No. 817,463. PATENTED APR. 10, 1906.

R. A. BALDWIN & G. D. FOOTE.

RAILROAD SIGNAL SYSTEM.

APPLICATION FILED AUG. 10, 1905.

2 SHEETS—SHEET 1.

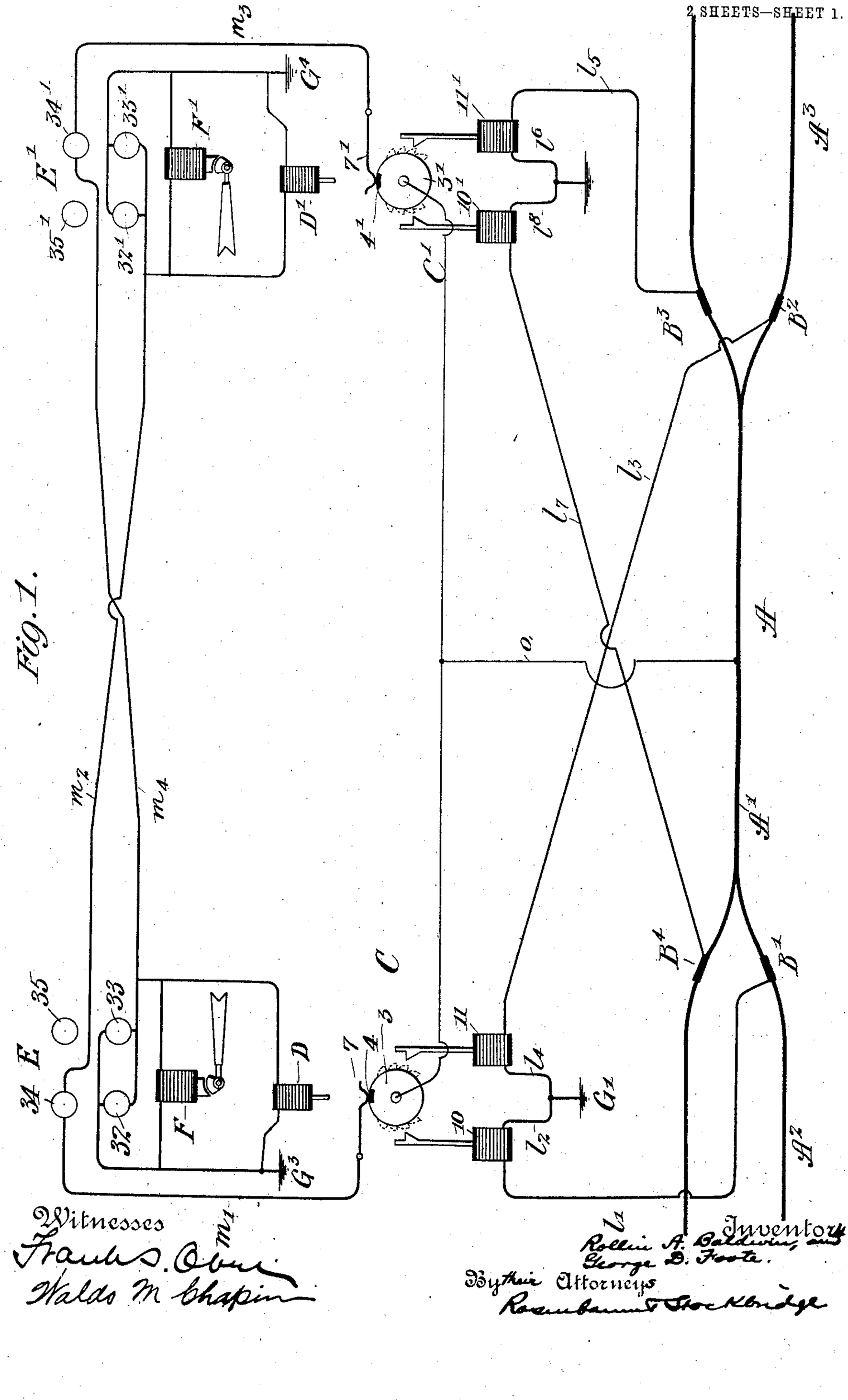

FIG. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

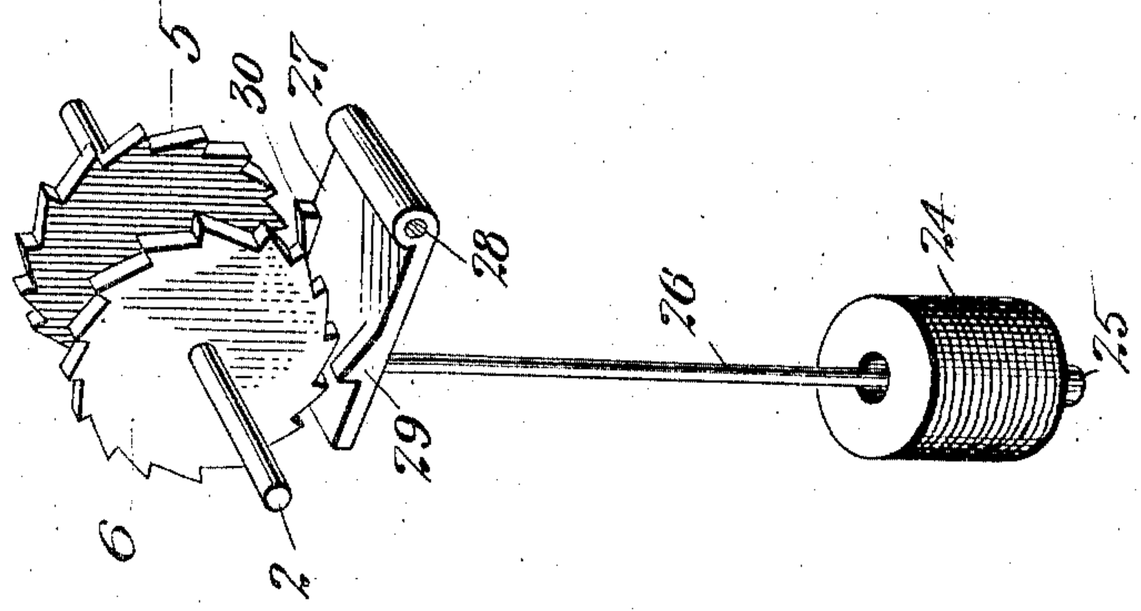
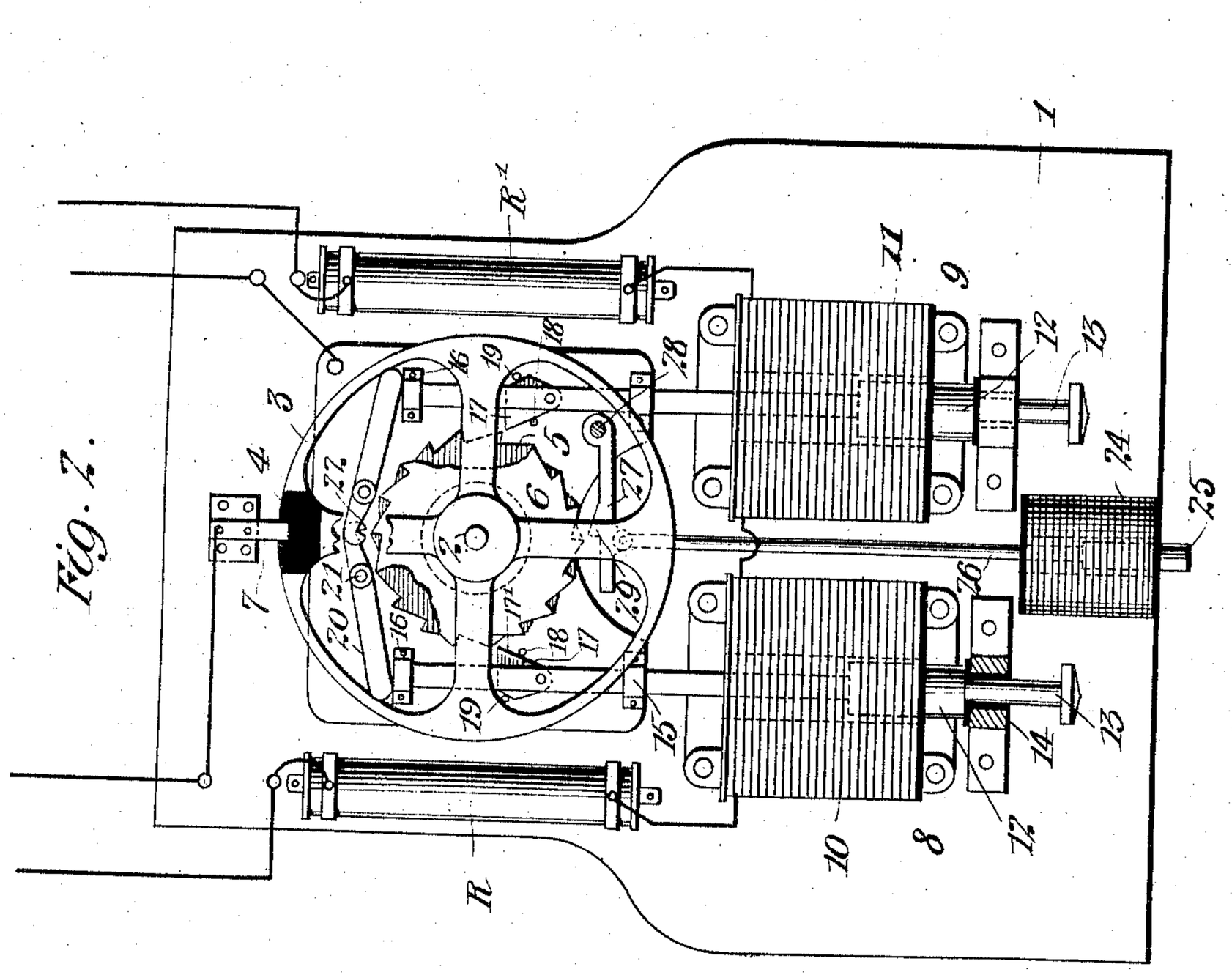


Fig. 2.



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UNITED STATES PATENT OFFICE

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RAILROAD SIGNAL SYSTEM.

No. 817,463. Specification of Letters Patent. Patented April 10, 1906.

Application filed August 10, 1905. Serial No. 273,504.

To all whom it may concern:

Be it known that we, ROLLIN A. BALDWIN and GEORGE D. FOOTE, citizens of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Railroad Signal Systems, of which the following is a full, clear, and exact description.

Our invention relates to railroad-signals.

In single-track-railway installations it is customary to provide double-track sections at intervals along the railroad, so that cars traveling in opposite directions may pass one another. This arrangement is particularly common in suburban trolley-roads, and the arrangement is generally such that cars are admitted in one direction or the other into the single-track section separately, those desiring to pass in the return direction being held back at the switch or double-track section until the first cars have left the single track. Under ordinary circumstances but one car is admitted to the block-section at a time; but during rush hours it is sometimes desired to admit two or any greater number of cars into the single-track section in one direction and after they have all left the same to admit a plurality of cars in the opposite direction.

It is the object of our invention to provide a semaphore signal apparatus which shall be adapted to the above conditions and which shall display danger-signals at one entrance to a single-track section as long as any cars are passing through the section from the opposite end.

A further object of the invention is to provide a device which shall be effective under all conditions which arise in practice, which shall be simple and easy to construct, and having few operating parts.

With these and other objects in view our invention consists in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally particularly pointed out in the appended claims.

Figure 1 is a diagrammatic view showing the electrical connections of a railroad signal system embodying the principles of our invention. Fig. 2 is a side elevation of the recording signal-transmitter employed in the system illustrated in Fig. 1, and Fig. 3 is a perspective view showing a detail of construction.

In carrying out our invention we employ a recording appliance at each entrance to the signal-section, which is adapted to make a record of each car which enters the section and to complete a signal-circuit until all of such cars have again left the section. While we have shown this device as employed with a single-track railroad in which cars run in opposite directions, it is obvious that it is equally capable of use upon a double-track road to admit a number of trains to a block-section, becoming automatically cleared after all the trains have left that section.

Referring now to the accompanying drawings, and to the various views and reference-signs appearing thereon, in which like parts are designated by the same reference-sign wherever they occur, A denotes a portion of a road-bed which may be either steam or electric or that of an ordinary street-car installation, and in the drawings we have shown a single-track section A′ and double-track sections A^2 and A^3. At suitable points adjacent to each entrance to the block A′ we provide means B′, B^2, B^3, and B^4 for making an electrical circuit whenever a car passes these points. It is obvious that such circuit-closing means may be of any desired sort; but we prefer to make use of an insulated conductor or section *c*, Fig. 4, upon the usual trolley-wire *d*, to which the trolley-wheel forms a bridge from the wire when a car passes, so that the insulated section is temporarily charged.

C and C′ indicate, broadly, what we shall term "recording signal-transmitters," and a preferred construction of each of these parts is illustrated in Figs. 2 and 3 of the drawings.

Referring to Fig. 2, 1 denotes a frame or casing in which is journaled a rotatable shaft 2. Upon the shaft 2 we arrange a revoluble disk or wheel 3, having an insulated section 4 upon the periphery thereof. 5 and 6 denote separate ratchet-wheels which are respectively keyed to the shaft and which have teeth pointing in opposite directions. 7 denotes a contact-brush which is secured to the frame 1, so as to bear upon the periphery of the disk or wheel 3, and is normally located

opposite the insulated section thereon. By virtue of the above arrangement the wheel is turned in one direction or the other by the actuation of either ratchet-wheel, and contact is made between the wheel and its brush 7.

While we have shown a particular construction involving a pair of ratchet-wheels, we do not desire to be restricted thereto, since other constructions may be used and still fall within the principles of our invention. It is merely essential to provide means by which the wheel is stepped in one direction or the other by the operation of either of a pair of separate actuating means.

8 and 9 indicate, broadly, the actuating means by which the wheel or disk 3 is turned, and we have shown a practical construction comprising solenoid-magnets 10 and 11, having movable cores therein.

12 denotes the movable core for the magnet 10, which is mounted upon a rod 13, guided to reciprocate in bearings 14, 15, and 16. Upon the reciprocating rod 13 we arrange a feeding-pawl 17, which engages the ratchet-wheel 6. The pawl 17 is provided with an inclined surface 17′, which bears against a fixed stop or pin 18, so that the pawl is normally cleared of the ratchet when not in operation.

19 denotes a second stationary fixed stop for the feeding-pawl.

20 indicates what we shall term a "stop-pawl" and comprises an arm pivoted to the frame at 21 and having a tooth or detent 22 to engage the ratchet. The tail of the stop-pawl is extended over the reciprocating rod 13, so that the detent 22 passes into the path of and limits the movement of the ratchet-wheel 6 whenever the latter is moved by the feeding-pawl 17. It will be seen that whenever the solenoid 10 is energized its core is drawn upward, so that the ratchet-wheel is stepped around exactly one tooth, such motion being accurately determined by the stop-pawl 20.

The feeding mechanism of the ratchet-wheel 5 is substantially similar to that of the ratchet-wheel 6, except directed in the opposite way and need not, therefore, be again described in detail. By virtue of the ratchet 5 the wheel 3 is stepped around one notch to the left whenever the solenoid 11 is energized.

R and R′ indicate resistances which we employ in practice in series with the operating-magnets 10 and 11 in order that the current taken from the usual five-hundred-volt circuit shall not be excessive. In order to simplify the diagram of circuits later described, these resistances will not be referred to, since it is obvious that they may or may not be used and take no part in the operation of the real invention.

Arranged within each recording signal-transmitter C and C′ we arrange a locking-magnet, which is diagrammatically shown at D and D′ in Fig. 1. A convenient construction of this locking-magnet is particularly shown in Figs. 2 and 3, in which a solenoid 24 is secured in any convenient way to the frame 1 and has a core or plunger 25 longitudinally movable therein. 26 indicates a link connected to the plunger 25, and 27 denotes a locking-lever which is pivoted to the frame at 28, so as to be rocked upward by the link 26 whenever the solenoid-magnet 24 is energized. 29 and 30 indicate dogs upon the lever 27, which lie directly beneath the ratchet-wheels 5 and 6, so that each of the ratchet-wheels is engaged and locked against rotation whenever the locking-lever 27 is raised. When the solenoid 24 is deënergized, the locking-lever 27 falls by gravity, so that both of the pawls 5 and 6 are released and free to rotate under the influence of their feeding-dogs.

In conjunction with the apparatus above described we employ semaphores or display-signals of any desired sort—such, for example, as diagrammatically shown in Fig. 1, in which E and E′ indicate, broadly, the signal devices. In practice we provide pairs of lamps 32, 33, 32′, and 33′, which are arranged to display a red or danger signal at each entrance to the block E′. We also provide lamps 34 34′, which are arranged to indicate what we shall term a "telltale-signal" at each entrance to the block.

35 35′ indicate telltale-lamps which are normally out of circuit, but are arranged to be automatically switched into circuit should either of the lamps 34 34′ burn out by any suitable magnetic cut-out, which need not be described.

We will now describe the various arrangements of circuits and mechanical parts by which the above-described devices are used in operation and by which a complete railroad-signal attaining the objects of this invention is provided.

l' indicates a connection from the circuit-closing device B′ to the magnet 10 of the recording signal-transmitter C, the circuit being completed through the wire l^2 to the ground at G′. l^3 indicates a connection from the circuit closing-device B^2 to the magnet 11 of the signal-transmitting device C, which is also completed to the ground at G′ through the wire l^4. l^5, l^6, l^7, and l^8 indicate connections from the circuit-closing devices B^3 and B^4 to the recording-transmitter C′, in all respects similar to the connection of the recording signal-transmitter C above described. By these means whenever the car passes from the section A^2 onto the single-track section A′ a circuit is completed through the magnet 10 and its wheel 3 is stepped around one notch to the right. Whenever a car leaves a section A′ and passes onto section A^3, a circuit is made through magnet 11 and the contact-wheel 3 is stepped around one

notch in the opposite direction. Accordingly it will be seen that if the wheel is initially positioned with the insulating-section 4 under the brush 7 a circuit will be completed from the wheel to the brush when the first car passes from section A^2 to A′, and this circuit will remain completed until the last car traveling from left to right has passed off of the section A′, at which time the magnet 11 will have been energized the same number of times as magnet 10, so that the wheel 3 will be again located at its zero position. In like manner whenever a car passes from the section A^3 to section A′ the recording signal-transmitter C′ is actuated in a right-handed direction and is returned step by step to zero position when all of the cars passing from left to right have left the block A^3.

We will now describe the signal-circuits which are completed by the above-described action and the manner in which the various signals are displayed. Whenever contact is made between the wheel 3 and the brush 7, which we have seen occurs when a car passes from block A^2 to block A′, current passes from any suitable source, such as the trolley-wire having a connection o' therefrom, through lead m', lamp 34, wire m^2 to the semaphore apparatus E′. At this point the circuits may be completed in any desired way, so as to display the lamps 32′ 33′, the semaphore-arm F′, and also energize the locking-magnet D′, previously referred to. We have conveniently shown all of these devices in a multiple circuit in order that a burn-out or failure of any one may not affect the rest; but it is clear that they may be in a series multiple or in a series circuit, if desired. In any case it is merely necessary to employ resistances suitable to the conditions. The circuit is completed through the ground connection G^4. By reason of the completion of the above circuit it will be seen that a telltale-signal 34 has been displayed to the car passing onto the block A′, while the semaphore-arm F′ and the danger-lamps 32′ 33′ are displayed to hold up all cars at the section A^3 from entering the block. It is evident that this condition will be maintained for any desired number of cars entering the block from the section A^2 until the last of such cars has passed off at A^3. In like manner the telltale-signal 34′ and the semaphore apparatus E are displayed by cars passing from right to left. The purpose of the telltale-signals is to indicate to an entering car that the apparatus is in proper condition and that the semaphore devices at the opposite end have been properly displayed.

It sometimes happens that after a car has entered an unoccupied block from one end that a car will enter from the opposite end, disregarding the warning semaphore displayed, and under these circumstances a controversy might arise when the cars meet at the center of the single track as to which has the right of way. In order to prevent such a controversy, the locking-magnets D and D′ are used, and it will be seen that whenever either of the semaphore devices E or E′ are operated at either entrance to the block A′ one or the other of the locking-magnets D′ is energized. When the semaphore E′ displays signals to lock out cars from leaving the section A^3, the locking-magnet D′ is energized, so that the wheel 3′ cannot turn. Accordingly cars which wrongfully leave the section A^3 cannot cause the actuation of their recording signal-transmitters, so that conflicting signals will be given.

The circuits from the recording signal-transmitter C′ are exactly like those of the recording signal-transmitter C and include wires m^3 and m^4, through which current passes in the same way as through the wires m' and m^2. The apparatus is symmetrical with respect to its action in both directions, so that its action for cars passing from right to left need not be repeated.

We have now described the various mechanical parts and electrical connections of a complete and operative railroad signal system embodying the principles of our invention. It is obvious that the various mechanical parts could be widely modified and still be applicable to the arrangement of circuits shown. In like manner the arrangement of circuits may be modified and still fall within the spirit and scope of the invention. For example, it is not necessary to have the recording signal-transmitter C connected to contacts B′ and B^2, since the device would work equally well were the connections made to the points B^3 and B^4, respectively. In this case the connections for the transmitter C′ would be made to the circuit-closing devices B′ and B^2 instead of B^3 and B^4. It is merely essential that the respective recording signal-transmitters be cross-connected to be operated by entering and issuing trains upon an intermediate block-section.

It is to be understood that we install a complete apparatus for each single-track block-section along the line, which is complete in itself and independent of succeeding sections.

What we claim is—

1. In a block-signal system, a wheel or disk, a signal-circuit arranged to be completed by movement of said wheel or disk in either direction, a pair of operating-magnets for moving said disk in either direction, and a locking-magnet for holding said wheel or disk against rotation.

2. In a block-signal system, a wheel or disk, oppositely-directed ratchet-teeth secured thereto, a pair of feeding-pawls acting on the respective ratchet-teeth, a pair of magnets having operative connections to said feeding-pawls, and a locking-magnet arranged to hold said disk against rotation.

3. In a railroad signal system, a wheel or disk having an insulated section thereon, a pair of oppositely-directed ratchet-wheels connected to said disk, feeding-pawls for the respective ratchet-wheels, a rocking lever having detents thereon to engage each of said ratchet-wheels, and a locking-magnet for moving said rocking lever into engaging position.

4. In a railroad signal system, a wheel or disk, means for moving said wheel or disk step by step in either direction, a circuit completed by said movement of said wheel or disk, said circuit including a telltale-signal, and means whereby the completion of said circuit displays a danger-signal and actuates a locking-magnet.

5. In a block-signal system, a disk having an insulated section thereon, a contact bearing on said insulated section and having included in circuit therewith a telltale-signal, a danger-signal and a semaphore-operating means, means for charging the said disk from a trolley-wire, a ground-return for said circuit, and a pair of solenoid-magnets having armatures acting on said disk to turn the same in opposite directions.

6. In a block-signal system, a disk having an insulated section thereon, a contact bearing on said disk and included in a circuit having a semaphore-operating means and danger-signal therein, means for charging said disk by connection to the trolley-wire, a pair of magnets arranged to step said disk around in opposite directions, and a pair of circuit-closing devices opposite the ends of a block-section included in circuits with said respective magnets.

7. In a block-signal system, a disk having an insulated section thereon, a pair of solenoid-magnets arranged to step around said disk in opposite directions, circuit-closing devices upon the trolley-wire at opposite ends of the block-section in circuit with the respective magnets, and a circuit including a telltale-signal at one end of the section and a danger-signal at the opposite end arranged to be completed by the rotation of said disk.

8. In a block-signal system, a disk having an insulated section thereon, a pair of solenoid-magnets arranged to step around said disk in opposite direction, circuit-closing devices upon the trolley-wire at opposite ends of the block-section in circuit with the respective magnets, a circuit including a telltale-signal at one end of the section and a danger-signal at the opposite end arranged to be completed by the rotation of said disk, and a locking-magnet for said disk.

9. In a block-signal system, a pair of double-track sections connected by an intermediate single-track section, circuit-closing devices upon the trolley-wires of both double-track sections, a pair of disks charged from the trolley-wire also opposite such points and each having an insulated section thereon, magnets for stepping around said disks respectively connected to said circuit-closing devices, a pair of contacts bearing on said disks, and a pair of series circuits each including one of said contacts and also including telltale and danger signals at the respective entrances to the single-track section.

In witness whereof we subscribe our signatures in the presence of two witnesses.

ROLLIN A. BALDWIN.
GEORGE D. FOOTE.

Witnesses:
HEVALAN ROWLAND,
SUSAN E. MERRIAM.