semaphore and switch-throwing shaft 26, that connects the switch-points, carries a contact 30, that coöperates with a contact 31 in circuit with the wire 51, and the contact 30 is in circuit through the wire 29 with the semaphore-lamp 28, which in turn is connected to the sectional conductor 3, that also connects with the signal-lamp 17 of the station 16, which signal-lamp 17 connects in turn with the rail 1, as shown, so that when the engine arrives with the brush 87 on the rail 3 of the station-section and the switch-section the lamps 17 of the station will be lighted, and

current will also pass through the lamp 28 and light the switch-signal lamp. Current for switch-lamp 28 is from rail 3, wire 32, lamp 28, wires 29 and 33 to rail 1.

Should a train be on the siding and the rear car thereof project too near to the main track, so that a swipe-end collision would occur, the wheels and axle of the rear car would short-circuit the rails of the switch 1^a 2^a, and hence the current from the dynamo of the engine will flow through the wire 51 and the wire 34 to the rail 2^a and from thence cross through the wheels 89^v and the axle 89^x of the rear car to the rail 1^a and from thence through brush 88 back to the dynamo 86 and also operate the proper drop-signal in the engineer's cab, as will be more fully understood later.

In Fig. 1 I have shown a complete block between the insulation *x y* and the parts of the two adjacent blocks, the block ahead of the block between the points *x y* being connected to the contact 54^a of the stationary contact member B through the medium of a wire 54, as shown.

Suitably mounted upon the engine in a manner which will be explained later and projected from one side thereof, so as to be in alinement with the contact member B, is an engine-carried contact member A, having a series of contact springs or strips 60^a, 61^a, 62^a, 63^a, and 64^a, arranged to coöperate with the contact-strips 50^a, 51^a, 52^a, 53^a, and 54^a, respectively, of the contact B, before described.

The engine-carried indicator mechanism, as well as the engine-carried parts of the circuits and their coöperative arrangement, can be best understood by reference to Fig. 2 of the drawings.

By reference to Fig. 2 it will be seen that a plurality of annunciator mechanisms No. 1, No. 2, No. 3, &c., are arranged to be mounted in the cab in any approved and practical manner, as the location of the signals in the cab and the manner in which they are mounted form no part of my present invention. A source of electricity 86 is also carried by the engine, and it has its negative pole connected electrically with a brush 88, that engages the locomotive-axle 89 of the wheels 89^v, which ride on the rails 1 and 2. The positive terminal of the dynamo 86 connects through a lamp 85, adapted to give a red or danger signal, with a wire 85^a, from which a series of laterals 60^b 61^b 62^b connect, respectively, with the contact members 60^a 61^a 62^a, passing through the operating-magnets 65 of each annunciator mechanism No. 1, No. 2, and No. 3, each annunciator mechanism comprising a drop 66, upon which is indicated the particular nature of the danger it is intended to indicate, and the indicating-marks on the drop 66 are visible when the drop has fallen through a suitable aperture 66^b in the outer casing of the annunciator, which drop 66 is held by a latch 65^b, whose

armature 65^a coöperates with the magnets 65, so that when the magnet 65 is energized the armature 65^a will be drawn over and release the drop 66, thus permitting it to fall.

5 Each drop 66 carries a contact member 66^c, adapted to engage, when the drop has fallen, with the contact members 90^c, that connect the wires 90 of a local or alarm circuit in which is contained a battery 90^a and a bell
10 90^b, as shown.

Each drop member also includes a contact member 67 in electrical connection with the wires 60^b, 61^b, or 62^b and 62^c below the magnet 65, and the contact member 67, when the
15 drop 66 has fallen, engages a fixed contact 68, that is in electrical connection with the wire 69, that in turn connects with a magnet 70 for a purpose presently explained, the magnet 70 connecting through a wire 71 with the
20 negative terminal of the dynamo 86.

The latch 65^b is returned to its drop-engaging position when released by spring-pressure or other suitable means.

The magnet 65 of annunciator mechanism
25 No. 1 is in circuit with the contact 60^a of the engine-carried contact-maker A, that coöperates with the contact 50^a of the stationary contact member B, which contact 50^a is in connection with the block-section of the rail
30 2 through the wire 50, as before specified. Thus the land-slide mechanism 35, a car or engine in the first block ahead, and the rail-spreading mechanism all coöperate with the annunciator mechanism No. 1.

35 The washout 8 and the bridge mechanism 11 are in circuit through the wire 53, contact 53^a of contact-maker B, and contact 63^a of contact A through the wire 63 with magnet 65 of annunciator mechanism No. 4. Thus
40 the signals from the washouts-indicator mechanism 8 and the bridge mechanism 11 will be registered on annunciator mechanism No. 4, while the wires 15 15 and station 16 are adapted to be in circuit with an indicator-magnet of the annunciator mechanism
45 No. 3 by reason of the wire 15^a being connected to the wire 52^a, as will be explained more fully hereinafter.

The switch-setting mechanism 25^a is in
50 circuit with the annunciator mechanism No. 2, whose magnet 65 is in electrical circuit with the positive pole of the dynamo through the wires 85^a and 61^b and signal-lamp 85. The magnet 65 of annunciator mechanism
55 No. 2 is also connected with the wire 61, that coöperates with the contact 61^a of the contact-maker A and with the contact 53^a of the contact-maker B.

It should be stated that the station 16 and
60 the telegraph apparatus 19 and 18 are in circuit with the annunciator mechanism No. 3 by reason of the wire 15^a being connected with the wire 52, a suitable telegraph instrument 100 being placed in circuit with the magnet 65 of the annunciator mechanism No. 3

on the engine, so that its sounder 100^a and key 100^b may be properly manipulated.

The annunciator mechanism No. 5 has a signal-light 85^b in circuit with its magnet 65, and the said magnet 65 also connects with
70 the wire 64, that coöperates with the contact 64^a of the maker A, which contact 64^a in turn coöperates with the contact 54^a, that is in electrical connection with the block ahead of that with which the wire 50 connects, such
75 connection being made through a wire 54, as shown.

When the magnet 70 is energized, the armature 70^a thereof will be drawn down, thus causing the valve 70^d in the lateral 72
80 of the air-pipe 73 to be opened, thus permitting air to pass from the pipe 73 to the lateral 72 into the cylinder 74 and forcing the piston 75 into the direction of the arrow, a vent 74^a being provided to permit exhaust of the
85 air within the cylinder. As the piston 75 moves in the direction of the arrow the rod 75^a will impart the motion thereof to the chain 76, which passes through an aperture 78^a in the lever 78 and passes around a roller
90 79^a on the throttle-valve lever 77 and is connected at 77 to the release-lever 78, as shown. As the piston 75 moves in the direction of the arrow the lever 78 will be drawn toward the lever 79, and hence release the
95 catch-rod 78^b from the rack 80^c and draw the throttle-lever 79 in the direction of the arrow and impart motion to the valve-stem 80^b, that is pivotally secured at 79^c to the lever 79, and thus close off the throttle-valve, the
100 rod 80^b passing through the gland 80 to the steam-dome. (Not shown.) The throttle-valve lever 79 is pivotally mounted at 79^b to a bracket 80^a, as indicated.

As the magnet 70 draws its armature 70^a
105 down the rod 70^e will have its latch 70^f engage the latch 70^g and become locked therewith. In practice I prefer to secure the rod 70^h, carrying the latch 70^g, beneath the engine-floor and operable through a gripping
110 portion 70ⁱ at the side of the engine, thus making it necessary for the engineer to get off his engine before he can release the rod 70^e, and hence prevent him from readjusting the mechanism and running on without stopping. A spring 70^k may be provided to return the rod 70^h to its normal position.

73^s designates the signal-pipe of the air-line, which may be of any approved construction, as the same *per se* forms no part of
115 my present invention.

The automatic air-brakes, such as are now in common use, will be automatically set when the valve 70^d is opened.

Any approved type of contact-makers A B
120 can be used in my invention; but I prefer to use the contact-makers illustrated in the drawings.

The contact-maker B comprises a body portion of substantially the shape disclosed

in Fig. 5, built up of insulated material and carrying the contact-strips 50^a, 51^a, 52^a, 53^a, and 54^a, respectively. The contact member B has as many contact-strips as are necessary to connect up with the different portions of the system and to correspond with the contact-springs on the contact member A, hereinafter again referred to.

In the form of my invention shown in the drawings I use the track-rails for the return-circuit; but whenever it is found desirable I may run a common return-wire for the various portions of my signaling-circuits and connect them with a supplemental plate on the contact member B, and in that event the negative wire from the dynamo will also be connected to a corresponding supplemental contact-spring on the contact-maker A of the engine. The contact member B, it will be seen, comprises the body 101 of suitable insulating material, the ends 101^a 101^b being preferably formed of some hard material that can withstand the wear and tear, such as stone or other like hard material. The body 101 is secured to a pair of transverse cross-bars 102^d of any approved construction, by means of which the device is secured alongside of the track. The body portion 101 is provided with apertures to permit passage of the conductor-cables, which pass through the body portion 101 and are connected to the conductor-strips in any approved manner.

The engine-carried contact member A has a plurality of contact-springs, one for each conductor-strip on the contact member B, which contact-springs 60^a, 61^a, 62^a, 63^a, and 64^a may be of any approved construction, so that they will remain in contact with the contact-strips 50^a, 51^a, 52^a, 53^a, and 54^a of the contact member B.

The contact member A comprises a body portion 102, preferably rectangular in cross-section, with a longitudinal slot 102^a in its wall. The flanged edges 102^b of the contact member A may be of metal up to the line 102^c, so as to keep the edges from becoming battered up by contact with the member B, while the remaining portion of the body of the contact member A is of insulating material.

103 designates a series of metal shoes secured to the inner faces of the contact member A so as to space the contact member B away from the wall of the contact member A at all times, and thus prevent the strips of the contact member B engaging the metal flanges of the contact member A and giving a short circuit during the time the contact member B passes through the contact member A.

The passage-way through the contact member A is of larger area than the top of the contact member B, so as to give plenty of room for horizontal and perpendicular movement of the contact member A as the contact member B passes therethrough.

The contact member A carries a series of contact strips or springs, as shown, which are secured to the contact member A in any approved manner and insulated one from the other, and these contact strips or springs are connected with the wires that run to the annunciator mechanisms and to the dynamo, &c., within the engine-cab, as before described.

105 designates a hollow arm supporting the contact member A and fastened to a frame on the engine. The current-carrying wires are insulated in this hollow arm 105 and fastened to the contact-springs of the engine-carried contact member A.

The top plate 105^a of the contact-arm 105 is fastened to the lower portion of 105^b of the arm by bolts or screws, so as to allow the top plate to be removed when necessary to get at the current-conducting wires in the arm. Near the end of the arm 105, near where it hangs in the framework of the engine, springs 105^c are secured to the plate 107^a of the framework or boxing 107, in which the arm 105 is held from the engine. This spring allows perpendicular movement of the arm 105 and the contact member A, so that the contact member B may more readily pass through the contact member A.

The beveled edges of the member B, as before stated, are both of non-conducting substances, either stone or hard fiber or other hard non-conducting substances, while the arm 105 is of metal or any other suitable substance and is fastened to the contact member A, as shown in the drawings.

The outer edges of the contact member A may be bound by a metallic band 108, as indicated, to add strength thereto.

The framework or boxing 107 includes a pair of cross bridge members 107^b, to which springs 109 110 are secured, and these springs are connected, respectively, to the portions of the arm 105 at each side of the bridge 107^b, so as to hold the arm 105 balanced in the supporting-framework and permit it to have a limited movement longitudinally therein, so as to adapt itself to the alinement of the contact member B as said contact member B passes through the contact A, as will be readily understood in the art. This also allows for the slight sidewise movement of the engine that is always present when the same is running.

111 designates a hanger in which the boxing 107 is adjustably secured by suitable set-screws or bolts 111^a, as shown, so that the boxing 107 can be adjusted through the hanger to project the contact member A closer or farther from the track, as may be required in practice.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete construction of my improved signaling system will be readily

understood, and the manner in which the system operates can be best understood as follows:

Referring now particularly to Figs. 1 and 2 and assume the engine to have brought the contact member B into the contact member A, so that the various contact plates and springs of the two contact members are in engagement with one another, the spring 60^a engaging the plate 50^a, and so on. Now assume that either a land-slide has taken place and the circuit closed at the contacts 38^a 39^a of the land-slide indicator 35 or assume that the rails have spread apart and a short circuit to have taken place over the wires through wires 7 7 or a car should be in the block ahead. Should either or all of these occurrences happen, then when the engine contact-maker A and fixed contact member B are in cooperative engagement current will flow from the positive pole of the dynamo 86, through the red or danger-indicating lamp 85 in the cab, through the wire 85^a, magnet 65, contact 60^a, contact 50^a, wire 50, rail 2, across through the short circuit to the rail 1, and from thence through wheel 89^a and axle 89 to brush 88 and return to the negative pole of dynamo 86. This energizes magnet 65 of indicator No. 1 and releases the drop 66, upon which is indicated the particular one or group of signals such as annunciator No. 1 is adapted to register—for instance, land-slides, spread rails, or train, car, or engine in first block ahead. As soon as the drop 66 has fallen, the contact members 67 and 68 will engage one another, and inasmuch as by this time the engine will have moved its contact member A out of engagement with the contact member B (the engine running when the contact members A and B engage one another momentarily) the circuit is broken at the contacts 60^a and 50^a. Therefore the signal-lamp 85 would become extinguished were it not for the fact that the contact members 67 and 68 are immediately brought into engagement when the drop 66 falls, so as to make the circuit from positive pole of dynamo 86 through lamp 85, wire 85^a, wire 60^b, magnet 65 of annunciator No. 1, across contacts 67 68, through wire 69, to magnet 70, and from magnet 70 through wire 71, back to the negative pole of dynamo, thus relighting the proper light 85 and simultaneously energizing the magnet 70, that controls the valve 70^d. As soon as the magnet 70 is energized, the armature 70^a will be drawn down, the valve 70^d opened, and compressed air from the air-pipe 73 will be forced against the piston 75 to move it in the direction of the arrow in Fig. 2, hence closing the throttle-valve to cut off the supply of steam to the engine-cylinders. At the same time the armature 70^a of the magnet 70 will be locked down by the rod 70^e and the rod 70^b, together with their catches 70^f 70^g, respec-

tively, so that the train cannot be again started without first coming to a full stop, and thus allowing the engineer to dismount and release the armature 70^a, as before specified.

The engineer after releasing the armature 70^a can then reset annunciator No. 1 and restart his locomotive, if desired.

The same cycle of operations occur should the switch 25^a be open or a train be on the siding with the rear car projecting too near to the main line. In case of open switch the circuit will be through the positive pole of the dynamo 86, through danger-lamp 85, wire 85^a, wire 61^b, magnet 65 of annunciator No. 2, contact 61^a, contact 51^a, wire 51 to contact 31, across contacts 31 30 to wires 29 and 33, to rail 1, and from thence to wheel 89^a, axle 89, to brush 88, and return to negative pole of the dynamo, thus operating annunciator mechanism No. 2, causing it to drop and cut in the circuit through magnet 70, and hence operate the throttle-lever and apply the brakes, as before. For a car too near the main track the circuit will be from wire 51 to wire 34, rail 2^a, wheels 89^v, axle 89^x, rail 1^a, rail 1, wheel 89^a, axle 89, brush 88 to dynamo.

The same cycle of operations take place through annunciator mechanism No. 3 should there be an approaching train on the crossover 14. Different conductor-wires, contact-springs of A, and plate of B are used for No. 3.

Each time the annunciator mechanisms No. 1, No. 2, and No. 3 operate the lamp 85 will be lighted and indicate "danger" and the brakes set and the valve automatically closed off.

When annunciator mechanisms No. 4 and No. 5 operate, the lamp 85 is not lighted; but auxiliary lamps 85^r and 85^s for the annunciator mechanisms No. 4 and No. 5 are lighted to give safety and caution signals. The annunciator No. 4 cooperates with the wash-out-indicating mechanism 8 and bridge-indicating mechanism 11, and when it is operated it does not affect the throttle-valve as does annunciator mechanisms 1 to 3, inclusive. Lamp 85^r is clear and suggests "safety" when illuminated.

The annunciator mechanism No. 5 cooperates with the advance block-section and likewise does not affect the throttle-valve. Its lamp is green (caution) and shows danger in second block ahead.

When the station 16 desires to communicate with an approaching train, the operator throws the lever 22 to close the contacts 21 and 20. Thus when the engine arrives with its contact member A on the contact B dynamo 86 will send current from positive pole through lamp 85, magnet 65 of annunciator No. 3, telegraph set 100 to contact 62^a, (it being understood that key 100^b is nor-

mally held closed,) and from contact 62^a to contact 52^a and from thence through wire 15^a to wire 15, through which the current passes to telegraphic instruments 19 and 18, respectively, and thence to rail 1 and through wheel 89^a and axle 89 to brush 88 and return to the negative pole of the dynamo, thus operating annunciator mechanism No. 3, which in turn cuts off the steam-supply to the engine and sets the brakes by closing the throttle-valve through the medium of the magnet 70 and its cooperating parts that affect the throttle-lever 79 and brings the train to a standstill.

The engineer then reverses the engine and backs back until contact members A and B are again in alinement with each other. Signaling may be then had between the station 16 and the engineer's cab by means of the telegraphic instruments and the circuit established when the engine has backed back until contacts A and B are again in engagement with one another.

Each annunciator mechanism may be of any approved type with relation to size and form, and any approved type of telegraph instruments may be used, as well as any approved code of signals, as may be found desirable.

In Fig. 9 I have shown a slightly-modified form of my invention in which a series of contact members B are arranged along the trackway, and this arrangement is used where the various portions of the system are wide apart—for instance, where the distance between the main-line indicating mechanisms, the washouts, the bridge mechanism, the station, the switch, the crossover, &c., are relatively great—and when this arrangement of my invention is used that contact-strip which is relatively in proper position for engagement with the engine contact member is wired up to its respective portion of the system—for instance, as indicated in Fig. 9. The remaining contact-strips of the member B may be left off, if desired.

The contact-makers B should be duplicated on each side of the track for single-track systems, and as such would be a mere duplication of the parts I have not specifically illustrated the arrangement.

Should the engine be traveling backward, then the engine-carried contact member A would be shifted to the other side, so the one on the left side would be in line of engagement with B and the one on the right side out of line of engagement, so as to be in proper cooperative relation with the track devices.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete construction, operation, and many advantages of my invention will be readily understood by those skilled in the art to which it appertains, and I desire it understood that many slight changes in the

detail construction, combination, and arrangement of parts may be readily made without departing from the scope of the appended claims, and I desire to say, further, that the terms used in the following claims are to be construed as broad as possible in view of the prior art.

What I claim is—

1. In a system of the class described, the combination with suitable electric blocks including a plurality of circuit-controlling devices, of a plurality of train-carried indicator mechanisms controlled by said circuit-controllers, means for placing the blocks in electrical connection with the train at times, means controllable by the train-carried mechanism for stopping the train at predetermined times, said blocks including a portion of a telegraphic circuit and means carried by the train for cooperating with and completing the telegraph-circuit whereby telegraphic communication can be had with the train, substantially as shown and described.

2. In a system of the class described, the combination with a plurality of circuit-controlling devices arranged along a railway-track, a fixed contact-maker having a plurality of independent contacts in electrical connection with said controlling devices, of a plurality of train-carried annunciator mechanisms, a contact device carried by the train and having independent contact-plates in connection with the annunciator mechanism for cooperating with the fixed contact-makers, a local alarm-circuit carried by the train and controlled by the annunciator mechanism.

3. In a system of the class described, the combination with a plurality of circuit-controlling devices arranged along a railway-track, fixed contact-makers having a plurality of independent contacts in electrical connection with said controlling devices, of a plurality of train-carried annunciator mechanisms, a contact device carried by the train and having independent contact-plates in connection with the annunciator mechanism for cooperating with the fixed contact-makers, a local alarm-circuit carried by the train and controlled by the annunciator mechanism, and means controlled by said annunciator mechanism for setting the brakes and closing the throttle-valve of the train.

4. In a system of the class described, the combination with train-carried mechanism, and suitable electric blocks having circuit-controlling mechanism, said train-carried mechanism and said electric blocks and circuit-controlling mechanism comprising means for indicating land-slides, means for indicating spread rails, means for indicating washouts, means for indicating broken or unsafe bridges, means for indicating approaching trains means for indicating

whether the railway-crossing is occupied or not, means for telegraphically signaling from and with stations along the line, means for indicating open switches and cars too close to the main track or siding, and means for lighting up road-crossing signals, and switch-lamp signals, substantially as shown and described.

5. The combination with a suitable electric block including a circuit-closing device, a fixed contacting member in electrical connection with the circuit-closing device, of a source of electric energy carried by the train, means for electrically connecting one pole of the source of electrical energy with one of the track-rails, and means connecting the circuit-controller with said track-rail, an engine-carried contacting device for cooperating with the fixed contact device, means for electrically connecting said engine-carried device with said source of electric energy, an electric lamp and an annunciator mechanism connected in circuit with said last-named connecting means, said annunciator mechanism including an operating-magnet, a drop and a catch device for holding said drop in its normal position, means controllable by said drop, for closing the circuit through its respective lamp, an air-valve-operating magnet in electrical connection with said short-circuiting means and operable thereby, an air-valve operable by said air-valve-operating magnet, said air-valve being in communication with the train air-pipe, a piston and cylinder, connections between the cylinder and the air-valve to permit air passing through the air-valve to operate the piston, and means cooperatively connected with the piston for operating the throttle-lever to close the throttle-valve, substantially as shown and described.

6. The combination with a suitable electric block including a circuit-closing device, a fixed contact member in electrical connection with the circuit-closing device, of a source of electric energy carried by the train, means for electrically connecting one pole of the source of electrical energy with one of the track-rails, and means connecting the circuit-controller with said track-rail, an engine-carried contacting device for cooperating with the fixed contact device, means for electrically connecting said engine-carried device with said source of electric energy, an electric lamp and an annunciator mechanism connected in circuit with said last-named connecting means, said annunciator mechanism including an operating-magnet, a drop and a catch device for holding said drop in its normal position, means controllable by said drop for closing the circuit through its respective lamp an air-valve-operating magnet in electrical connection with said short-circuiting means, an air-valve operable by said air-valve-operating magnet, said air-

valve being in communication with the train air-pipe, a piston and cylinder, connections between the cylinder and the air-valve to permit air passing through the air-valve to operate the piston, and means cooperatively connected with the piston for operating the throttle-lever to close the throttle-valve, and a local bell-circuit closable by said drop when it has fallen, substantially as shown and described.

7. In a system of the class described, the combination with blocked railway-track sections, circuit-controlling means cooperatively connected with said blocked sections, a fixed contact-maker having a plurality of independent contact-plates connected with said circuit-controlling means and arranged alongside of the track, of train-carried annunciator mechanisms for said circuit-controllers, a train-carried source of electrical energy cooperatively connected in circuit with said annunciators, indicating-lamps in circuit with said annunciators, a train-carried contact-maker having a plurality of independent contact-plates electrically connected with said annunciator mechanisms and operable with the fixed contact-makers at times, and means for electrically connecting the source of electric energy with the car-axle, substantially as shown and described.

8. In a system of the class described, the combination with blocked railway-track sections, circuit-controlling means cooperatively connected with said blocked sections, fixed contact-makers connected with said circuit-controlling means and arranged alongside of the track, of train-carried annunciator mechanisms for said circuit-controllers, a train-carried source of electrical energy cooperatively connected in circuit with said annunciators, indicating-lamps in circuit with said annunciators, a train-carried contact-maker electrically connected with said annunciator mechanisms and operable with the fixed contact-makers at times, means for electrically connecting the source of electrical energy with the car-axle, and means controllable by each annunciator mechanism for closing the circuit through its respective lamp to relight the train-carried signal-lamps after the train-carried contact member has moved out of electrical engagement with the fixed contact member, substantially as shown and described.

9. In a system of the class described, the combination with blocked railway-track sections, circuit-controlling means cooperatively connected with said blocked sections, fixed contact-makers connected with said circuit-controlling means and arranged alongside of the track, of train-carried annunciator mechanisms for said circuit-controllers, a train-carried source of electrical energy cooperatively connected in circuit with said annunciators, indicating-lamps in circuit with

said annunciators, a train-carried contact-maker electrically connected with said annunciator mechanisms and operable with the fixed contact-makers at times, means for electrically connecting the source of electric energy with the car-axle, and a train-carried local signal-circuit controllable by said annunciator mechanisms substantially as shown and described.

10 10. In a system of the class described, the combination with blocked railway-track sections, circuit-controlling means coöperatively connected with said blocked sections, fixed contact-makers connected with said circuit-controlling means and arranged alongside of the track, of train-carried annunciator mechanisms for said circuit-controllers, a train-carried source of electrical energy coöperatively connected in circuit with said annunciators, indicating-lamps in circuit with said annunciators, a train-carried contact-maker electrically connected with said annunciator mechanisms and operable with the fixed contact-makers at times, means for electrically connecting the source of electrical energy with the car-axle, means controllable by the annunciator mechanisms for closing the circuit to relight the train-carried signal-lamps after the train-carried contact member has moved out of electrical engagement with the fixed contact member, and a train-carried local-signal circuit controllable by said annunciator mechanisms, substantially as shown and described.

35 11. In an electric signaling system, the combination with track-arranged circuit-controlling devices, electrically connected with the track, a fixed contact-maker arranged along the track and electrically connected with the circuit-controller, a train-carried annunciator, a train-carried contacting device for coöperating with the fixed contact device and electrically connected with the annunciator mechanism, a signal-lamp and a source of electric energy in circuit with the annunciator mechanism, said source of electric energy being electrically connected with the car-axle, a local alarm-circuit controllable by said annunciator mechanism, and means controlled by the annunciator mechanism for closing the circuit through its respective lamp at times and means controllable by said circuit-closing means for stopping the train, substantially as shown and described.

55 12. The combination with track-sections, of circuit-controllers electrically connected to said track-sections, a fixed contact member arranged adjacent the track and in electrical connection with the circuit-controllers, of a train-carried contact member for engaging the fixed contact member as the train passes, train-carried annunciator mechanisms electrically connected with the train-carried contact devices, a source of electric energy connected with the train car-axle, and with the

annunciator mechanisms, signaling-lamps for said annunciator mechanisms, lightable by the current from the source of electric energy when the train-carried and fixed contact devices are in engagement, and means controllable by said annunciator mechanisms for relighting said annunciator signal-lamps after the train-carried contact device has passed the fixed contact devices and the annunciator mechanism has registered, substantially as shown and described.

13. The combination with suitable electric block-sections including track portions, circuit-controllers coöperating with each of said block-sections, a fixed contact device electrically connected with all of said circuit-controllers, and having independent contact members, of a train-carried contact device having correspondingly independent contact members, a plurality of train-carried annunciator mechanisms electrically connected with said train-carried contact device, a train-carried source of electrical energy electrically connected with said annunciator mechanisms and the train car-axle, of signaling-lamps electrically connected in circuit with said annunciator mechanisms and coöperating therewith, said signaling-lamps adapted to be lighted and said annunciators operated while the train-carried contact device passes the fixed contact device, and means controlled by the annunciator mechanisms for relighting the signal-lamps thereof when the train-carried contact device leaves the fixed contact device after the annunciator mechanism has been operated, substantially as shown and described.

14. The combination with suitable electric block-sections including track portions, circuit-controllers coöperating with each of said block-sections, a fixed contact device electrically connected with all of said circuit-controllers, and having independent contact members, of a train-carried contact device having correspondingly independent contact members, a plurality of train-carried annunciator mechanisms electrically connected with said train-carried contact device, a train-carried source of electric energy electrically connected with said annunciator mechanisms and the train car-axle, of signaling-lamps electrically connected in circuit with said annunciator mechanisms and coöperating therewith, said signaling-lamps adapted to be lighted and said annunciators operated while the train-carried contact device passes the fixed contact device, means controlled by the annunciator mechanisms for relighting the signal-lamps thereof when the train-carried contact device leaves the fixed contact device after the annunciator mechanism has been operated, and a local alarm circuit closable by said annunciator mechanism at times, substantially as shown and described.

15. The combination with suitable electric block-sections including track portions, circuit-controllers cooperating with each of said block-sections, a fixed contact device electrically connected with all of said circuit-controllers, and having independent contact members, of a train-carried contact device having correspondingly independent contact members, a plurality of train-carried annunciator mechanisms electrically connected with said train-carried contact devices, a train-carried source of electrical energy electrically connected with said annunciator mechanisms and the train car-axle, of signaling-lamps electrically connected in circuit with said annunciator mechanisms and cooperating therewith, said signaling-lamps adapted to be lighted and said annunciators operated while the train-carried contact device passes the fixed contact devices, means controlled by the annunciator mechanisms for relighting the signal-lamps thereof when the train-carried contact device leaves the fixed contact device after the annunciator mechanism has been operated, and means controllable by some of said annunciator mechanisms for applying the air and closing the throttle-valve of the engine to stop the train, substantially as shown and described.

16. The combination with train-carried indicator mechanism and track-arranged circuit-controllers therefor, and means for electrically connecting the track-arranged circuit-controllers and the train-carried indicator mechanism at times, of electromagnetically-controlled means cooperatively connected with the train-carried indicator mechanisms and controlled thereby for operating the throttle-valve of the engine to close off the same, and means for locking said electromagnetically-controlled means after it has operated to close off the throttle-valve substantially as shown and described.

17. A contact-maker comprising an insulating-body having wedge-shaped ends, and a plurality of contact-strips carried by said body, said body having apertures to permit passage of conducting-wires, substantially as shown and described.

18. A contact member comprising an insulating-body, T-shaped in cross-section and provided with wedge-shaped ends, a plurality of contact-strips parallelly and longitudinally arranged on said body, and apertures in said body to permit passage of current-conducting wires, substantially as shown and described.

19. A contact member comprising an insulating-body of rectangular tubular shape, said body having beveled ends and a longitudinal slot in one wall thereof, a plurality of contact-strips carried by said insulating-body and spacing-lugs on the inner walls of said insulating-body, substantially as shown and described.

20. A contact member comprising an insulating-body of rectangular shape, said body having beveled ends and a longitudinal slot in one wall thereof, a plurality of contact-strips carried by said insulating-body, spacing-lugs on the inner walls of said insulating-body, and means for mounting said contact member for lateral adjustment, substantially as shown and described.

21. A contact member comprising a hollow rectangular insulating-body having a longitudinal slot in one wall, a plurality of contact-strips carried by the insulating-body and projecting into the interior thereof, beveled end pieces secured to said insulating-body, and means for mounting said insulating-body for lateral adjustment on a railway-car.

EDWIN JOHNSON ADAMS.

Witnesses:

CHAS. H. MAYER,
S. F. RYAN.