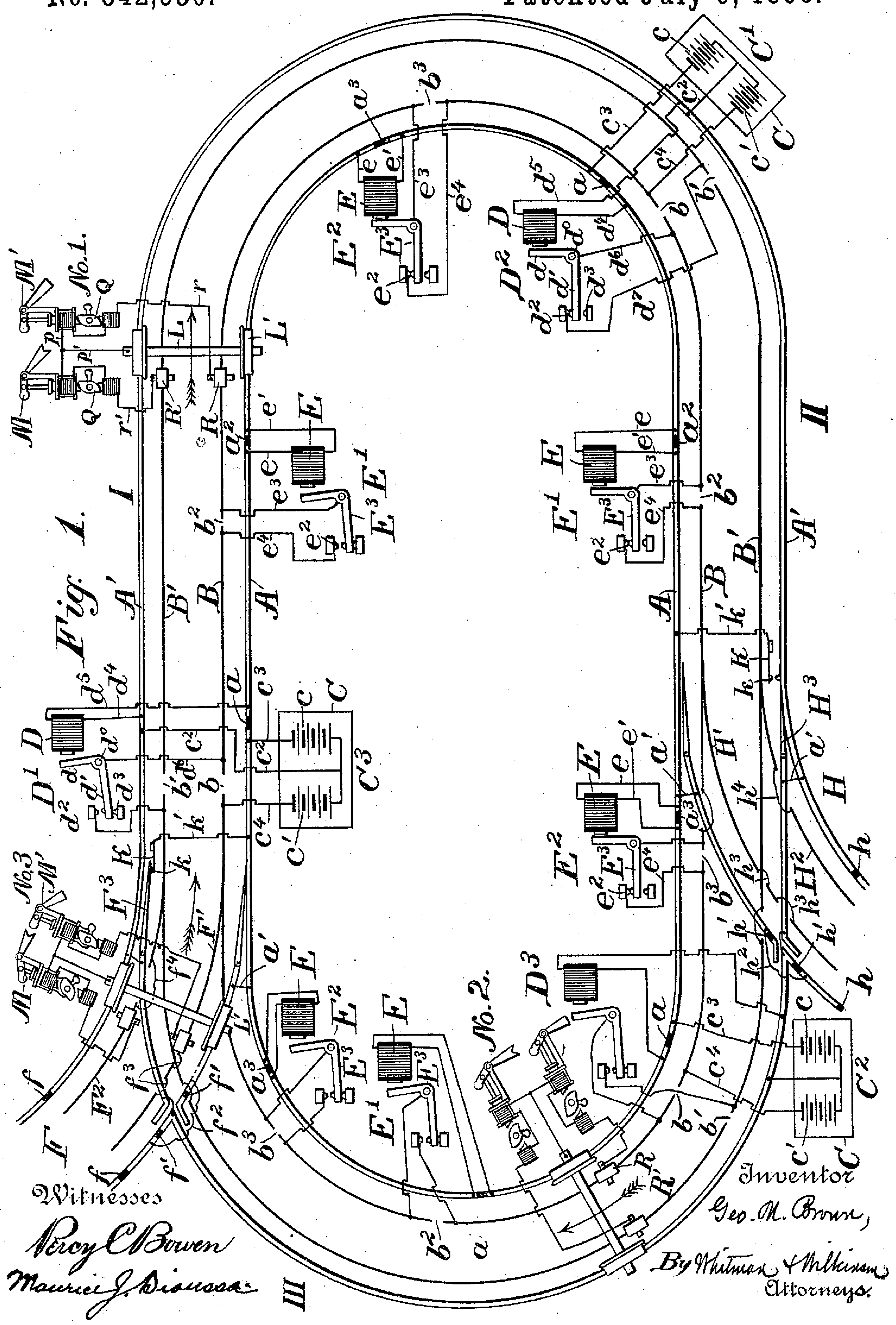
(No Model.) 2 Sheets—Sheet 1.

G. M. BROWN.

RAILWAY BLOCK SIGNAL SYSTEM.

No. 542,550. Patented July 9, 1895.



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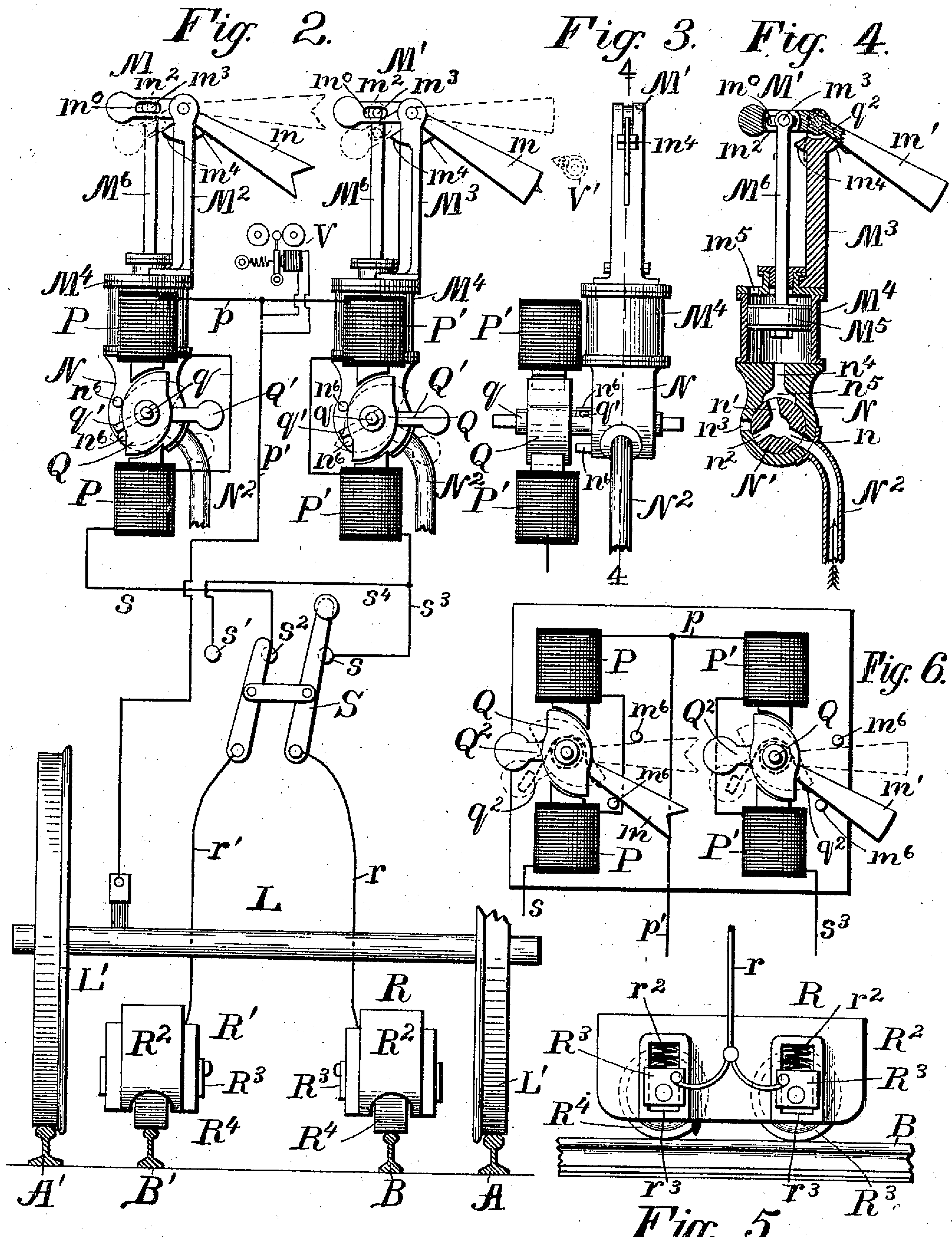

Witnesses

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RAILWAY BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 542,550, dated July 9, 1895.

Application filed May 4, 1895. Serial No. 548,115. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. BROWN, a citizen of the United States, residing at Galesburg, in the county of Knox and State of Illinois, have invented certain new and useful Improvements in Railway Block-Signal Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric signals for railway block systems, the object being to provide signals in the cab of the engine, which, when the engine enters a block, will notify the engineer if the track is clear and the switches closed in the block he is in, and also in the next block ahead.

The invention also relates to certain other novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a diagram of three blocks of a railroad equipped with my system of block-signals. Fig. 2 represents an elevation of the cab-signals, showing in diagram the electrical connection with the wheels and rails. Fig. 3 represents a side elevation of one of the signals. Fig. 4 represents a vertical sectional view of the same, taken on the line 4 4 of Fig. 3. Fig. 5 represents a side elevation of the trolley for taking the current from the conducting-rails, and Fig. 6 represents a modified form of signal.

Referring now more particularly to Fig. 1, A and A′ designate the track-rails, which are suitably insulated from the ground and from each other and used as conductors, and B B′ designate conducting-rails placed along the track near to and parallel with the track-rails, preferably between the latter.

In the diagram I have shown three blocks or sections I, II, and III, and for convenience of illustration have connected the end of block III to the beginning of block I. The rails A, B, and B′ in each block are insulated from the corresponding rails of the next block, as at *a b b′*, but the rail A′ is continuous and used as a return-conductor for all currents. Each section of the rail B′ extends the whole length of one block and is used to convey the current from the next block ahead to a cautionary signal in the cab, which will be hereinafter described.

At the end of each block near the track is situated a well or box C containing the batteries C′, C^2, and C^3 for each of the blocks I, II, and III, respectively. Each battery consists of a pair of batteries *c c′*, the negative poles of which are connected to the return-rail A′, as by the wires c^2. The positive poles of the batteries *c* are connected to the track-rail A of their respective blocks by the wires c^3, and the positive poles of the batteries *c′* are connected to the conducting-rails B of their respective blocks by the wires c^4. Thus it will be seen that the batteries, being placed at the end of the block, will send the current back over the track-rail A and conducting-rail B to meet a coming train. At the beginning of each of the blocks I II III are placed the circuit-breakers D′, D^2, and D^3, respectively, each having a magnet D. These magnets are connected by wires d^4 with the beginning of the sections of the track-rails A and by the wires d^5 with the return-rail A′. Thus the circuit from each of the batteries is closed through the rail A, the magnet D of the circuit-breaker, and the return-rail A′.

The connections of the several circuit-breakers being the same, I will for convenience describe those of the circuit-breaker D^2 as typical of all. The armature *d* of the circuit-breaker D^2 is pivoted at d^0 and has an arm *d′* so placed that the force of gravity will tend to draw the armature *d* away from the magnet. A contact-point d^2 is placed in position for the arm *d′* to strike against when the armature *d* is attracted by the magnet, and the movement of the armature away from the magnet is limited by any suitable stop, as d^3. The arm *d′* of the armature is connected by a wire d^6 with the rail B of its respective block II, and the contact-point d^2 is connected by a wire d^7 with the rail B′ of the block I. Thus if the circuit-breaker D^2 be closed (by the energizing of its magnet D) the current from the rail B of block II will be conducted to rail B′ of block I. Thus it will be evident that should an engine be coming over block I, with a trolley on each of the rails B and B′, the trolley on the rail B will receive electricity from the battery C′ of block I, while the trolley upon the rail B′ will receive electricity from the battery C^2 of the block II, and a signal on the engine, operated by the current from the rail B, would indicate the condition of the track in block I, while a signal operated by the current from rail B′ would indicate the condition of the track in block II.

The rails A and B of each block are made in a number of sections insulated from each other, as at a^2 b^2 and a^3 b^3, and circuit-breakers E′ E^2, having magnets E and similar in construction to the circuit-breakers D′, D^2, and D^3, are placed at each of the breaks. The magnets E are connected to the two adjacent ends of the sections of the rail A, so that the current passing in the rail must pass through the coils of the magnets. The armature E^3 is connected by a wire e^3 with the end of one of the sections of the rail B, and the contact-point e^2 is connected by a wire e^4 with the adjacent end of the next section. Thus when the magnets E are energized by the current passing through the rail A the armatures E^3 will be held against the contact-points e^2, thus closing the circuit through the several sections of the conducting-rail B, making it a continuous conductor through the block.

Where a switch enters a block, as shown at F and H, the switch-rails are connected to the main-track rails A and A′ by the wires a' to form continuous conductors therewith for a short distance outside of the main track, at which point they are insulated, as at f and h. The switch-rail is also insulated from the main track where it crosses at the "frog," as at f' and h', and the two sections are electrically connected by wires f^2 and h^2. The conducting-rails F′ F^2 and H′ H^2 are electrically connected to the conducting-rails B B′, but insulated from each other and from the track-rails where they cross, the electrical connection being carried round by wires f^3 f^4 and h^3 h^4. These conducting-rails extend a short distance into the side track and are discontinued, the ends being beveled downward to receive the trolley-wheels.

The pivoted switch-rails F^3 and H^3, which normally are closed against the track-rails have near their free ends a spring K, having a contact-point k, against which the said pivoted switch-rails will strike when the switch is open. The spring K is connected by a wire k' with the opposite track-rail, so that when the switch is open connection will be made from rail A to rail A′, short-circuiting the track at that point and preventing the current from going any farther back along the rail A, thus causing all the circuit-breakers in the block back of the open switch to open and break the circuit of the conducting-rail B, so no current will pass in the rails A or B back of the open switch in the same block or in the rail B′ in the next block.

In Figs. 2 to 4 of the drawings the signals in the cab of the engine are shown. These consist of a cautionary signal M and a danger-signal M′, having the usual semaphores m and m', pivoted in the uprights M^2 and M^3, secured to the cylinders M^4, which latter are suitably mounted in the cab of the engine. Each semaphore is provided with a weighted arm m^2, extending on the opposite side of its pivot and tending to throw the semaphore to the danger position, as shown in dotted lines in Fig. 2. The movement of the semaphore is limited by the stops m^4 upon the uprights M^2 M^3. Within each cylinder M^4 is a piston M^5, the rod M^6 of which extends upward and is connected with the weighted arm of the semaphore by a pin m^3 on the piston-rod, moving in a slot m^0 in the weighted arm m^2. Below each cylinder is a valve-box N, containing a three-way valve N′, having ports n n' n^2. This valve-box is connected with the boiler of the engine by the steam-pipe N^2 and has an exhaust-port n^3, opening into the atmosphere, and a steam-port n^4, opening into the lower end of the cylinder. The valve is arranged, as shown in Fig. 4, so that when one of its ports n is opened into the steam-pipe the port n' will be open into the cylinder to admit steam thereto and the other port n^2 will be closed. In this position the weighted arm of the semaphore will be forced upward by the piston and rod throwing the semaphore down out of the danger position and will be held in this position as long as steam is admitted to the cylinder. When the valve is turned to cause the port n^2 to open into the exhaust-port n^3, (the port n' being still open to the cylinder-port n^4, which is enlarged, as at n^5, to allow for the movement of the valve,) the steam-port n will be closed and the steam in the cylinder will escape through the exhaust-port, thus allowing the weighted arm m^2 to fall and throw the semaphore up to the danger position. Vents m^5 are formed in the upper part of the cylinder M^4 to allow of the free access of air thereto.

Two pairs of magnets P and P′ are mounted in front of the signals M and M′, respectively, and midway between the poles of each pair of magnets is mounted a rock-shaft q, carrying a rocking armature Q. The said rock-shaft q is also connected with the three-way valve N′, so that when the rocking armatures are attracted by the magnets to the position shown in Fig. 2 the three-way valves N′ will be turned to admit steam to the cylinders, as shown in Fig. 4.

When the armatures Q are released from the attraction of the magnets by the breaking of the electric circuit, the weighted arms Q or a coil-spring q' placed on the shaft Q, as shown in Fig. 4, will turn them to the position shown in dotted lines in Fig. 2, and this movement will turn the rock-shafts q and the three-way valves N′, causing the latter to shut off the steam from the pipes N^2 and open the cylinders into the exhaust-ports n^3, thus allowing the steam to escape and the pistons, rods, and weighted arms m^2 to fall and throw the semaphores up to the danger position. Thus it will be seen that when the electric current is passing through the magnets P and P′ the signals will be held in the safety position, but when the current is interrupted or stopped the signals will fall to the danger position.

The movement of the rock-shafts, armatures, and valves is limited by the stops n^6 on the valve-box N and the pins q' extending from the rock-shafts between the said stops.

Beneath the engine are secured, in any suitable manner, a pair of trolleys R R′, the wheels of which travel upon the conducting-rails B and B′ respectively. Each trolley is preferably composed of a frame R^2 in which are mounted in sliding journal-boxes R^3 the wheels R^4, springs r^2, which bear upon the journal-boxes, serving to keep the wheels R^4 down firmly upon the rails. The downward movement of the journal-boxes and wheels is limited by the bottom part r^3 of the slot in which they slide, so that the wheels can only drop a short distance below the top of the rails when the trolleys pass off the ends of the conducting-rails, as they do when the engine passes on a siding.

The current is taken from the conducting-rails B B′ by the trolleys R R′ and conveyed by the wires r r' to a pole-changing switch S, the contact-points s and s' of which are connected by the wires s^3 and s^4 to the pair of magnets P′ of the danger-signal M′ and contact-point s^2 of which is connected by the wire s^5 with the pair of magnets P of the cautionary signal M, and the return-circuit from both pairs of magnets is made through the wires p and p' to the axle L of the wheels L′ of the engine and thence to the track-rail A′.

The pole-changing switch S should be turned, as shown in Fig. 2, to convey the current from the conducting-rail B′ to the magnets P of the cautionary signal M and the current from the rail B to the magnets P′ of the danger-signal M′, or, in other words, should be turned to the right when the engine is going forward, and to the left when the engine is running backward.

Should it be found desirable a bell V may be placed at any point in the circuit in the cab to ring and warn the engineer of any change in the signals, or it may be so placed, as at V′, to be struck by the signal itself.

In Fig. 6 I have shown a modified form of signals in which the steam-cylinder and attachments are dispensed with, the semaphores being attached directly to the rocking armatures, so that the movement of the latter, when attracted, will move the semaphores down to the safety position and the weighted arms Q^2 or the coil-spring q' (shown in dotted lines) will turn the armatures and semaphores to the danger position, as shown in dotted lines, the electrical connections being the same.

The travel of the semaphores is limited by the stops m^6.

The operation of the system is as follows: Referring to Fig. 1, when the track is clear the current from the battery c will flow through the several sections of the rail A, the circuit-breaker magnets E E and D, and the wires d^4 and d^5 of each block to the return-rail A′. This will keep the circuit-breakers all closed and make a closed circuit for the current from the battery C′ through the wire B, the circuit-breakers E′ E^2 in the block, and through the circuit-breaker (for instance D′) at the beginning of the block to the rail B′ in the next block. Now, if a connection be made from either the rail B or B′ to the return-rail the current from battery c' will flow therethrough, and also through the said rails between said connections and the said battery. Now, should an engine (No. 1) enter a block (for instance block I) the trolley R will take the current from the rail B from the battery c' of that block and conduct it through the wire r to the magnets of the danger-signal M′, holding the said signal to the safety position, as shown, showing the block to be clear, the current returning through the wires p p', axle L, and wheels L′ to the return-rail A′. The trolley R′ will take the current from the rail B′ which comes from the battery c' of the next block ahead, (block II,) and this current will pass through the wires r' to the magnets of the cautionary signal M, returning through the wires p p', axle L, and wheels L′ to the return-rail A′, thus holding the cautionary signal M to the safety position, showing the track clear in the next block. As soon as the engine has passed the circuit-breaker D′ the wheels and axles will make a short-circuit from the rail A to the rail A′, thus cutting out the circuit-breaker D′ and causing it to open and cut the current off from the rail B′ of the next block, (block III.) Now, should an engine (No. 3) enter block III the magnets of its cautionary signal M would receive no current from the rail B′ (which receives its current from the battery of the block ahead) and would consequently fall to the danger position, showing the next block ahead to be occupied; but the danger-signal M′ of engine No. 3 would receive its current from the wire B, which comes from the battery c' of its own block. As the engines pass the circuit-breakers E′ E^2 they will each be short-circuited in turn, thus cutting off the current from the rails after the engine has passed. Should another engine enter the same block, its danger-signal M′ could receive no current from the rail B, (that being cut off by the engine ahead.) Consequently that signal would fall to the danger position, showing the block to be occupied. In the drawings, engine No. 2 has entered block III, which engine No. 3 has also entered from the siding. Engine No. 3 short-circuits all the circuit-breakers behind it in the block. Consequently no current can pass to the danger-signal of engine No. 2, which will fall to the danger position. The open switch-rail F^3 making contact with the spring K would also short-circuit the circuit-breakers if the engine were not on the switch or in the block and would cut the current off from rail B, showing a danger-signal in the engine.

In the case of engine No. 2, as engine No. 1 in block I has cut off the current from the wire B′ in the block III, as before stated, the cautionary signal in engine No. 2 will receive no current and will therefore fall to danger position, thus showing both signals in the danger position and indicating that the track is not clear either in its own block or in the block ahead.

Of course should a break occur in any of the connections or any other interruption of the current take place the signals would fall to the danger positions, and so warn the engineer to proceed carefully.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A railway block signal system comprising a plurality of sources of electricity, a continuous traffic rail, a second traffic rail composed of a plurality of sections insulated from each other, a conducting rail composed of a series of conductors continuous through each block and insulated from each other; a second conducting rail composed of a series of conductors and consisting of a plurality of broken sections in each block, insulated from each other; electromagnets connecting the insulated sections of the traffic rail, and circuit breakers operated by the said magnets and connecting the insulated sections of the broken conducting rail; and signals operated by the current from the conducting rails, substantially as described.

2. A railway block signal system comprising a source of electricity for every block, two traffic rails, the one continuous and the other broken into sections insulated from each other; two conducting rails, the one continuous throughout the entire block and the other broken into a plurality of sections insulated from each other, an electro-magnet connecting the two adjacent ends of the broken traffic rail, and a circuit breaker operated by the said magnets and connecting the insulated sections of the broken conducting rail, and signals carried by the cab and operated by the conducting rails, substantially as described.

3. A railway block signal system comprising a plurality of sources of electricity, a continuous traffic rail, a second traffic rail composed of a plurality of sections insulated from each other, a conducting rail composed of a series of conductors continuous through each block and insulated from each other; a second conducting rail composed of a series of conductors and consisting of a plurality of broken sections in each block, insulated from each other; electro-magnets connecting the insulated sections of the traffic rail; and circuit breakers operated by the said magnets and connecting the insulated sections of the broken conducting rail; and a signal carried by the train and operated by the current from the one conducting rail, and a second signal also carried by the train and operated by the current from the second conducting rail, substantially as described.

4. A railway block signal system comprising a source of electricity for every block, two traffic rails, the one continuous and the other broken into sections insulated from each other; two conducting rails, the one continuous throughout the entire block and the other broken into a plurality of sections insulated from each other; an electro-magnet connecting the two adjacent ends of the broken traffic rail, and a circuit breaker operated by the said magnets and connecting the insulated sections of the broken conducting rail, and a signal carried by the train and operated by the current from the one conducting rail, and a second signal also carried by the train and operated by the current from the second conducting rail, substantially as described.

5. A railway block signal system comprising a plurality of sources of electricity, a continuous traffic rail, a second traffic rail composed of a plurality of sections, insulated from each other; a conducting rail composed of conductors continuous through each block and insulated from each other; a second conducting rail composed of a series of conductors, and consisting of a plurality of broken sections in each block, insulated from each other; electro-magnets connecting the insulated sections of the traffic rail, and circuit breakers operated by the said magnets and connecting the insulated sections of the broken conducting rail; trolleys carried by the train running on the said conducting rails; and signals carried by the train operated by the current from the conducting rails, substantially as described.

6. A railway block signal system comprising a source of electricity for every block, two traffic rails, the one continuous and the other broken into sections insulated from each other, two conducting rails, the one continuous throughout the entire block and the other broken into a plurality of sections insulated from each other, an electro-magnet connecting the two adjacent ends of the broken traffic rail, and a circuit breaker operated by the said magnets and connecting the insulated sections of the broken conducting rail, trolleys carried by the train running on said conducting rails, and signals carried by the cab and operated by the conducting rails, substantially as described.

7. A railway block signal system comprising a plurality of sources of electricity, a continuous traffic rail, a second traffic rail composed of a plurality of sections insulated from each other, a conducting rail composed of a series of conductors continuous through each block and insulated from each other; a second conducting rail composed of a series of conduc-

tors and consisting of a plurality of broken sections in each block, insulated from each other; electro-magnets connecting the insulated sections of the traffic rail; and circuit breakers operated by the said magnets and connecting the insulated sections of the broken conducting rail; an electro-magnet connected to the two traffic rails, a circuit breaker operated by the said magnet connecting the end section of the broken conducting rail to the end of the continuous conducting rail of the next block, and a signal carried by the train and operated by the current from the one conducting rail, and a second signal also carried by the train and operated by the current from the second conducting rail, substantially as described.

8. A railway block signal system comprising a source of electricity for every block, two traffic rails, the one continuous and the other broken into sections insulated from each other; two conducting rails, the one continuous throughout the entire block and the other broken into a plurality of sections insulated from each other; an electro-magnet connecting the two adjacent ends of the broken traffic rail, and a circuit breaker operated by the said magnets and connecting the insulated sections of the broken conducting rail, and trolleys carried by the train running on said conducting rails; an electro magnet connected to the two traffic rails, a circuit breaker operated by the said magnet, connecting the end section of the broken conducting rail to the end of the continuous conducting rail of the next block; a signal carried by the train and connected to one of said trolleys and operated by the current from the one conducting rail, and a second signal also carried by the train and connected by the other of said trolleys, and operated by the current from the second conducting rail, substantially as described.

9. A railway block signal system comprising a plurality of sources of electricity, a continuous traffic rail, a second traffic rail composed of a plurality of sections insulated from each other, a conducting rail composed of a series of conductors continuous through each block and insulated from each other; a second conducting rail composed of a series of conductors and consisting of a plurality of broken sections in each block, insulated from each other; electro-magnets connecting the insulated sections of the traffic rail; and circuit breakers operated by the said magnets and connecting the insulated sections of the broken conducting rail; and a signal carried by the train and operated by the current from the one conducting rail, and a second signal also carried by the train and operated by the current from the second conducting rail and means for short circuiting the track rails when a switch is open, substantially as described.

10. A railway block signal system comprising a source of electricity for every block, two traffic rails, the one continuous and the other broken into sections insulated from each other; two conducting rails, the one continuous throughout the entire block and the other broken into a plurality of sections insulated from each other; an electro-magnet connecting the two adjacent ends of the broken traffic rail, and a circuit breaker operated by the said magnets and connecting the insulated sections of the broken conducting rail, and a signal carried by the train and operated by the current from the one conducting rail, and a second signal also carried by the train and operated by the current from the second conducting rail, and a spring and conductor connecting the opposite traffic rail adapted to close the circuit when the switch is open, substantially as described.

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

GEORGE M. BROWN.

Witnesses:

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