No. 812,433. PATENTED FEB. 13, 1906.

C. MITCHELL & H. MILLINGAR.

ELECTRICAL RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 8, 1903.

4 SHEETS—SHEET 1.

Fig. 1.

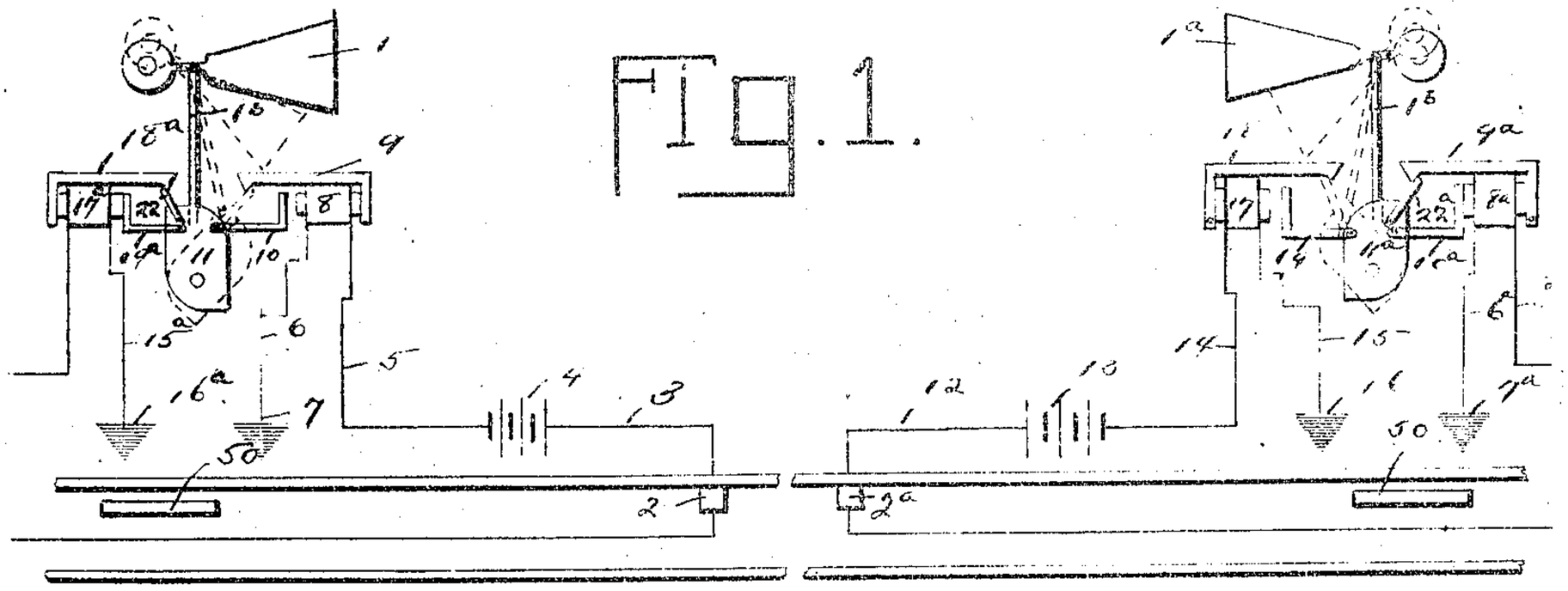


Fig. 10.

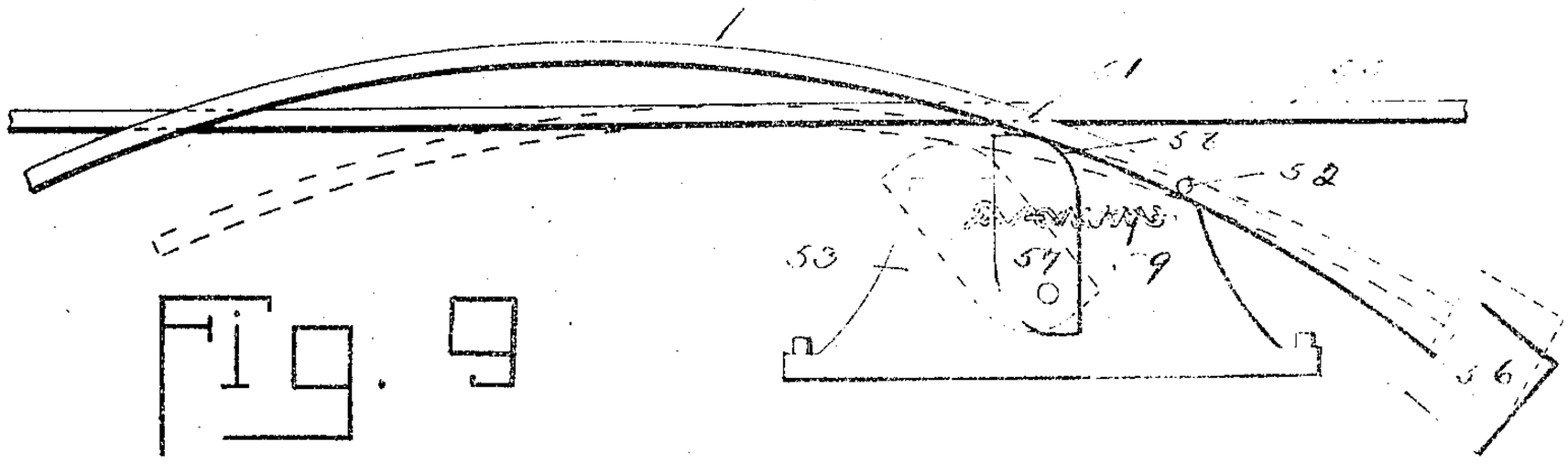
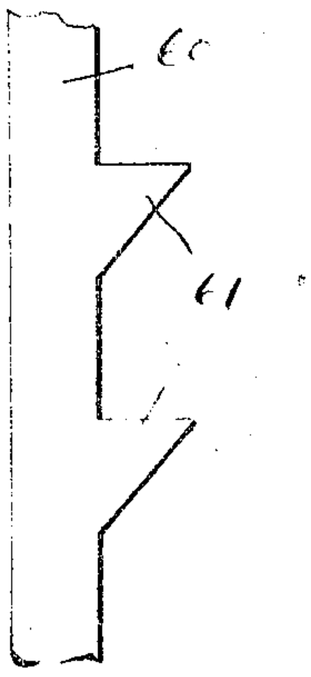
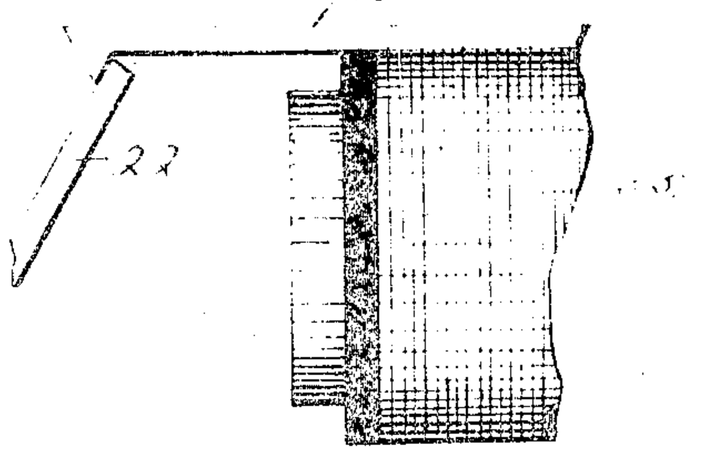


Fig. 9.

Fig. 8.





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4 SHEETS—SHEET 2.

Fig. 2.

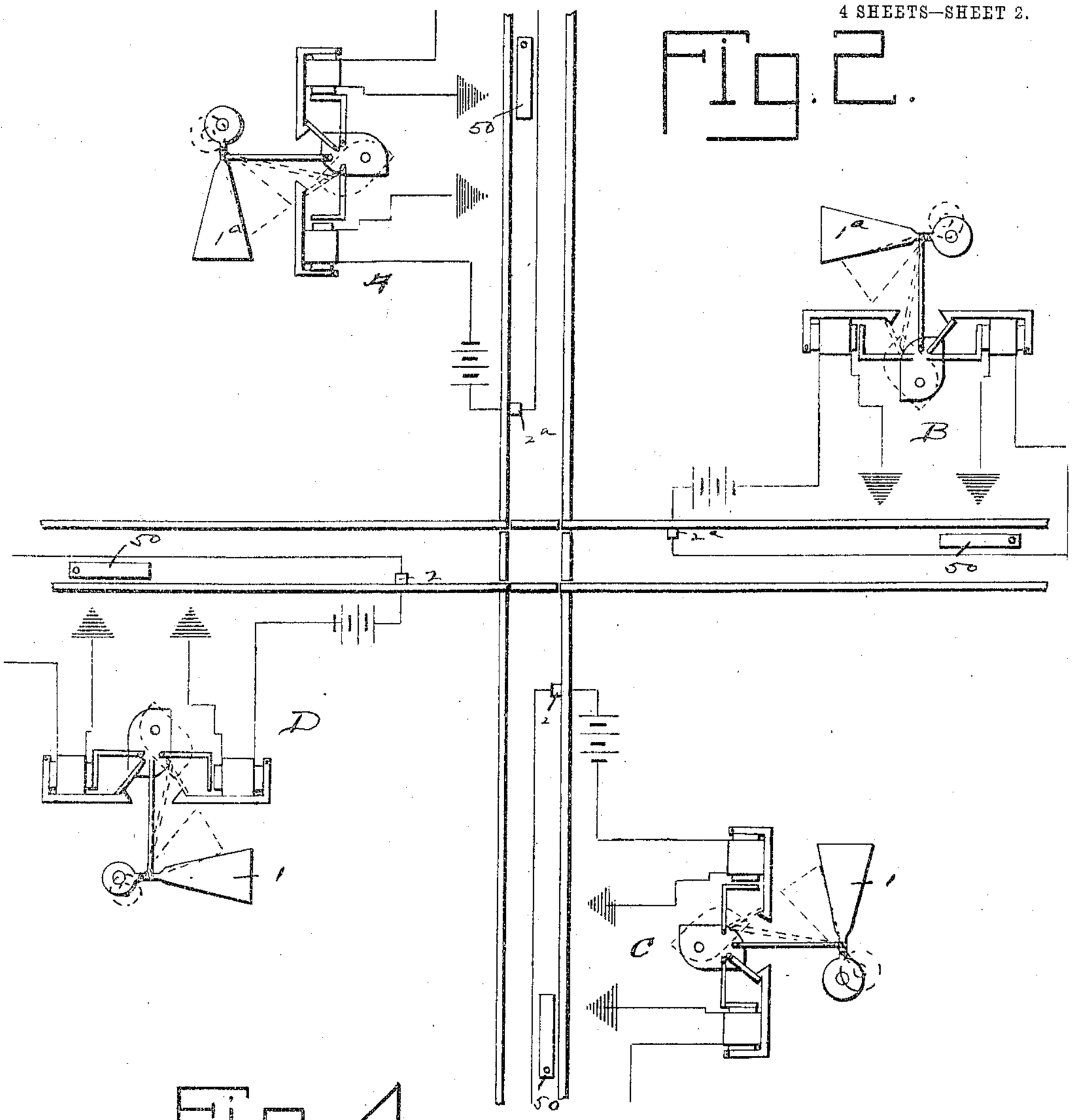
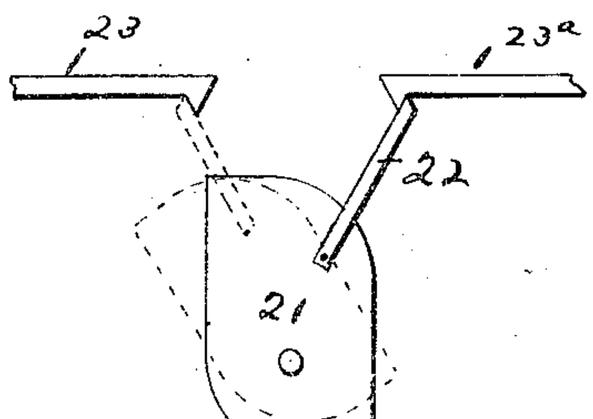


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 1.

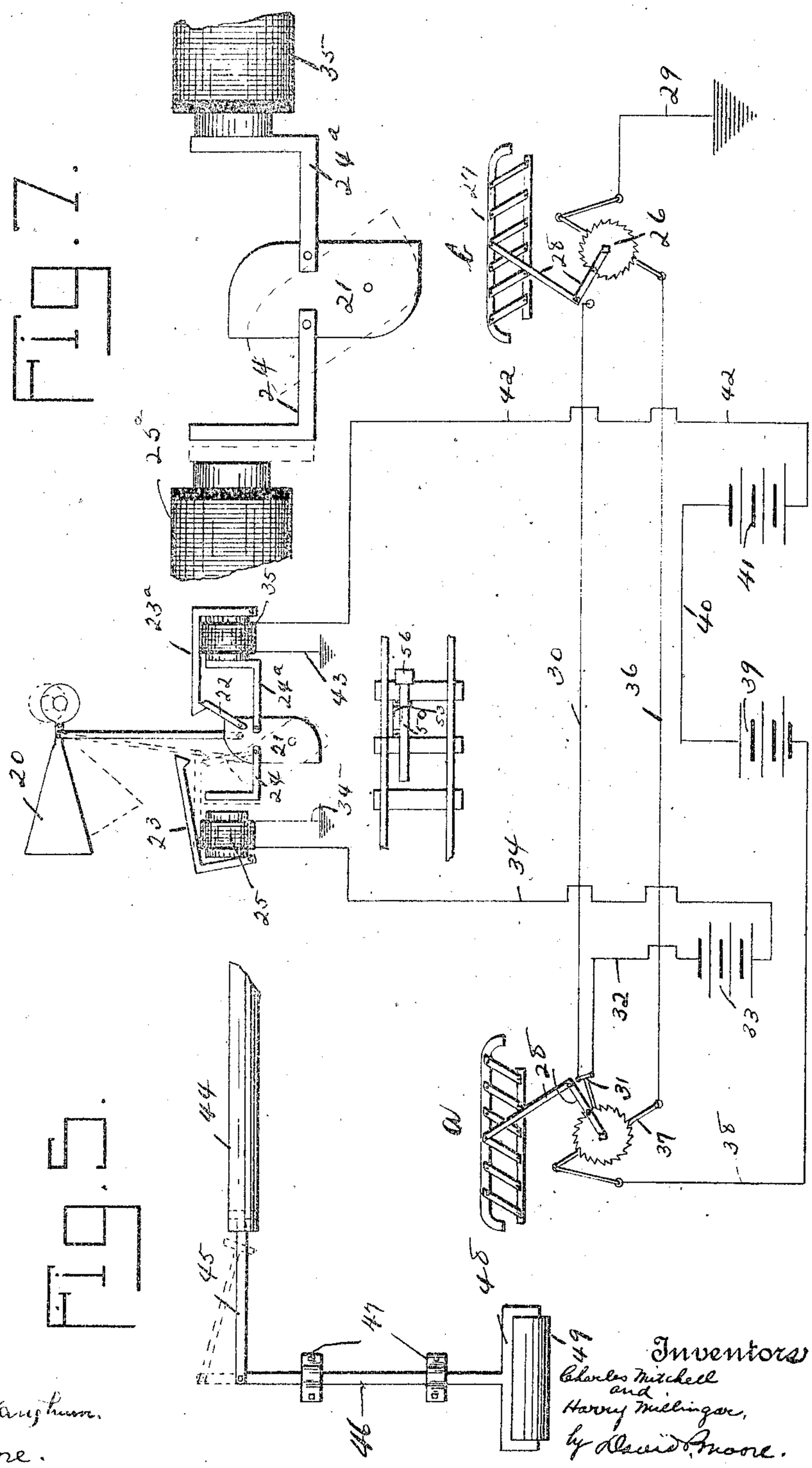

Fig. 2.

Fig. 3.

Fig. 4.

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ELECTRICAL RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 8, 1903.

4 SHEETS—SHEET 4.

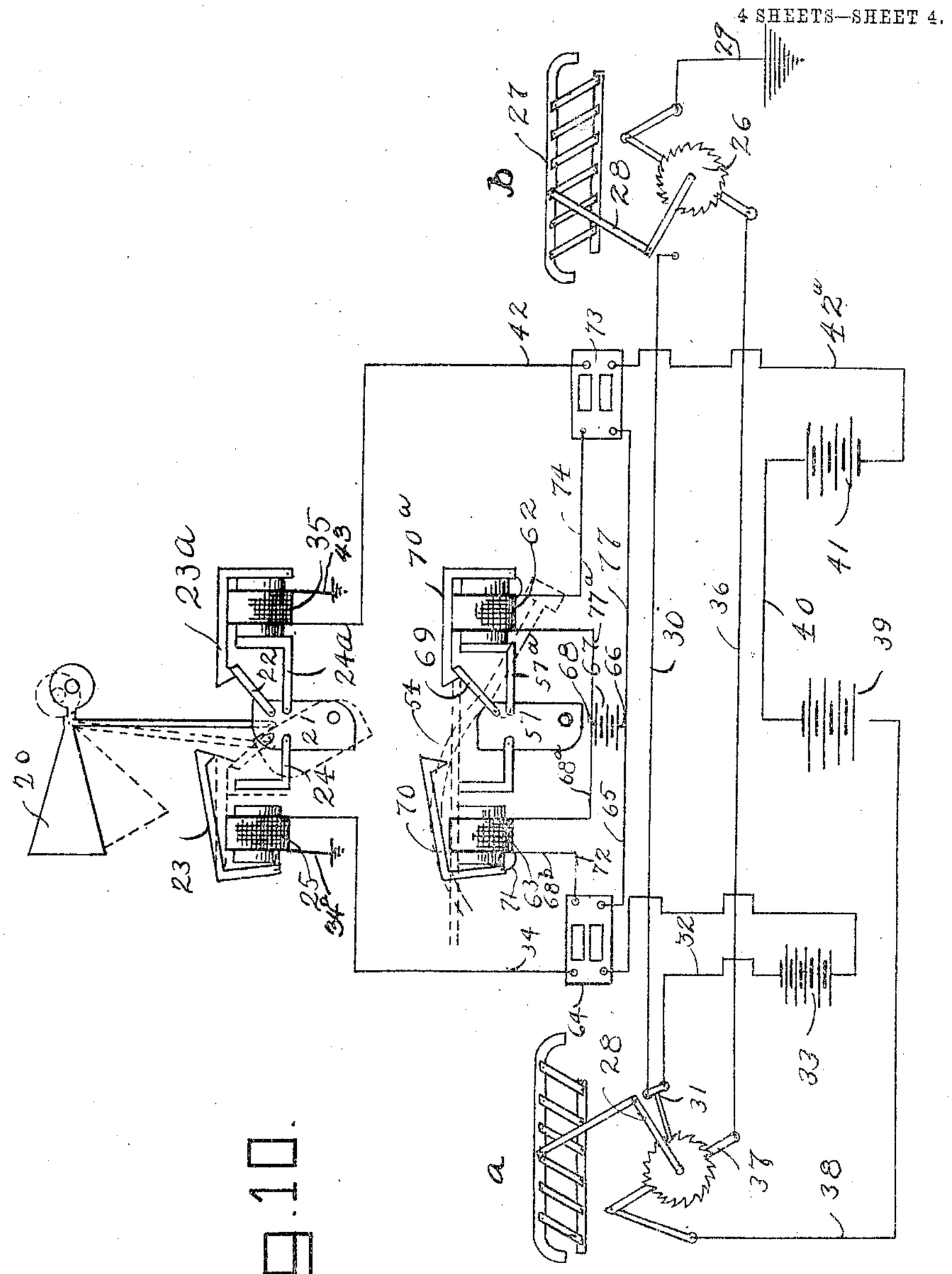

Fig. 10.

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UNITED STATES PATENT OFFICE.

CHARLES MITCHELL AND HARRY MILLINGAR, OF EAST ST. LOUIS, ILLINOIS, ASSIGNORS OF ONE-HALF TO HARRY E. DICKINSON, OF EAST ST. LOUIS, ILLINOIS.

ELECTRICAL RAILWAY SIGNALING SYSTEM.

No. 812,433. Specification of Letters Patent. Patented Feb. 13, 1906.

Application filed August 8, 1903. Serial No. 168,761.

To all whom it may concern:

Be it known that we, CHARLES MITCHELL and HARRY MILLINGAR, citizens of the United States, residing at East St. Louis, in the county of St. Clair and State of Illinois, have invented certain new and useful Improvements in Electrical Railway Signaling Systems, of which the following is a specification.

Our present invention relates to improvements in electrical railway-signals; and the main object of our invention is the provision of an electrical signaling device which will advise one train when another train has entered a block and which will also provide a means whereby a train is automatically stopped without the coöperation of the engineer should he not heed the signal. We thus reduce railway accidents to a minimum by the use of an electrical apparatus so operated as to first set an out signal "semaphore" at termination of each blocked section of track to warn engineer on trains following or approaching in opposite direction that the block he is entering is occupied. In addition to semaphore is a steel spring-trip located in track arranged that when semaphore is set the trip is also set. Should the engineer be asleep or disregard the semaphore-signal, the engine passing over the trip automatically sets emergency air-brakes, stopping the train regardless of engineer.

We also propose to employ our apparatus where tracks cross each other and at open switches in desired places along the route of the railroad, and by the installation of this system it will be evident that all classes of collisions will be avoided.

In the accompanying drawings, Figure 1 is a diagrammatical view of our system used in connection with a straightaway block of a railway system. Fig. 2 is a similar view of our system as used in connection with railroads crossing each other. Fig. 3 shows a detailed view of the semaphore, trip, switches, and third rail connected as in operation. Fig. 4 is a detailed view of a circuit-breaker. Fig. 5 is a detailed view of the appliances carried by the engine. Fig. 6 is a detailed view showing the operation of the trip. Fig. 7 is an enlarged detail view showing the operation of the eccentric. Fig. 8 is an enlarged detail view of the eccentric's lock. Fig. 9 is a detailed view of a lock used for the air-release. Fig. 10 is a view somewhat similar to Fig. 3, showing in detail the mechanism for electrically controlling the trip which is adapted to operate the air-brake system of a train.

Referring to the drawings, and more particularly to Fig. 1 thereof, the numerals 1 and 1^a designate the semaphores, which are mounted, respectively, at the beginning and end of the block. In order to operate the semaphore 1 after the train has entered the block, the pressure device or third rail 2 is thrown into operation, so as to cause a current to pass through wire 3, batteries 4, wire 5, electromagnet 8, wire 6, and ground 7, thus energizing the electromagnet 8 and causing the armature 10 to be thrown toward the electromagnet, so as to operate the eccentric 11 and cause it to assume the position shown in dotted lines, the catch or latch armature 9 being adapted to engage and control the arm 22 of the eccentric and secure the eccentric in the position shown in dotted lines. As the train passes onward and before leaving the block it engages a third rail or pressure device 2^a, which causes a current to pass through the wire 12, batteries 13, wire 14, relay 17, wire 15, and ground 16. This energizes the electromagnet 17 and causes the armature 19 to be operated upon so as to pull upon the eccentric 11^a and cause the semaphore 1^a to assume the position shown in dotted lines, the armature catch or latch 18 engaging the arm 22^a of the eccentric and holding the same in locked position. As the train proceeds farther it engages a pressure device similar to the device 2 or 2^a beyond the semaphore, so that a circuit is made through wire 5^a, electromagnet 8^a, wire 6^a, and ground 7^a, causing the electromagnet 8^a to be energized so as to operate an eccentric 11^a through the medium of the armature 10^a and armature latch or catch 9^a, thus holding the semaphore in the position shown in full lines, indicating that the block is empty. As soon as the train is disconnected from the pressure device 2 the electromagnet 8 is de-energized, so that the semaphore can be easily operated by another train either approaching or leaving the block by energizing the electromagnet 17^a, which is in circuit with a series

of batteries and with the wire 15ª and ground 16ª. This electromagnet operates the latch 18ª and armature 19ª, causing the semaphore 1 to assume the position shown in full lines. Thus the electromagnets 8 and 17 through the armature-levers 10 and 19 will pull the signals to "safety," while the armatures 17ª and 8ª will operate them and hold them at "danger." By providing an eccentric in the shape as shown the rod 1ᵇ, connected to the semaphore and to the eccentric, is so pivoted as to properly operate the semaphore, the eccentric being so pivoted as to be easily operated by the armature-arms and so that its arms 22 and 22ª will readily engage the catch controlled by the electromagnets.

In Fig. 2 we have shown our system as applied to railroads which cross at either right angles or, in fact, any angles, but are provided with means whereby one train is notified of the approach of the other train upon the crossing-track, and consists, substantially, of the same mechanism as set forth in Fig. 1 except that four sets of apparatus A, B, C, and D are employed.

In Fig. 3 of the drawings we have illustrated more minutely and in detail the apparatus used at one end of the block which consists, substantially, of the semaphore 20, operably connected to the eccentric 21, which carries the catch 22, which is adapted to be engaged, respectively, by either one of the latch-armatures 23 or 23ª. Connected to the eccentric are the two oppositely-extending armature-levers 24 and 24ª. The latch-armature 23 and lever-armature 24 are adapted to be operated in unison by means of the electromagnet 25 when the switch 26, which is connected to the third rail 27 by means of the arms 28, is operated, so that the ground-wire 29 is connected with the line-wire 30, switch-bar 31, wire 32, batteries 33, and wire 34, the electric current being adapted to pass through this circuit to energize the electromagnet 25, being grounded at 34ª. At this point the electromagnet 35 has been deënergized, so that the eccentric is pulled to assume the position shown in dotted lines, causing the semaphore to assume the position while at the same time the catch 22 is in engagement with the armature-latch 23 and the armature-lever 24 is being held by the electromagnet 25. To operate the semaphores, so that the same signal when the block is closed can be given, the switch 26 assumes the position shown in full lines, Fig. 3, and connects the ground 29 with the wire 36, switch 37, wire 38, battery 39, wire 40, batteries 41, wire 42, electromagnet 35, and ground-wire 43. In the event that the engineer of the approaching train does not understand the semaphore we mount upon each engine and connect with the air-valve 44 a crank 45, connected to a rod 46, which is guided in bearings 47 and carried in its forked or bifurcated ends 48 a roller 49, which is adapted to be contacted by the trip 54, mounted between the tracks in the proper position. This trip consists, substantially, of a curved plate 51, (clearly shown in Fig. 6,) pivoted at 52 to a support 53, and to normally hold the trip, so that the curved portion 54 is above the rail 55, so as to engage the roller 49, we provide the weight or counterbalance 56 and the pivoted eccentric 57, which is provided with a curved upper end 58, which contacts the under surface of the trip and is further provided with a coiled spring 59, which is connected to the support 53 and to the eccentric 57, so as to normally hold it in an upright position.

Instead of the coil-spring 59 for returning the eccentric 57 we propose to use an electromagnet which is adapted to be operated by any of the various electrical circuits to which it is shunted, thus causing the trip to be operated simultaneously with any one of the various electromagnets used for operating the semaphores.

As shown in Fig. 9 of the drawings, we provide upon one side of the rod 46 the air-release lock 60. This device is adapted to be operated when the crank-arm 45 is raised, said crank-arm being locked in place by means of the locks or latches 61, which retain the crank-arm in the raised position until the same is released by the engineer. This device operates the air-brake system of the train and brings this train to a full stop.

From the foregoing description, taken in connection with the drawings, the operation of our device is readily understood, but, briefly stated, it is as follows: Where the ordinary block system is employed, the train approaching will operate the semaphore so as to indicate to any train following that the train is not the proper distance within the block for the other train to proceed. When, however, a train has passed into the block and operates the opposite electromagnet so as to cause the semaphore to signal "safety," the train waiting outside the block can proceed. If there should be another train at the other end entering the block and coming in the opposite direction, the train within the block will then operate the pressure device 2ª as it approaches the semaphore 1ª, and thereby operates the semaphore so as to signal the train approaching the block that there is a train within the block. This applies more particularly to the apparatus as shown in Figs. 1, 3, and 10, whereas in the construction shown in Fig. 2 where the tracks cross each other the signals are operated by a train working at right angles to the other train, so as to indicate the trains approaching the cross-

ing. As shown in Fig. 10 of the drawings, when the electromagnet 35 is energized the electromagnet 62 is energized, while when the electromagnet 25 is energized the electromagnet 63 is energized. The energizing of these electromagnets 62 and 63 controls the movement of the eccentric 57, which is adapted to operate the treadle 54, the details of which are clearly shown in Fig. 6 of the drawings. In order for the electromagnets 25 and 63 to be operated when the train is passing into the block from *a*, a circuit is made from the ground 34ª to the electromagnet 25, wire 34, relay 64, batteries 33, wire 32, connection 31, switch 37, wire 36, switch 26, wire 29, and consequently the ground. The energizing of the relay 64 completes a circuit through the wire 65, wire 66, batteries 67, wire 68, wire 68ª, electromagnet 63, and wire 68ᵇ. This circuit energizes the electromagnet 63, which attracts the armature 57ª of the eccentric 57, causing the eccentric to be pulled toward the electromagnet 63, so that its catch 69 is engaged by the latch 70, which is brought down at a horizontal position by the electromagnetic effect thereon. This causes the semaphore controlled by electromagnet 25 and also the trip 54 to be operated simultaneously, the trip being placed at "danger" by this operation. As the train passes on through the block and out at *b* it is necessary that the semaphore should be thrown in the other direction to show that the block is clear and also to simultaneouly operate the trip 54. A circuit is then made from the ground through wire 43, electromagnet 35, wire 42, relay 73, wire 42ª, batteries 41, wire 40, batteries 39, wire 38, switch 37, wire 36, switch 26, and the ground-wire 29. The energizing of the electromagnet 73 operates and closes a circuit through wire 77, wire 66, batteries 67, wire 68, wire 77ª, electromagnet 62, and wire 74, this curcuit energizing the electromagnet 62, which attracts the armature 57ᵇ, so as to pull the eccentric 57 toward the electromagnet 62, so that its catch 69 is engaged by the electromagnetically-controlled latch 70ª, thus raising and placing the trip at "safety." If a train is approaching and enters the block at *b*, a similar circuit is made to energize the electromagnets 25 and 63, so as to show that the train is within the block, this circuit being made through the ground 34ª, electromagnet 25, wire 34, electromagnet 64, batteries 33, wire 32, wire 30, switch 26, and a ground-wire 29. The energizing of the electromagnet 64 controls the circuit-controlling electromagnet 63, so that the same is energized and attracts the eccentric toward the same, so that the catch 69 is engaged by the latch 70. As the train proceeds and passes out of the block the electromagnets 35 and 62 are energized, a circuit being made through the ground at 43, electromagnet 35, wire 42, relay 73, wire 42ª, batteries 41, wire 40, batteries 39, wire 38, switch 37, wire 36, switch 26, and a ground-wire 29, the relay 73 in this instance being energized so as to complete the circuit to the electromagnet 62, which controls the movement of the eccentric 57 toward it, so that its catch 69 is engaged by the latch 70ª, thus simultaneously operating the electromagnet 62 and the electromagnet 35.

From the foregoing description, taken in connection with the drawings, it is evident that our system will protect the train within the block by allowing the train to automatically operate a signal and to furthermore provide it with a device which will automatically stop the train if the engineer should allow his train to enter the block.

What we claim as new, and desire to secure by Letters Patent, is—

1. In combination with a block of a railway system, of a signaling system having a semaphore mounted at each end of the block, an eccentric connected to each semaphore provided with a catch, oppositely-arranged electromagnets for moving the eccentrics in opposite directions and latching the same for operating the semaphore and electrical circuits for operating said electromagnets by the train as the train enters or leaves the block.

2. In combination with a block of a railway system, of a signaling system having a semaphore mounted at each end of the block, an eccentric connected to each semaphore provided with a catch, oppositely-arranged electromagnets for moving the eccentrics in opposite directions and latching the same for operating the semaphore, electrical circuits for operating said electromagnets by the train as the train enters or leaves the block, and an electrically-operated trip for operating the air-brake system of a train operated simultaneously with any of the electrical circuits connected with the said electromagnets.

3. In combination with a block of a railway system, of a signaling system, consisting of a semaphore mounted at each end of the block, means connected to the semaphore provided with a catch, oppositely-arranged electromagnets for moving the means in opposite directions, and locking the same for controlling the semaphores, and electric circuits for operating said electromagnets connected by the train as the train enters or leaves the block.

4. In combination with a block of a railway system, of a signaling system therefor, having a semaphore mounted at each end of the block, means connected to each semaphore provided with a catch, oppositely-arranged electromagnets for operating the said means in opposite directions and locking the

same for operating the semaphores, electric circuits for operating the electromagnets connected by a train as the train enters or leaves the block, and an electric trip for operating the air-brake system of a train operated simultaneously with any of the electric circuits connected with the said electromagnets.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES MITCHELL.
HARRY MILLINGAR.

Witnesses:
HERMAN C. HAUSS,
PATRICK BAYNE.