

(No Model.)

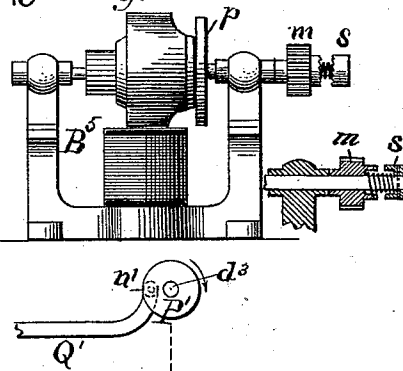
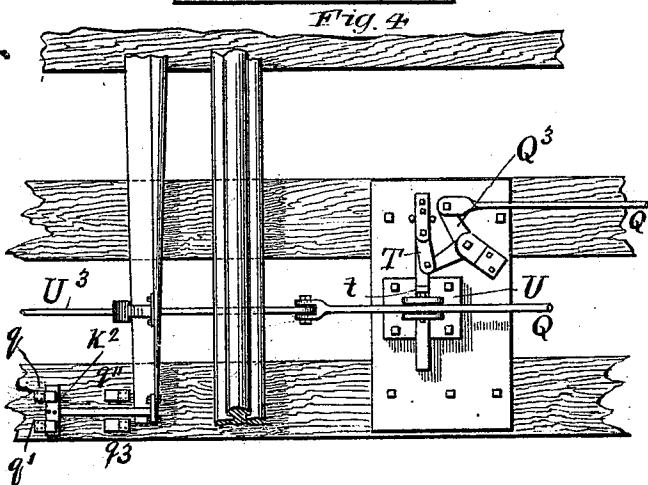
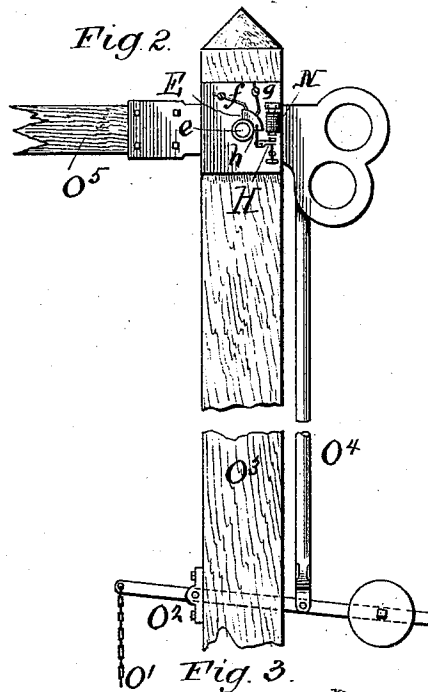
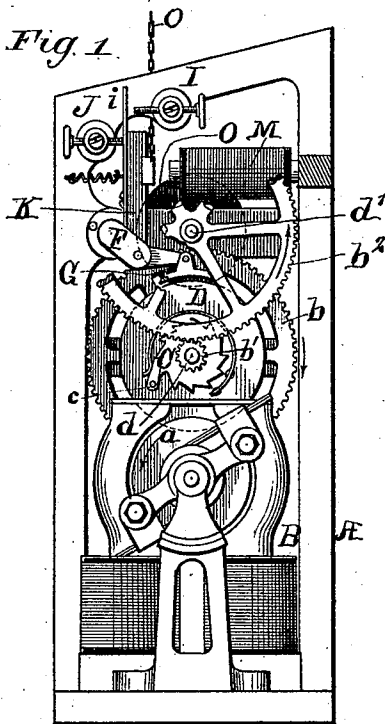
4 Sheets—Sheet 1.

J. D. TAYLOR.

RAILWAY SIGNALING AND SWITCHING APPARATUS.

No. 516,903.

Patented Mar. 20, 1894.



WITNESSES:

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Fig. 4.

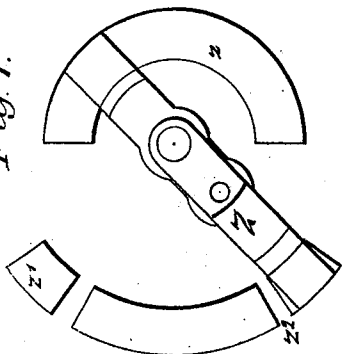


Fig. 9.

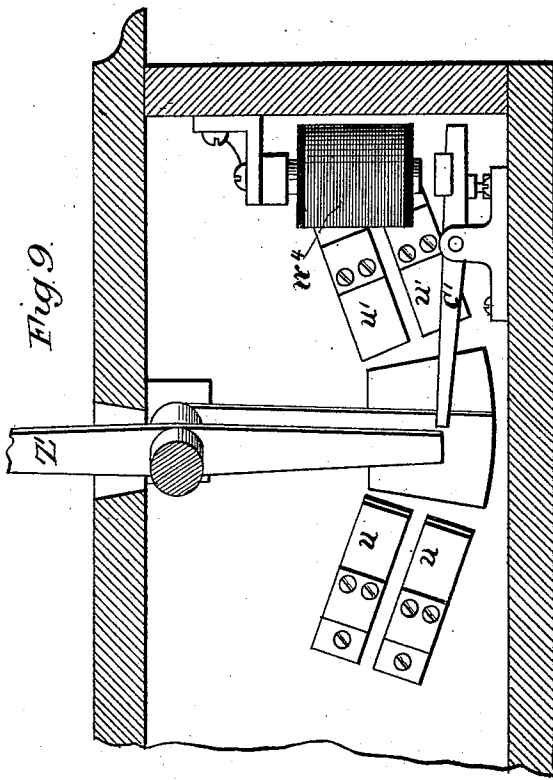


Fig. 6.

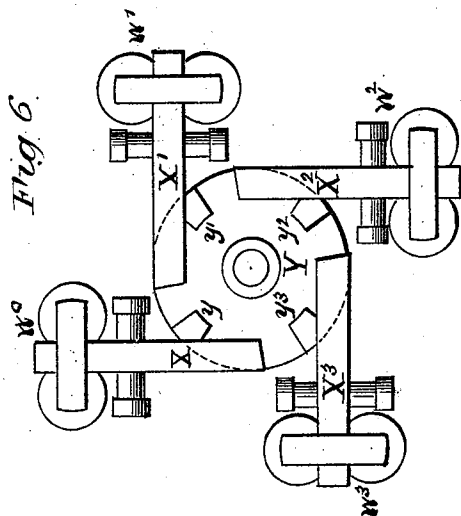
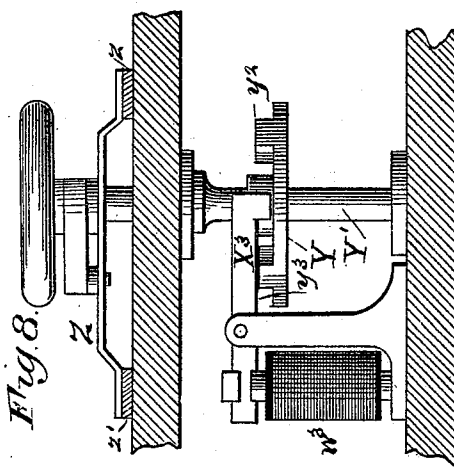


Fig. 8.



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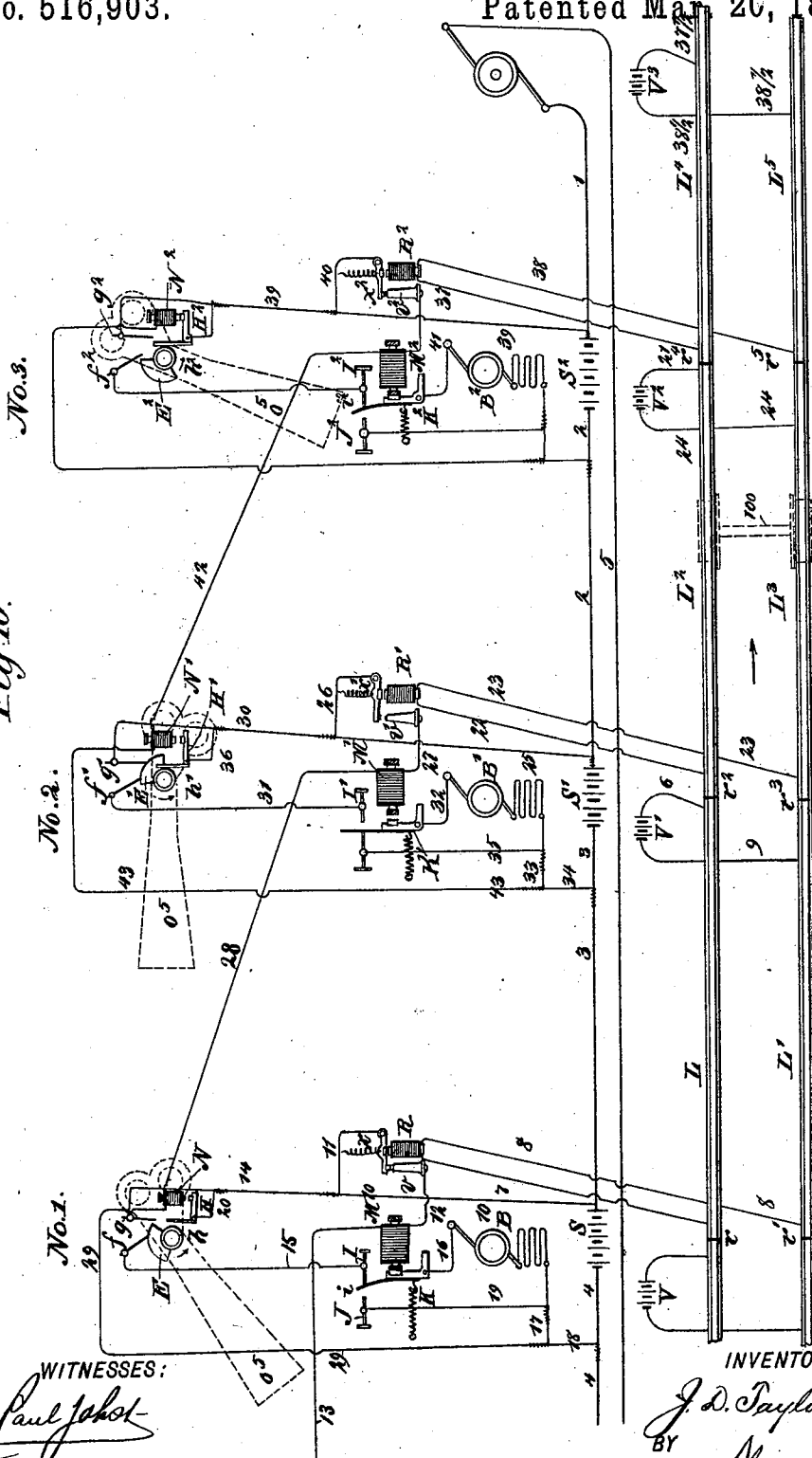
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RAILWAY SIGNALING AND SWITCHING APPARATUS.

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Fig. 10.



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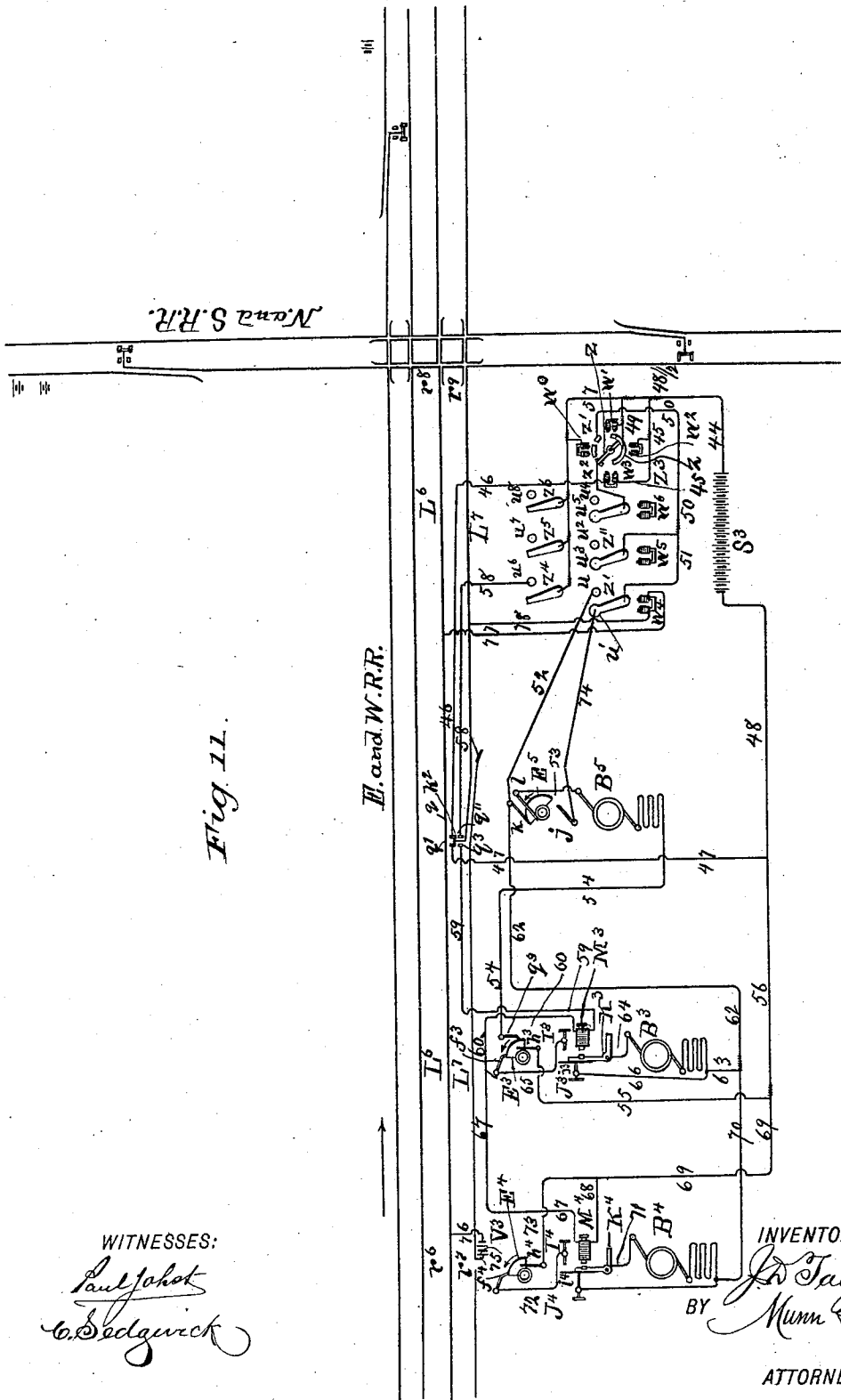
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RAILWAY SIGNALING AND SWITCHING APPARATUS.

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Patented Mar. 20, 1894.



UNITED STATES PATENT OFFICE.

JOHN D. TAYLOR, OF CHILLICOTHE, OHIO.

RAILWAY SIGNALING AND SWITCHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 516,903, dated March 20, 1894.

Application filed December 14, 1892. Serial No. 455,133. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. TAYLOR, of Chillicothe, in the county of Ross and State of Ohio, have invented a new and Improved Railway Signaling and Switching Apparatus, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a side elevation of the signal operating mechanism, with a portion of the casing removed to show the internal parts. Fig. 2 is a side elevation of the signal post, showing the circuit controlling device. Fig. 3 is a side elevation of the switch operating motor. Fig. 4 is a plan view of the switch locking mechanism. Fig. 5 is a side elevation of the switch operating mechanism, circuit controller and part of the locking apparatus. Fig. 6 is a plan view of the interlocking mechanism. Fig. 7 is a plan view of the interlocking contacts. Fig. 8 is a side elevation of part of the interlocking mechanism and contacts. Fig. 9 is a perspective view of the switch operating contact lever, contacts, and track circuit controlling magnet. Fig. 10 is a diagrammatic view of the track controlling magnets, batteries and circuit adapted to block signaling; and Fig. 11 is a diagrammatic view of the track controlling magnets, motors and circuits of the interlocking crossing signal and derailing switch.

Similar letters and figures of reference indicate corresponding parts in all the views.

The object of my invention is to provide electrically controlled and operated mechanism which will serve as a block signal system, a switch operator, and crossing signal, the same to be worked and controlled by the current, but constructed so as to give the danger signal in case of the failure of the current.

My invention consists in the combination of electric motors, semaphore operating mechanism, controlling magnets, and switch operating mechanism combined and arranged as hereinafter more fully described.

The description of the mechanical construction and the arrangement of the parts and electrical circuits will be given in connection with the description of the operation.

I will first describe the apparatus as used in block signaling, referring to Figs. 1, 2 and 10. Fig. 10 shows three sets of electric mo-

tors, magnets and circuit controllers, such as are shown in the enlarged views Figs. 1 and 2. These three sets of motors correspond to three stations or blocks. The magnets R, R' and R², have no mechanical connection with the signal and are omitted in Figs. 1 and 2. The rails of the track are divided electrically into sections whose length corresponds to the length of the blocks by insulating pieces *r*, *r'*, *r²*, &c., near each section. The connections having been made and the blocks being clear of trains or cars, the circuit of the battery V' will be closed so that the current flows through the wire 6, the rail L, wire 7, magnet R, wire 8, rail L' and wire 9 back to the battery. This energizes the magnet R, causing its armature lever *x* to make contact with the forward stop *v*, thus closing the circuit of the battery S, so that the current flows through the wires 3, 10, 11, lever *x*, contact *v*, wire 12, magnet M, wire 13 and a magnet N of the apparatus of the adjoining station, thence to the wire 4 and back to the battery S, or if that be the first signal in the system, the wire 13 would be connected to the wire 29, thus leaving the current through the wires 13 and 4 back to the battery S. In either case the magnet M would be energized and would attract the armature lever K, so as to bring the contact spring *i* carried by the said lever K into contact with the forward stop I, thus completing another circuit of the battery S, so that the current flows through the wires 3, 10, 14, brush *g*, quadrant-shaped switch arm E, brush *f*, wire 15, contact I, spring *i*, armature lever K, wire 16, motor B, wires 17, 18 and 4, back to the battery S, causing the armature of the motor B to rotate. The armature shaft of the motor B (see Fig. 1) carries a pinion (not shown) which engages the spur wheel *b* on the shaft *d*. On the same shaft *d* is a pinion *b'*, which engages the spur wheel *b²* on the shaft *d'*. The shaft *d'* also carries the sheave O, to which one end of a chain O' is attached, the other end being connected with the semaphore arm in the manner presently to be described, the connections being arranged so that when the semaphore arm is in a horizontal position, the chain is unwound from the sheave O. The other end of the chain O' is connected with the shorter arm of a counter-weighted lever O² fulcrumed on the

semaphore post O^3 . The other arm of the lever O^2 is connected by a rod O^4 with the signal arm O^5 pivoted to the top of the post O^3 . The shaft e to which the signal arm O^5 is rigidly attached carries the quadrant-shaped switch arm E, also rigidly attached to the shaft, but electrically insulated therefrom. The brushes f and g are attached to the post O^3 and are made of spring material which causes them to form a good contact with the periphery of the quadrant-shaped switch arm E, but their motion is limited so that they will not follow the arm to any considerable extent. The rotation of the armature of the motor B, acting through the intermediate gearing, causes the chain O' to be wound upon the sheave O. The said chain acting through the counter-weighted lever O^2 and connecting rod O^4 , lowers the semaphore arm and rotates the quadrant-shaped switch arm E in the direction indicated by the arrow, Fig. 10. This motion continues until the quadrant-shaped switch arm E ceases to make contact with the brush g . The circuit is thus broken through the motor B, when the motor stops. The semaphore arm O^5 now makes an angle of about forty degrees with the horizon, indicating "caution" in this position. It is held in this position by the following arrangement. The armature lever K is angled and pivoted to the support F attached to the frame A. The vertical arm of the lever carries the contact spring i as before described, and the horizontal arm carries a brake shoe G, capable of being pressed against the drum D, whenever the armature lever K is drawn toward the magnet M. The drum D is placed loosely on the shaft d and carries the spring-pressed pawl c , which engages the teeth of the ratchet C secured to the shaft d . The direction of the motion of the parts when actuated by the motor is indicated by the arrows, and it will be seen that the application of the brake shoe G to the brake drum D, offers little resistance to the rotation of the armature, as the pawl c will slide easily over the teeth of the ratchet; but the rotation in the opposite direction, such as would be communicated by the counter-weight, is prevented by the engagement of the pawl with a tooth of the ratchet. In this manner the signal is prevented from returning to the horizontal position so long as the magnet M is energized. The battery V^2 sends a current through the wire 21, rail L^2 , wire 22, magnet R' , wire 23, rail L^3 and wire 24, which returns it to the battery V^2 . This energizes the magnet R' , causing its armature lever x' to make contact with the stop v' , which closes the circuit of the batteries S and S' , so that the current flows through the wires 2, 25, 26, the lever x' , stop v' , wire 27, magnet M' , wire 28, magnet N of the next station at the rear of the train, wires 29, 18, 4, battery S, wire 3 and battery S' . This energizes the magnet M' , causing the operations previously described in connection with signal No. 1, to take place in

signal No. 2. It also energizes the magnet N, causing the lever H to be attracted. The lever H carries a brush h , which when the lever H is attracted by its magnet N, makes contact with the quadrant-shaped switch arm E. This closes the circuit of the battery S, so that the current flows through wires 3, 10, 20, brush h , quadrant-shaped switch arm E, the brush f , wire 15, contact I, spring i , lever K, wire 16, motor B, wires 17, 18, 4 and back to the battery S. This causes a further rotation of the armature of the motor B, bringing the semaphore arm still farther down, this motion being continued until the quadrant-shaped switch arm E ceases to make contact with the brush f , when the circuit through the motor is broken. The semaphore arm now makes an angle of about eighty degrees with the horizon, a position indicating "safety." It is held in this position by the brake G, as before described. In the same manner a battery V^3 belonging to the adjacent block, energizes the magnet R^2 , causing it to attract its armature x^2 , thereby making contact with the stop v^2 and closing the circuit of the batteries S' and S^2 , so that the current would flow through the magnets M^2 and N' , causing signal No. 2 to assume a position indicating "safety," and signal No. 3 to assume a position indicating "caution" as above described in connection with signal No. 1. In like manner the magnet N^2 would be energized, causing signal No. 3 to be brought to the position indicating "safety," in which position it would be held so long as the current circulates in the coils of the magnets M, M' , M^2 , &c. This condition will be maintained so long as the track is clear. Now suppose a train to enter a section having the rails L, L' , moving in the direction indicated by the arrow; the first pair of wheels passing the insulating pieces r , r' would, with the axle to which they are attached, form an electrical connection between the rails L and L' , of no appreciable resistance, and as the battery V' is preferably one of high internal resistance, there would be no difference of potential between the rails L, L' , consequently no current would circulate in the coils of the magnet R, it being short circuited by the axle of the locomotive and the armature lever x will be drawn away from the contact v by its retractile spring; this breaks the circuit above described through the magnet M, releasing the brake G from the drum D. Under these conditions there is nothing to prevent the counter-weight from descending, and by means of the connecting rod pulling the semaphore arm into horizontal position, where it is stopped. The retractile spring of the armature lever K draws the contact spring i away from the contact point I, and brings it to rest against the back contact J. The counter-weight in its descent, acting through the lever O^2 and connecting chain O' , causes the train of gearing and the armature a to rotate in a direction opposite to that in which it rotates when act-

uated by the current. The rotation of the armature in the magnetic field causes the motor to act as a generator and send a current through the circuit composed of the motor B, wire 19, back contact J, armature lever K and wire 16, and the direction of the current through the motor is the same as that sent through it when driven as a motor by a current from the battery. This strengthens the magnetic field, which, re-acting on the armature coils, strengthens the current, the action being that of a dynamo. The resistance thus offered by the armature in a closed circuit acts as a brake on the counter-weight, and thus retards the fall of the counter-weight. The object of this arrangement is to prevent the jar and rebound of the semaphore arm and to avoid the danger of breaking the parts of the mechanism. By this arrangement nothing is detracted from the effective weight of the counterpoise, it is only prevented from acquiring momentum. The horizontal position of the semaphore arm is the one indicating "danger," that is to say, it indicates that a train, a car, or an engine is in the section or block L, L'. When the first pair of wheels enters the section L², L³, the magnet R' is cut out in the manner above described, the lever α' is withdrawn from the contact ν' and the circuit is broken through the magnets M' and N'. This allows signal No. 2 to assume the position indicating "danger" as above described in connection with signal No. 1, and allows the brush h' to be withdrawn from the quadrant-shaped switch arm E'. When the last pair of wheels passes the insulating pieces γ^2 and γ^3 , the battery V' again sends a current through the magnet R, and signal No. 1 is brought into the position indicating "caution" in the manner above described. This position of the semaphore arm in No. 1 indicates to a train approaching that signal or moving in the same direction as the first mentioned train, that the second block ahead is occupied as indicated by dotted wheels and axle at 100. When the first mentioned train passes the insulating pieces γ^4 , γ^5 , the battery V² sends a current through the magnet R', closing the circuit of the batteries S, S', through the magnets M' and N, causing signal No. 1 to assume the position indicating "safety," and signal No. 2 to assume the position indicating "caution" as above described. This position of signal No. 1 indicates that the track is clear two blocks ahead. In this description it is supposed that the signal is in use on a road having two or more tracks, and that the trains run in only one direction on the same track. In that case the other tracks would be equipped like those already described, and therefore no further description is necessary. My improved signal is equally applicable to a single track road, the number of signals being the same as for a double track road, the only difference being that the magnet R' would control a signal No. 1 and

a signal No. 2 at the end of the block by closing the circuit of the battery S through the magnets M and M' of such a system arranged in parallel, the operation being exactly the same as that above described. The batteries S, S' and S² are preferably storage batteries which are kept charged by the occasional application of a current from a dynamo through the wires 1, 2, 3, 4.

In describing the use of a signaling and switching apparatus as hereinafter represented, reference will be made to Figs. 3, 4, 5, 6, 7, 8, 9 and 11. The construction of the signal is the same as that already described except that in this case the magnet N is omitted, and the brush h is arranged to press permanently against the quadrant shaped switch arm E. For a single crossing of two roads there will be four switches, one on each road at each side of the crossing and eight signals, one home and one distant signal for each of the four switches. The object of the switches is to prevent a train from reaching the crossing, until it gets the right of way by causing the train itself to set the danger signal. The use of the signals is to indicate the position of the switches. The switches are interlocked so that the switches on one road only can be closed at the same time, as will be hereinafter more fully described. The normal position of the switches is open and of the semaphores at "danger" until it is desired to let a train pass. Suppose a train going west on an east and west railroad to be approaching a crossing; to give it the right of way it would be necessary to close the switch lying between it and the crossing and to make the signal governing that switch to indicate "safety." To do this, the contact arm Z (Figs. 7 and 8) would be placed so that one end makes a contact with the plate z and the other with the plate z' ; and the switch lever Z' would be placed on the contact u . This would close the circuit of the battery S³ so that the current would flow through the wires 44, 48 $\frac{1}{2}$, 49, plate z , contact arm Z, contact z' , wires 50, 51, switch lever Z', contact u , wire 52, brush h , semicircular switch arm E⁵, brush l , wire 53, motor B⁵, wire 54, brush g^3 , quadrant-shaped arm E⁸, brush h^3 , wires 55, 56, 48 to the battery S³, energizing the motor B⁵. The motor B⁵ is shown in detail in Fig. 3. Attached rigidly to the armature shaft and at right angles thereto, is a circular iron disk p , the said disk being located near the field magnets so that when the motor is energized the disk is drawn toward the field magnets, carrying the armature shaft with it. On the outer end of the armature shaft is secured one half s of a clutch, the other half of the said clutch being formed on a boss on the pinion m . The pinion m is placed loosely on the armature shaft between the half clutch and the journal box. The parts of the clutch are chambered to receive the coiled spring which separates them whenever the disk p ceases to be attracted by the field magnet, and they are at such a distance

apart as not to permit the disk p to touch the field magnet at any time. In other respects the motor may be of any well known type. The current flowing through the motor causes the disk p to be attracted, bringing the part 5 of the clutch into engagement with the part carried by the pinion m ; at the same time the armature is revolved and the pinion m which is carried thereby, and which engages the spur wheel m' on the shaft d^2 , communicates motion to the said shaft. A pinion (not shown) on the shaft d^2 engages the spur wheel m^3 on the shaft d^3 . The shaft d^3 carries the plate P' , and the spur wheel m^2 which engages the spur wheel m^4 on the shaft d^4 . The said 10 shaft d^4 carries the plate P and the semicircular switch arm E^5 , shown in detail detached from the apparatus. The diameter of the spur wheel m^4 is twice that of the spur wheel m^2 , so that the plate P' makes one revolution while the plate P makes a half revolution. The current continues to flow through the motor B^5 until the semicircular switch arm E^5 has made a half revolution, when the brush 15 k ceases to make contact with it and the circuit through the motor is broken. As soon as the circuit is broken the field magnet ceases to attract the disk p , and the spring separates, the two parts of the clutch thus cutting off the motor from the other parts of the mechanism and preventing its momentum from carrying the parts beyond the point where it is desired to have them stop. The mechanism is so arranged that the crank pins 20 n and n' , when the circuit is broken by the switch arm E^5 , always stop in the horizontal lines passing through the centers of their respective disks. One end of a connecting rod Q is attached to the switch rod U^3 , and the other end is supported between two friction rollers journaled on the side of the switch operating mechanism. Near the end of the rod guided by the roller is formed a transverse slot whose vertical length is a little 25 greater than the diameter of the circle described by the crank pin n . The sides of the slot are curved outwardly on a circular curve having the same radius as the outward portion of the path of the crank pin n . The ends of the slot are parallel plane surfaces. This construction allows the crank pin to move the rod Q through a distance equal to about a quarter of a revolution of the crank disk P . The switch rod Q passes through a slot in the casting U , secured to the ties, and the said rod Q has formed therein two holes, one of which comes opposite a hole in the guide casting U , when the switch is opened and the other is opposite the said hole when the switch is closed. A sliding bar T , carries a bolt t , which is fitted to the holes in the casting U and rod Q , so that when the switch is opened and also when it is closed, the bolt will lock the switch in either of these positions. When the mechanism is operated, the 30 crank pin n is carried along the curved side of the slot Q^2 in the rod Q , for one eighth

of its revolution without imparting any motion to the rod Q ; at the same time the plate P' is moved one quarter of a revolution, and 70 by means of the rod Q' and angled lever Q^3 by means of which it is connected to the bar T , withdraws the bolt t from the rod Q . During the next quarter of a revolution of the disk P , the pin n runs in the narrow portion 75 of the slot Q^2 at the lower end of the slot, and carries along with it the rod Q , closing the switch. During the corresponding revolution of the plate P' , the bolt t is carried farther from the rod Q , and brought back toward 80 its original position. The next eighth revolution of the disk P carries the pin n along the curved surface of the slot without giving any motion to the rod Q , when it comes to a stop at the middle of the slot. A corresponding 85 quarter revolution of the plate P' brings the crank pin n' back to its starting point and inserts the bolt t in a hole in the rod Q . At this point the current is cut off from the motor, and the movement of the mechanism ceases. 90 The switch is now closed and locked; the next operation is to place the semaphore in a position of safety. This is done by placing the switch lever Z^4 on the contact u^6 , closing the circuit of the battery S^3 , so that the current flows through the wires 44, 48 $\frac{1}{2}$, 57, switch 95 lever Z^4 , contact u^6 , wire 58, contacts q^2 , q^3 and their connecting bar k^2 , wire 59, magnet M^3 , wires 60, brush f^3 , quadrant-shaped switch arm E^3 , brush h^3 , wires 55, 56, 48 back to the 100 battery S^3 . I will mention here that the connecting bar k^2 is attached to the railway switch rail, and moves with it, so that when the switch is open, the bar k^2 connects with the contacts q and q' , and when the switch rail is 105 closed it connects with the contacts q^2 and q^3 . The circuit just described energizes the magnet M^3 , causing the lever K^3 to be attracted, and applies the brake G and causes the spring i^3 to make contact with the stop I^3 , as above 110 described in connection with the block signal. This closes the circuit of the battery S^3 , so that the current flows through wires 44, 48 $\frac{1}{2}$, 49, contact z , switch lever Z , contact z' , wires 50, 51, switch lever Z' , contact u , wires 52, 62, 63, motor B^3 , wire 64, armature lever K^3 , contact point I^3 , wire 65, brush f^3 , quadrant-shaped switch arm E^3 , brush h^3 , wires 55, 56, 48 back to the battery S^3 . The current energizes the motor B^3 , causing it to draw the 120 semaphore arm down as before described until the brush f^3 leaves the quadrant-shaped arm E^3 and breaks the circuit. The circuit through the magnet M^3 is not broken, but is continued from wire 60 through the wire 67, 125 magnet M^4 , wires 68, 69, 56 and 48, back to the battery S^3 , energizing the magnet M^4 , and causing the contact spring i^4 to make contact with the stop I^4 , closing the circuit of the battery S^3 through the wire 62, wire 70, motor B^4 , 130 wire 71, armature lever K^4 , spring i^4 , contact I^4 , wire 72, brush f^4 , quadrant-shaped switch arm E^4 , brush H^4 , wires 73, 69, 56 and 48, back to the battery S^3 . This energizes the motor

B⁴, and brings the distant semaphore arm to the position of safety, by means of the mechanism above described. The signals are held in this position by the brakes G so long as the magnets M² and M⁴ are in the circuit. To put the signals and switch in their normal position again, the switch lever Z⁴ is removed from the contact u⁶. This breaks the circuit through the magnets M³, M⁴, and allows the semaphore arms to take a horizontal position under the influence of their counter-weights, as before described. Then the switch lever Z¹ is removed from the contact u and placed on the contact u', thus closing the circuit of the battery S³ through the wires 44, 48½, 49, contact z, contact arm Z, contact z', wires 50, 51, switch lever Z', contact u', wire 74, brush j, semi-circular switch arm E⁵, brush l, wire 53, motor B⁵, wire 54, brush g³, quadrant-shaped switch arm E³, brush h³, wires 55, 56, 48 back to the battery S³. This energizes the motor B⁵, causing the semi-circular switch arm E⁵ to rotate in the same direction as before until it leaves the brush j⁴, a half revolution of the semi-circular switch arm being required to make this connection. The disk P also makes a half revolution, bringing the pin n back to the position shown in Fig. 5, thus opening the railway switch. The operation for opening the switch is the same as that already described. The fact that the circuit through the motor B⁵ depends on the contact of the brush g³ and quadrant-shaped switch arm E³, makes it impossible to open the switch when the signal is in any other position than that indicating danger, as a very slight downward movement of the semaphore arm is sufficient to break contact. A slight movement of the track switch from the closed position is sufficient to separate the contact bar k² and the points q² and q³, thus making it impossible to put the semaphore arm in the "safety" position when the track switch is in any other position than closed. The sections L⁶ and L⁷ of the track are insulated from the adjacent portions by the insulating pieces at r⁶, r⁷, r⁸, r⁹, and the battery V³ and magnet w⁴ are connected with them so that when that portion of the track is clear, the battery V³ sends a current through wire 75, rail L⁷, wire 78, magnet w⁴, wire 77, rail L⁶, and wire 76 back to the battery V³. This energizes the magnet w⁴ (see Fig. 9) causing it to attract its armature, thus depressing the outer end of the lever c' so that it offers no obstruction to the movement of the switch lever Z'. However, if a train or part of a train is standing on any part of the section L⁶, L⁷, the magnet w⁴ is cut off from the battery V³, and the outer end of the lever c' is elevated so as to be in the path of the switch lever Z' and prevent it from being put into contact with the contact u'. This arrangement is to prevent carelessly opening the track switch while a train is passing over it, or so near it that it could not be stopped before running off the track. The lever c' in

either position offers no obstruction to the movement of the switch lever Z' toward the contact u, and does not prevent the track switch from being closed while a train is on the section L⁶, L⁷. The switch lever Z² controls the operation of the track switch east of the crossing, and the lever Z⁵ controls the semaphores indicating the position of that switch in the manner before described. The north and south roads are represented as being single track roads. One switch lever Z³, only, is required for operating the switches, but they must be operated simultaneously for trains going in either direction. The circuits are exactly the same as that above described, except that the two motors operating the switch are connected in parallel according to a principle well known and requiring no special description. The two pairs of signals are controlled in parallel by the switch lever Z⁶. The switch lever Z³ is connected to the contact z², so that in operating the switches on the north and south roads the lever Z³ must be placed in contact with the contact z². When the track switch is open, the circuit of the battery S³ is closed so that the current flows through the wires 44, 45, magnet w³, wire 46, contact points q and q', and the connecting bar k² and wires 47, 48 back to the battery S³, energizing the magnet w³. In a similar manner the magnets w⁰, w', w² are each controlled by one of the three remaining track switches. The magnet w³ (see Figs. 6 and 8) has an armature attached to the lever X³, near the outer end thereof. The other end of the lever has a lug projecting downward so as to be in the path of the lugs y, y', &c., on the plate Y, when the magnet w³ is not in the circuit, but when the magnet w³ is energized the lug on the lever X³ is elevated so as to be out of the path of the lugs on the plate Y. The plate Y and switch lever Z are attached vertically to the same vertical shaft Y'. The contact points z' and z² are placed at such distance apart that in moving the lever Z from one contact point to the other, each one of the lugs y, y', y², y³, must pass a lug on the levers X, X', &c. This cannot be done unless all the magnets w⁰, w', &c., are energized, and they cannot be energized unless all the track switches are open. Suppose the switches north and south of the crossing to be closed, the switch lever Z being placed in contact with the contact point z², as shown in Fig. 11. While these switches are closed, the circuits through their corresponding magnets w⁰ and w² are open, and the ends of the levers X and X², carrying the lugs, would be depressed by virtue of the weight of the arms carrying the lugs. Now, to close one or both of the switches on the east and west road, it would be necessary to put the lever Z in contact with the contact point z'. This could not be done, as the lugs y and y³ would strike the ends of the levers X² and X, before the switch lever could reach the point of contact. In this way it is made impossible to give the

right of way to trains on the two roads at the same time through carelessness. The same principles can be applied to the junction or crossing of any number of roads, the circuits and operation being the same as that above described.

The switch mechanism can be applied to transfer switches as well as to derailing switches and it needs no further description to show its utility for that purpose.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In railway signal operating mechanism, the combination, with a signal arranged to be moved in one direction by power and in the opposite direction by gravity, of an electric motor for moving the signal against gravity, and electric connections whereby the electric motor is put on a closed circuit during the descent of the signal by gravity, the signal and electric motor being arranged to retain their mechanical connection, the motor being arranged to act as a dynamo when the signal descends by gravity, substantially as specified.

2. In a railway block signal and interlocking crossing signal and switch system, the combination of electro-magnetic mechanism provided with a motor capable of acting as a dynamo for holding the signal to "safety" and releasing the signal on the cessation of the current through the magnet of the said electro-magnetic mechanism, and an electric motor for replacing the signal in a position of safety and for retarding the descent of the semaphore arm when the said motor is revolved in the reverse direction by the descent of the said semaphore arm, thus causing the motor to offer the resistance due to its acting as a dynamo on a closed circuit, substantially as specified.

3. In a block signal and interlocking crossing signal and switch system, the combination of an electric motor, a semaphore operating crank-shaft and intermediate gearing, a brake drum placed loosely on one of the shafts of the train of gearing, and connected with the shaft by a pawl and ratchet, an electrically-operated brake for engaging the brake drum, a quadrant-switch arm carried by the crank shaft, a brush supported in the path of the switch arm, an electrically-operated brush arranged to be thrown into and out of contact with the quadrant-switch arm, and the electrical connections with the track rails and adjoining semaphore operating mechanism, substantially as specified.

4. In a block signaling and interlocking crossingsignal and switch system, an electrical switch operating motor provided with an armature shaft capable of sliding longitudinally in its bearings, an auxiliary disk armature of soft iron mounted on the armature shaft within the field of the motor field magnet, a clutch formed of two parts, one part secured to the armature shaft, the other part being

placed loosely on the armature shaft, and a spring placed on the armature shaft between the two parts of the clutch, for opposing the lateral pull of the auxiliary disk armature, the clutch being arranged to be operated by the longitudinal movement of the shaft, substantially as specified.

5. In a block signal and interlocking crossing signal and switch system, the combination of an electric motor, a pair of crank shafts connected with the motor by gearing, a transversely slotted and perforated rod connecting one of the cranks with the switch rail, and a connecting rod connecting the other crank with the bolt of the rail lock, substantially as described.

6. In a block signal and interlocking crossing signal and switch system, the combination of an electric motor, a pair of crank shafts connected with the motor by gearing, a transversely slotted and perforated rod connecting one of the cranks with the switch rail, a connecting rod connecting the other crank with the bolt of the rail lock, and an interlocking electric switch electrically connected with the rail switching mechanism, substantially as specified.

7. In switch operating mechanism, the combination with a power operated crank, of a switch rail operating bar provided with a transverse slot for receiving the crank, the said slot being furnished with concave sides to permit of locking the said bar in either of its two positions, while allowing the switch-operating crank to make a part of a turn without moving the said bar or releasing the switch rail, substantially as specified.

8. In an interlocking crossing signal and switch system, the combination of a series of electro-magnets consisting of one for each arm of each track of the crossing, the said magnets being connected electrically in parallel, one to each of an equal number of electric switches controlled by the track switch operating machines, detent levers operated by the said electro-magnets, a disk provided with lugs, and carrying an electric switch controlled by the said detent levers, electric switch and signal operating mechanism, and the electrical connections, substantially as specified.

9. In switch operated mechanism, the combination of the electric motor B^5 , the shafts d^3, d^4 , gearing connecting the said motor with the shafts, cranks n', n , connected with the said shafts d^3, d^4 , the perforated switch-operating rod Q provided with the transverse slot Q^2 , the said slot having concave sides, the track switch rail, the connecting rod Q' , and the locking bolt t arranged to lock the rod Q , substantially as specified.

10. In an interlocking crossing signal semaphore operating mechanism, the combination of the electric motor B , the shaft d , the drum D carried by the said shaft d , pawl and ratchet mechanism for connecting the drum and the shaft, the brake shoe G , the armature lever

K, the electro-magnet M, the sheave O, the chain O', lever O², rod O⁴, and the semaphore arm O⁵, substantially as specified.

11. The combination with the switch and
5 signal operating devices; of the rotary shaft Y' having rigidly attached disk Y with a series of lugs y y' &c. projecting laterally therefrom and carrying also switch arm Z; the stationary contacts Z, Z' Z²; a series of locking
10 armature levers X X' &c. arranged to vibrate

in planes at right angles to the disk to lock against or avoid said lugs thereon according to position; and a corresponding set of electro magnets W^o, W' &c. operating upon said armature levers, substantially as shown and 15 described.

JOHN D. TAYLOR.

Witnesses:

BENJ. F. STONE,
JACOB WEBERSALL.