No. 792,279. PATENTED JUNE 13, 1905.

C. D. McPHEE.

ELECTRIC BLOCK SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED JULY 1, 1904.

2 SHEETS—SHEET 1.

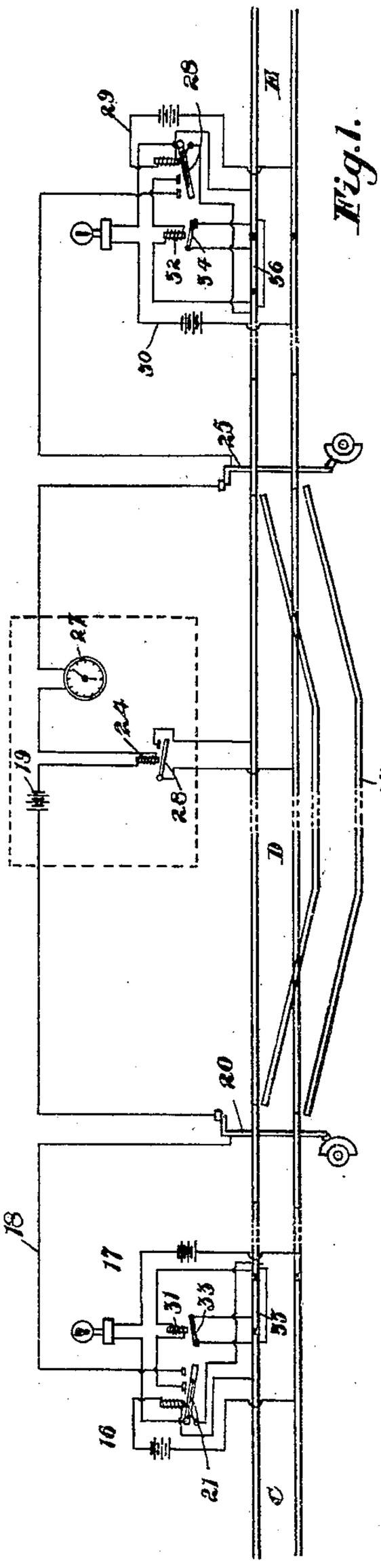

Fig. 1.

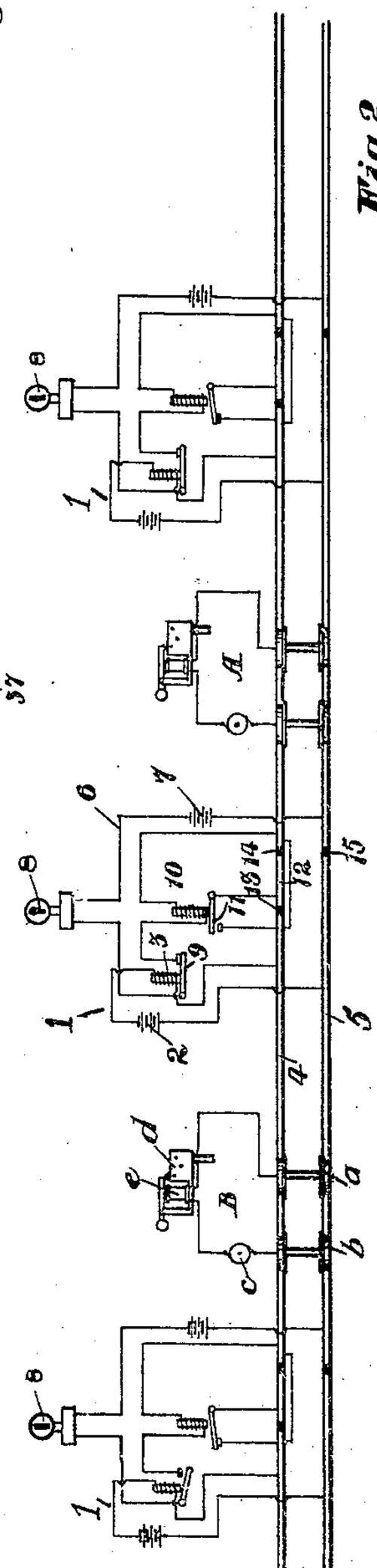

Fig. 2.

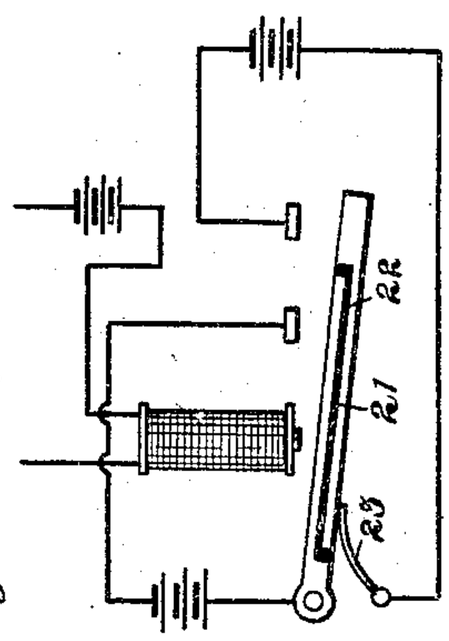

Fig. 3

Witnesses.
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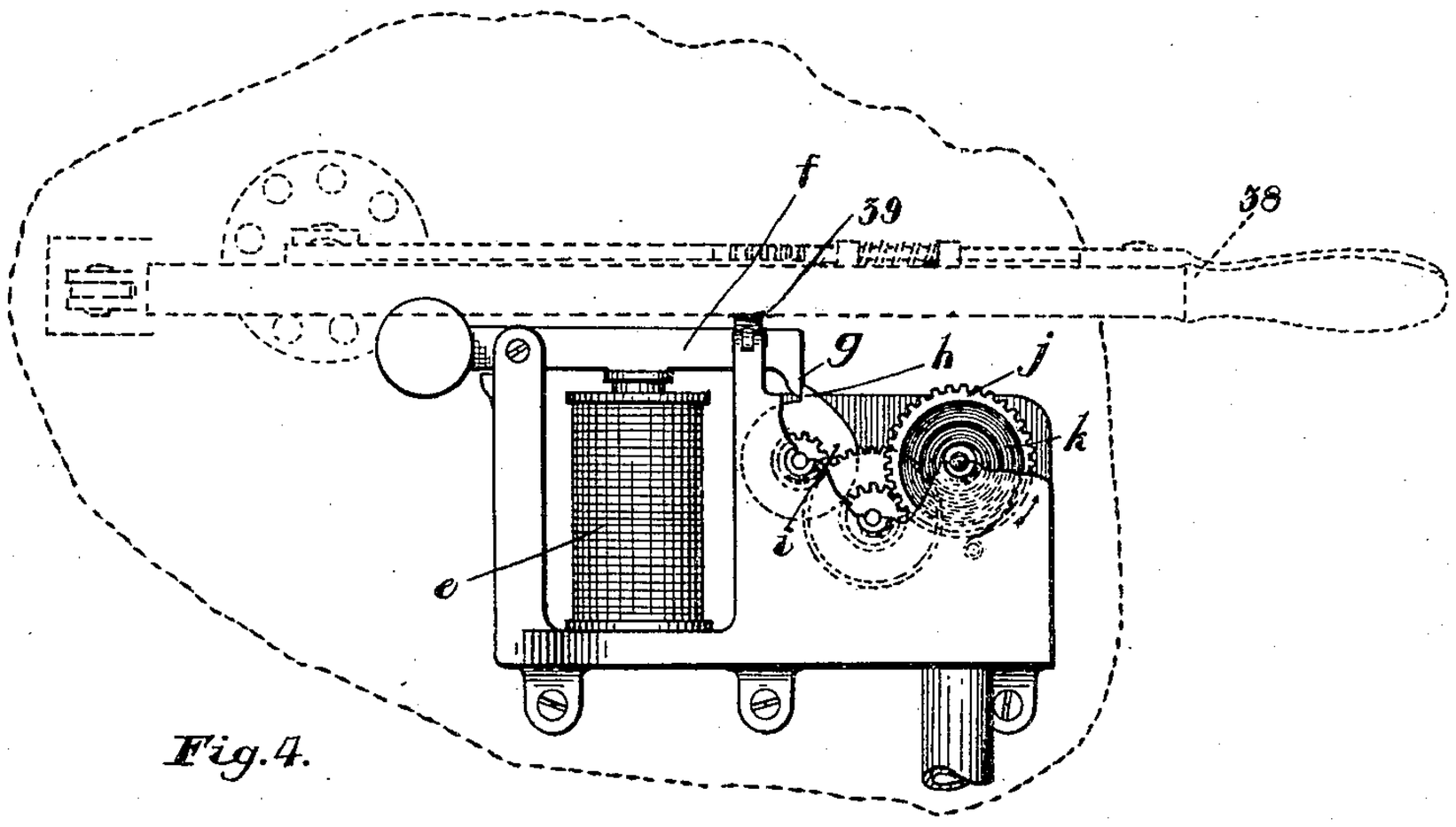

Fig. 4.

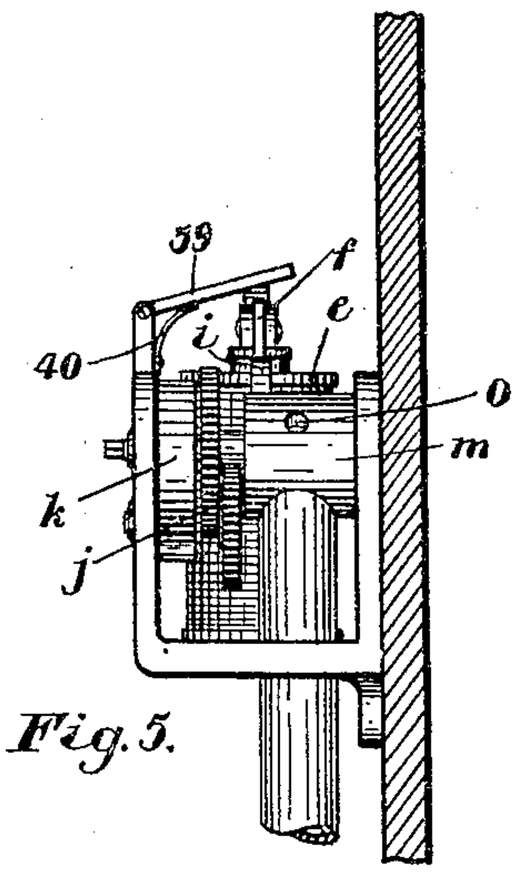

Fig. 5.

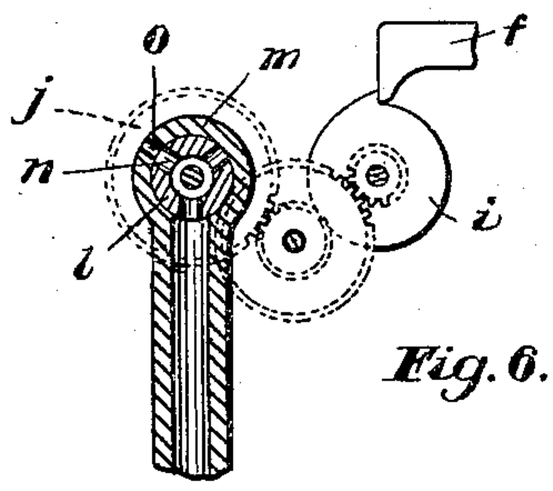

Fig. 6.

Witnesses.
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No. 792,279. Patented June 13, 1905.

UNITED STATES PATENT OFFICE.

CLAUD DANIEL McPHEE, OF ARNPRIOR, CANADA, ASSIGNOR OF ONE-HALF TO JOHN CARLING KELLY, OF OTTAWA, CANADA.

ELECTRIC BLOCK-SIGNALING SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 792,279, dated June 13, 1905.

Application filed July 1, 1904. Serial No. 214,994.

To all whom it may concern:

Be it known that I, CLAUD DANIEL McPHEE, of the town of Arnprior, in the county of Renfrew, Province of Ontario, Canada, have invented certain new and useful Improvements in Electric Block-Signaling Systems for Railways, of which the following is a specification.

My invention relates to improvements in electric block-signaling systems for railways; and the object of my invention is to provide means whereby railway-trains may be automatically signaled and stopped when there is danger of a collision; and it consists, essentially, of an electric circuit in a locomotive and tender, an electric dynamo in the said circuit geared to one of the car-wheels, a spring-actuated motor in the locomotive, means whereby the motor will operate the air-brakes when the circuit is broken, and so stop the train, a plurality of electrically-disconnected track-sections, a plurality of electric circuits so arranged that when two trains are on adjacent blocks dead rails will be provided whereby the circuit in the locomotive and tender is broken and the air-brakes operated, the various parts of the device being constructed and arranged in detail, as hereinafter more particularly described.

Figure 1 is a diagrammatic view of the tracks and electric circuit, this arrangement being used wherever there is a station. Fig. 2 is a diagrammatic view of the arrangement of the tracks and circuit between stations. Fig. 3 is a detail of the armature 21 in Fig. 1. Fig. 4 is an elevation of the spring-actuated motor in the locomotive, part being broken away to show the construction. Fig. 5 is a side elevation of the same. Fig. 6 is a sectional view showing a detail of the connection of the air-pipe with the spring-motor.

Referring now to Fig. 2, A represents a locomotive and tender, and B one following it. *a* is the rear wheel of the locomotive, and *b* the first wheel on the tender, insulation being provided between them. *c* is an electric dynamo suitably geared to the wheel *b*. *d* is the spring-motor hereinafter more particularly described. It will thus be seen that under ordinary circumstances the circuit between the locomotive and tender is closed by the rail underneath.

The spring-motor *d* consists, essentially, of a car-wheel *j*, provided with a shaft integral therewith which is suitably journaled in the outside frame.

k is a strong spiral spring, one end thereof being made integral with the frame and the other with the shaft, thus tending to rotate the wheel *j* in the direction indicated by the arrow. The wheel is connected by an idler to a similar wheel *i*, having a shaft integral therewith and journaled in the frame. The outside circumference of the wheel *i* is provided with a projection *h*.

f is an armature-lever constructed of a magnetic material pivoted in the frame, as shown, and a counterweight being placed at one end, tending to throw the lever up. The end of this lever is provided with a projection *g*, adapted to engage a projection *h* on the wheel *i*.

39 is a lever pivotally secured to the frame and adapted to swing in a direction transverse to that of the armature-lever *f* and adapted to engage the top of this lever.

40 is a spring integrally secured to the frame and adapted to engage the lever 39, forcing it in an upward direction.

e is an electric magnet suitably placed below the lever *f* and designed when energized to draw and hold the lever *f* down, so that the projection *g* on the end of it will engage the projection *h* on the wheel *i*.

A projection is provided on the frame adapted to engage the end of the lever *f*, thus limiting its upward movement. It will thus be seen that the lever will normally remain at its extreme upward position out of engagement with the projection *h* on the wheel *i*, with the lever 39 resting on top of it.

The spring-motor is so situated relative to the throttle-lever that the said lever in its motion of closing the throttle will engage the lever 39, so forcing it down, which forces the lever *f* down and causes the projection *g* to engage the projection *h* on the wheel *i*.

The electric magnet *e* depends for its energy on a dynamo *c*, which is suitably geared to the gear-wheels. It will thus be seen that

when the train stops the electrical energy will cease, and so the electric magnet will become deënergized, and the armature *f* may move upwardly, thus allowing the wheel *i* to move; but in shutting off the same the throttle-lever has been brought across and has forced the lever 39 down, which will continue to hold the projection *g* on the armature-lever *f* in engagement with the projection *h* on the wheel *i*. By this arrangement the necessity of setting the spring-motor at each stop is done away with.

The wheel *j* is integrally connected to a cylindrical plug *l*, which fits snugly inside a similar cylinder *m*, provided with an opening at any side thereof, to which a compressed-air pipe for operating the air-brakes is connected.

A plurality of openings *n* are provided in the cylindrical plug *l*, symmetrically placed around the circumference, a single opening *o* being provided in the cylinder *m*. The gearing is so arranged that every second turn of the wheel *i* will bring one of the openings in the cylinder opposite a similar opening in the cylinder *m*. It will thus be seen that when the openings in the two cylinders are opposite each other the air-brake pipe is opened to the air, and this operates the brakes. The means by which it does this is quite well known to those familiar with the mechanism of the ordinary air-brake and need not be described here.

Referring to Fig. 2, 1 is an electric circuit consisting of an electric battery 2, one pole of which is connected through an electromagnet 3 to one of the rails 4, the other side thereof being connected directly to the other rail, 5. 6 is an electric circuit consisting of an electric battery 7, one pole of which is connected through an electric semaphore 8 and armature 9 and an electric magnet 10 to the rail 4, the other pole being connected directly to the rail 5. On completion of the circuit the electric semaphore 8 will be operated and display a danger-signal. This semaphore may be of any well-known construction. 13, 14, and 15 are pieces of insulation provided to separate the various blocks of track.

It will be assumed for the sake of explanation we have two trains A and B in the position shown. The circuit 1 will then be completed through the axles and wheels of the locomotive B. This will operate the electromagnet 5, which will draw up the armature 9. The circuit 6 will be completed through the axles and wheels of the train A and the armature 9, which has been drawn into position by the magnet 3. This circuit being completed will operate the electromagnet 10. This will lift the armature 11, electrically disconnecting the rail 12 from the rest of the track. It will thus be seen that when the wheel on the locomotive comes on the rail and passes the two blocks of insulation 14 and 15 the circuit between the locomotive and tender will be broken on account of the insulation. It is to be noted that this does not take place until after the wheels of the locomotive have passed the two blocks 14 and 15. The circuit 1 will be kept closed by the following wheels of the other coaches of the train, if there are any; if not, by the end wheel of the tender, which will extend over this rail and which may be made very short.

Referring to Fig. 1, I show a more protective form of my invention to be applied in the immediate vicinity of a station. For use in the vicinity of a station I prefer to use a more protective form of my device in which an additional circuit is added to the ordinary form of the device, thereby producing better protection. 16 and 17 are two electric circuits corresponding exactly to the circuits 1 and 6 in Fig. 2. 18 is the additional circuit consisting of a battery 19, one side of which is connected through a switch 20 and armature 21 to one side of the rail. The switch 20 is so arranged that when it is thrown up it will break the circuit 18. The peculiar structure of the armature 21 is shown in detail in Fig. 3. To keep the two circuits 17 and 18 separate, it is necessary to have a strip of insulation 22 running down the center of the armature, contact being made by means of a spring 23 or other suitable arrangement. The other pole of the battery 19 is attached through an electromagnet 24, a switch 25, and an armature 26 to the same side of the rail. An electric clock 27 may be used to throw this circuit on at certain hours when desired. In front of the magnet 24 is an armature 28, by means of which the two rails may be connected electrically together. It is to be noted that when this armature is closed it serves the same purpose as the wheels and axle of a train would in connecting the two rails. 29 and 30 are two circuits precisely similar to 1 and 6, respectively.

Following the three sections of track C, D, and E and assuming for sake of illustration that we have a train on C and one on E, the train on C will complete the circuit 16, drawing up the armature 21. Similarly, the train on E will complete the circuit 29, drawing up the armature 28. These two armatures 21 and 28 having been drawn up will complete the circuit 18. This will operate the electromagnet 24, which will draw up the armature 28, making electrical connection between the two rails. Connection having been made between the two rails, the circuits 17 and 30 will both be simultaneously completed. This will operate the electromagnets 31 and 32, drawing up the armatures 33 and 34, leaving two dead rails 35 and 36, which will stop either train. The trains will be stopped at these points, and further progress cannot be made until one of the train-crews goes and throws either the switch 20 or 25, thus break-

ing the circuit 18. The electromagnet 24 ceasing to operate allows the armature 28 to fall, thus breaking the electrical contact between the two rails. The switch having been thrown, the two trains may now proceed, one having been switched into the siding 37. It will thus be seen that the two trains can only proceed in safety when there is a full block, as D, between them. It will thus be seen that a train will not be allowed to pass a station if there is another train on the next block.

In connection with the spring-motor (shown in Fig. 4) it is desirable that when the train has been brought to rest by the air-brakes these brakes should be shut off. In my device I have so arranged it that these will be automatically accomplished by closing the throttle-lever.

Referring to Figs. 4, 5, and 6, 38 is a throttle-lever. The spring-motor is so situated on the back of the boiler that the armature *f* comes immediately below the throttle-lever 38. At the top of one side of the spring-motor a lever 39 is pivotally secured thereto, being forced to retain an inclined position by means of the spring 40. The spring-motor is so placed that when the throttle-lever 38 is drawn across, whereby the same is shut, it engages the lever 39, slides along it, and forces it into a horizontal position. The lever 39 in turn engages the armature *f*, forcing it down into the position originally occupied before the circuit was broken. To shut off the air-brakes, all that has to be done is to turn the wheel *i* back one turn. The armature *f* will then hold it in that position.

It will now be seen that I have devised a system which has great advantages over any system previously used. In the past all such systems were dependent for operation upon the engineer seeing the signals displayed before him. In my system, however, the brakes are applied and the train brought to a standstill automatically. Thus all danger due to the oversight or carelessness of the train employees is done away with.

The apparatus used in carrying out my system is all of the simplest nature and will entail small expense to install on any railway.

It is to be understood that I do not wish to confine myself to the exact means herein described for working out my system.

Various changes may be made in the different electrical circuits without departing from the spirit of my invention.

What I claim as my invention is—

1. In a signaling system, the combination with the block of track in front of a station, of two adjacent blocks on each side thereof, electric circuits at the near end of the adjacent sections closed by the axles and wheels of the locomotive in the said section, electromagnets in the said circuit, armatures suitably situated in front of the said electromagnets, an auxiliary station-circuit which is closed by the said armatures when the electromagnets are energized, an electromagnet and armature in this auxiliary circuit so arranged that when the circuit is energized the armature will make electrical contact between the two sides of the track, an electrical circuit at each end of the station-block, said circuits having been completed by the action of the auxiliary station-circuit and the circuits at each end of the adjacent blocks, electromagnets and armatures in these circuits by means of which a single rail is electrically disconnected from the rest of the track at each end of the station-block as and for the purpose specified.

2. In a signaling system, in combination, a plurality of track-sections, a single rail between each, an electric circuit in one section closed by the wheels and axles of a train in that section, an electromagnet and armature in the said circuit, a second electrical circuit in the next following section completed by the armature operated by the electromagnet in the first section and by the rails and axles of a train on the second section, an electric semaphore in said circuit, an electromagnet and armature whereby the single rail is electrically disconnected from the remainder of the section as and for the purpose specified.

3. In a signaling system, in combination, a plurality of track-sections and a central rail between each, an electric circuit in each section closed by the wheels and axle of a train in that section, an electromagnet in said circuit a second electrical circuit in the next following section closed by the action of the electromagnet in the first section and by the rails and axles of a train in the second section, an electric semaphore in said section, an electromagnet, and an armature lifted by the said magnet whereby the central rail is electrically disconnected from the remainder of the section, an auxiliary circuit in the locomotive and tender, a spring-motor suitably arranged with the auxiliary circuit whereby upon the breaking of the said circuit the spring-motor operates the air-brakes as and for the purpose specified.

Signed at Ottawa this 5th day of May, 1904.

CLAUD DANIEL McPHEE.

Witnesses:

EDWARD P. FEATHERSTONHAUGH,

MAY LYON.