J. T. THOMPSON.

RAILWAY TRAIN CONTROL APPARATUS.

APPLICATION FILED MAR. 18, 1910.

1,068,023. Patented July 22, 1913.

5 SHEETS—SHEET 1.

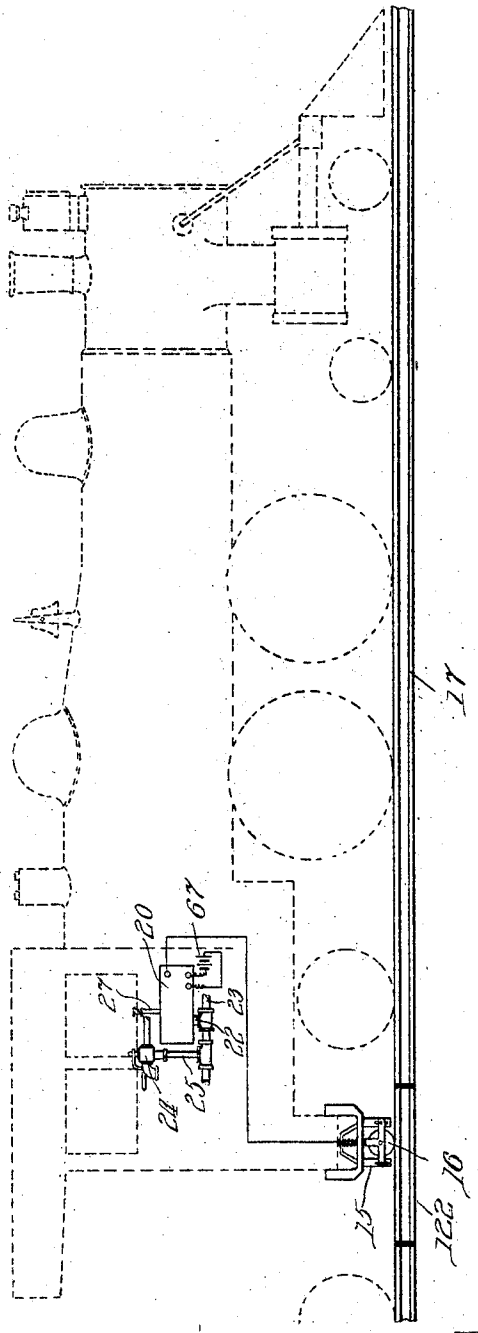


Fig. 1.

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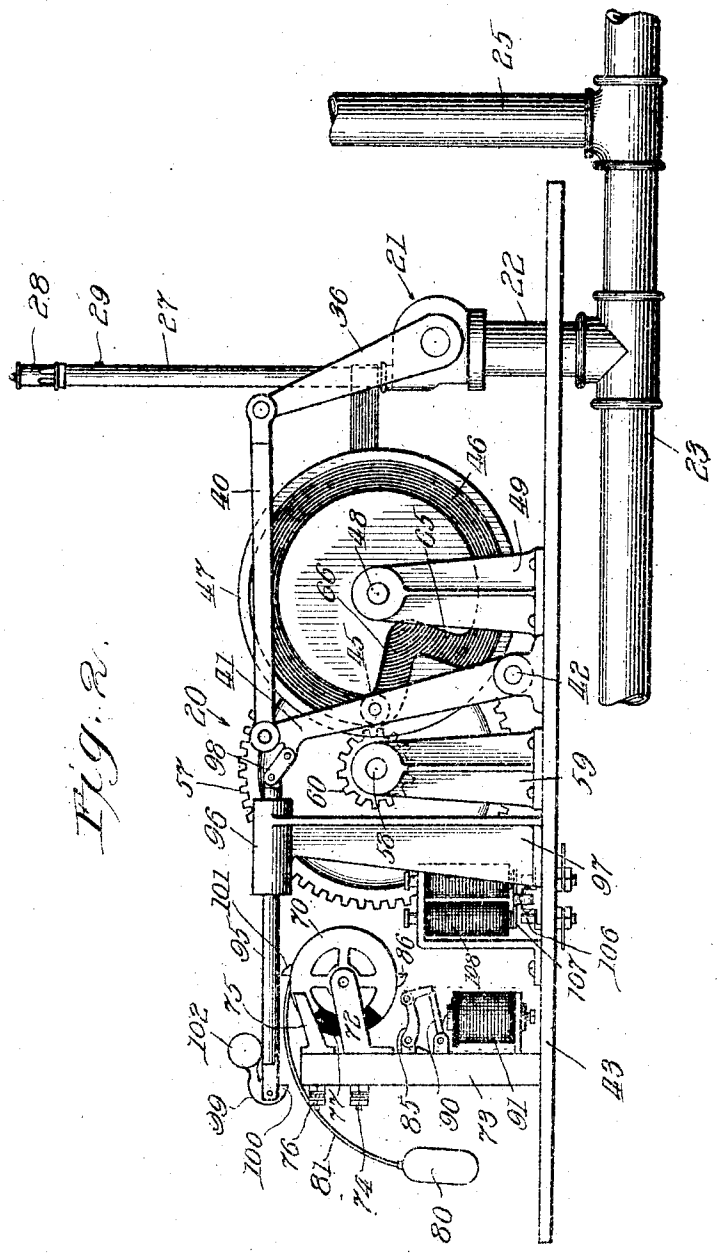


Fig. 2.

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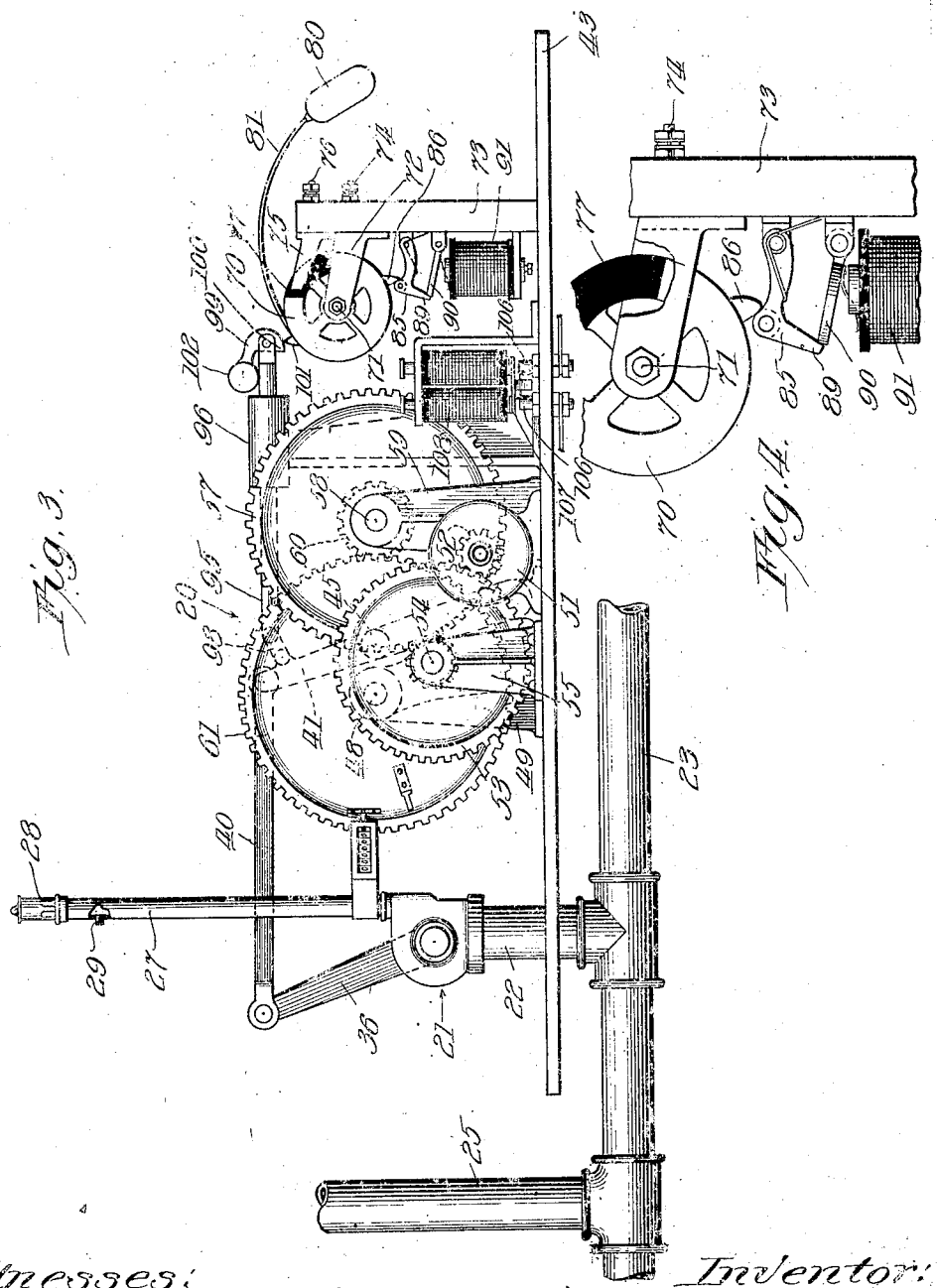


Fig. 3.

Fig. 4.

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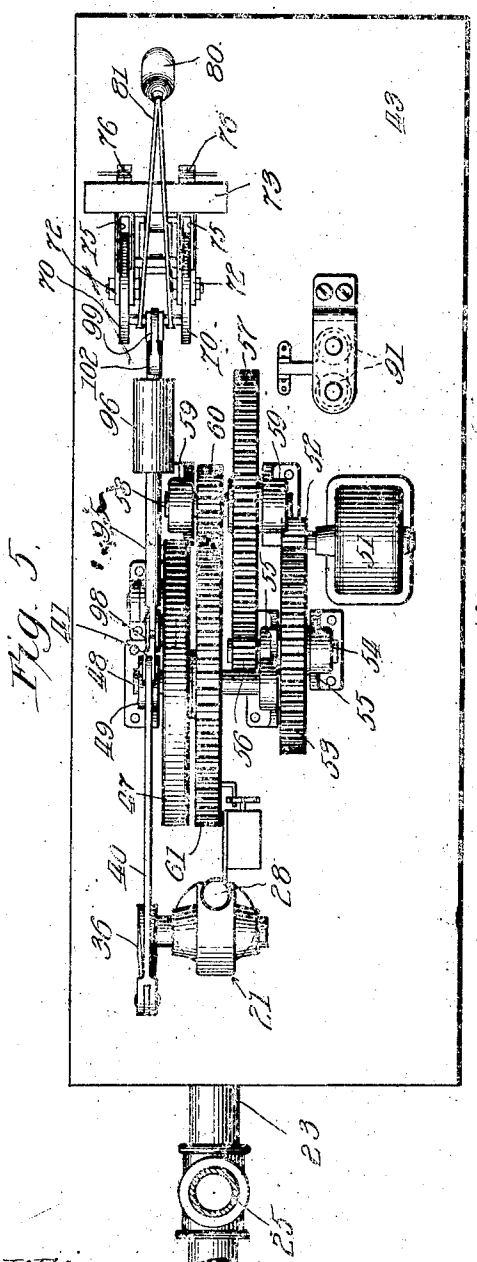


Fig. 5.

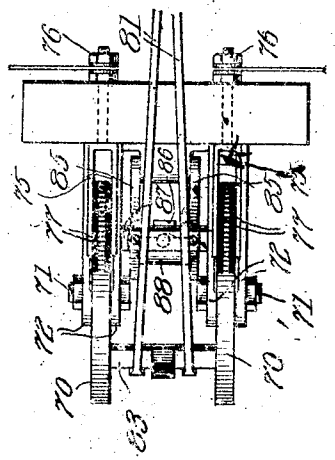


Fig. 7.

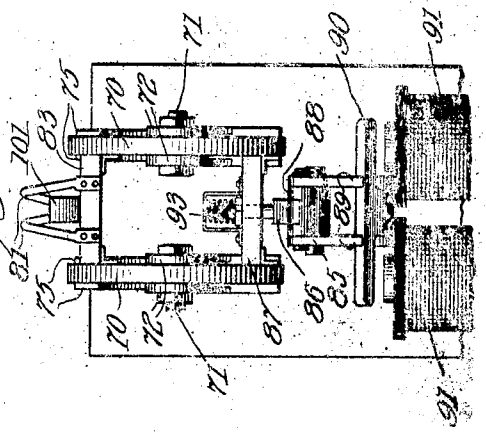


Fig. 6.

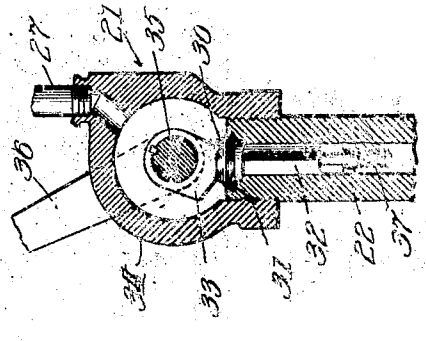


Fig. 8.

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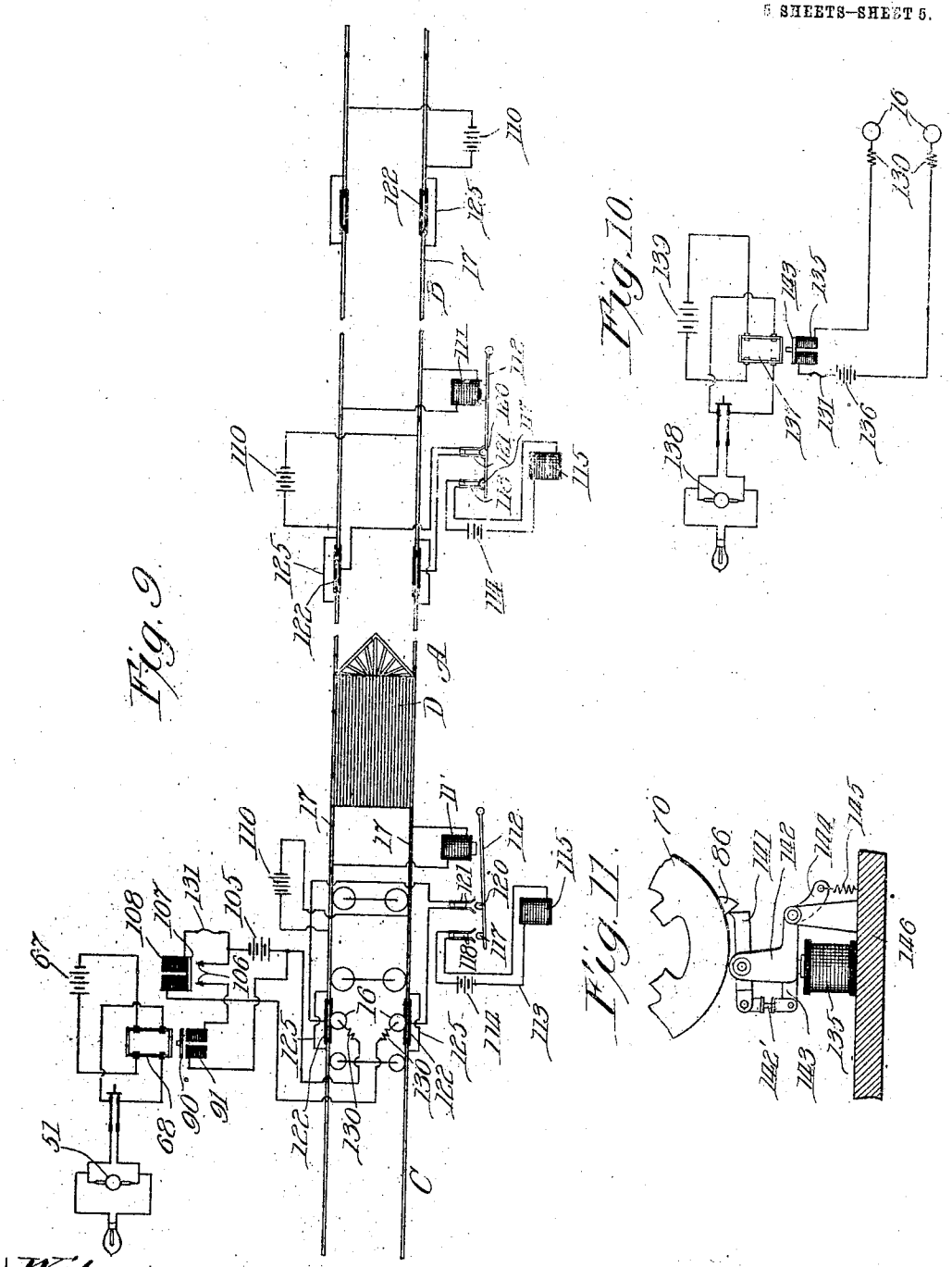


Fig. 9

Fig. 10.

Fig. 11.

Witnesses:

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William Goldberger

Inventor:

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UNITED STATES PATENT OFFICE.

JAMES T. THOMPSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE THOMPSON AUTOMATIC SIGNAL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF SOUTH DAKOTA.

RAILWAY-TRAIN-CONTROL APPARATUS.

1,068,023. Specification of Letters Patent. Patented July 22, 1913.

Application filed March 18, 1910. Serial No. 550,220.

To all whom it may concern:

Be it known that I, JAMES T. THOMPSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Railway-Train-Control Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to means for automatically applying brakes to railway trains for the purpose of slowing down or arresting a train or for operating a signal device in the locomotive cab when an attempt is made to drive it into a prohibited section of the track, as past a signal set against it or into a block occupied by another train, and at other points along the track where provisions are made for controlling the train under predetermined or emergency conditions.

Among the objects of the invention is to improve, simplify and render more certain the intended operation of the several parts of the apparatus, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a dotted outline view of a locomotive, showing my invention applied thereto. Fig. 2 is a side elevation of the mechanism on the locomotive for operating the air brake valve to set the brakes. Fig. 3 is a side elevation looking from the opposite side of said mechanism. Fig. 4 is an enlarged detail side elevation of the switch mechanism for controlling the motor circuit. Fig. 5 is a plan view of the valve operating mechanism. Fig. 6 is a front elevation of the switch shown in Fig. 4. Fig. 7 is a top plan view of said switch. Fig. 8 is a longitudinal section of the air release valve of the brake mechanism. Fig. 9 is a diagrammatic view illustrating a track section composed of a plurality of signal blocks equipped with a signal system, and showing the circuit on the locomotive which coöperates therewith to control the valve mechanism on the locomotive. Fig. 10 is a diagrammatic view illustrating a modification of the locomotive circuit. Fig. 11 is a detail illustrating the adaptation of the switch shown in Figs. 4, 6 and 7 to the arrangement indicated in Fig. 10.

The locomotive carries at either side thereof suitable brackets 15, (one of which is shown in Fig. 1) in which are mounted contact wheels or brushes 16 arranged in line with the locomotive and tender wheels and adapted to travel on the main track rails 17.

20 designates, as a whole the motor operated brake valve operating mechanism which is carried by the locomotive. It is indicated in Fig. 1 as contained in a casing located in the engineer's cab, and is shown in detail in Figs. 2, 3 and 5.

21 designates as a whole the air relief valve of the train pipe which is located in a branch pipe 22 extending upwardly from that part of the train or service pipe 23 which is carried by the locomotive. 24 designates the engineer's valve connected to said train pipe by a branch 25. The said relief valve 21 discharges through a pipe 27 which may be provided at its end with a whistle 28. The pipe is also shown as provided with an opening closable by a plug 29. The opening through the whistle and that closable by a plug are so proportioned that when the plug closes its opening the escape of air from the train pipe through the whistle will be limited to produce a service stop and when said plug is removed and the air escapes through both openings with sufficient freedom to provide for an emergency stop.

The valve operating mechanism 20 is operated by a motor which is controlled by a transient circuit on the locomotive, and which transient circuit is in turn controlled by predetermined conditions on the track, the arrangement being such that when conditions for slowing the train or stopping it arise, the mechanism will be set in operation to open the valve, release the air from the train pipe to actuate the brake mechanism, and to finally close the valve and place the brake mechanism back in normal position for the engineer to release the brakes.

The valve 21 is shown in detail in Fig. 8. It comprises a conically faced valve piece 30 which closes against the train pipe pressure on the conical seat 31 formed in the upper end of the branch 22, the stem 32 having guiding engagement with the bore of said branch. The valve piece is normally

held against its seat by an eccentric 33 which is located in the casing 34 of the valve and is fixed to a rock shaft 35 that is bearing in the side walls of the casing. Said shaft is adapted to be rocked by a crank arm 36 which is connected with the valve operating mechanism in a manner hereinafter to be described. A light spring 37 is applied to the stem for holding it against its seat when pressure on both sides of the valve is substantially equalized.

To the upper end of the crank arm 36 is pivoted one end of a connecting rod 40, which latter is pivoted at its other end to a vertically rocking lever 41 which is pivoted at its lower end to a pivot pin 42 carried by the base 43 of the valve operating mechanism. The rocking lever 41 is provided with a laterally extending roller bearing stud 45 which engages the closed cam groove 46 of a cam disk 47 that is rotatively mounted on a horizontal shaft 48 carried by the upper ends of standards 49 rising from the base plate 43. The said cam disk is operated by an electric motor 51 mounted on the base plate 43, which motor is connected to the disk by a speed reducing mechanism comprising the pinion 52 fixed to the motor shaft, the gear 53 that is fixed to the shaft 54 mounted in standard 55, 55, the pinion 56 fixed to the latter shaft, the gear wheel 57 meshing with said latter pinion and mounted on the shaft 58 that is supported in standards 59, 59, the pinion 60 rotating with the gear wheel 57, and the gear wheel 61 mounted on said shaft 48 and connected to and rotating with the grooved cam disk 47 in any suitable manner. The nest of gears reduces the speed of the motor, when transmitted to the cam disk, to give a suitable slow speed thereto to operate the valve.

The cam groove 46 is shaped to provide two short eccentric portions 65, 66, and a longer connecting concentric portion, one of said eccentric portions operating to open the valve as the roller bearing stud 45 passes therethrough, and the other to close the valve, and the concentric portion operating to hold the valve open. As shown in Fig. 2 the valve is in its open position, and is about to be moved to its closed position by the passage of the roller bearing stud of the lever 41 through the eccentric part 66 of the cam groove. As shown in Fig. 3 the valve is in its closed position, in which position the roller bearing stud 45 will occupy the lowest part of the cam groove between the eccentric portions thereof.

The motor 51 is included in an electric circuit, hereinafter designated as the motor circuit, which embraces a battery 67 carried on the locomotive (Figs. 1 and 9). Said circuit includes a switch designated as a whole by 68 in Fig. 9, and illustrated in detail in Figs. 4, 6 and 7, by the closing of which the motor is started in motion to effect the operation of the valve 21, and the opening of which stops the motor and discontinues the operation of the valve. Means are provided for actuating the switch 68 to close the same by the momentary passing of an electric current through a controlling circuit carried principally by the locomotive and hereinafter to be described.

The switch 68 is in the nature of a double knife switch. The blades or members 70, 70, however, are made of disk form, they being arranged side by side and axially alined and each mounted on a short shaft 71 carried by a pair of arms 72, 72 which are attached to and extend forwardly from a support 73. Said arms terminate at the back of said support in binding posts 74, 74 to which the conductors of the motor circuit are attached. Coöperating with each disk 70 is a pair of blades 75, 75 each arranged above one of the pair of bearing arms 72, and which bear on opposite sides of the disk. Said blades 75, 75 are attached to and extend forwardly from the support 73 and terminate at the rear of said support in binding posts 76. They bear on the opposite sides of the disks near the margins of the latter and each disk is made principally of conducting metal. The said disks are in electrical contact with the shafts 71, so that when the blades are engaged with the metal portions of the disks the motor circuit is completed through the blades, the disks and the bearing arms of the disks. A portion of the marginal parts of the disks engaged by said blades comprises insulation 77 which, when the disks are rotated to bring the insulation in bearing with the blades 75, opens the motor circuit. This is the position of the parts as illustrated in Fig. 3. The said disks are swung into position for engagement of the blades 75 with the metal or conducting portions of the disks to close the motor circuit by means of a weight 80 that is connected to the disks by an arm 81 which extends over the support 73. The forward end of said arm, which is bifurcated, is shown as attached to a cross bar 83 (Figs. 6 and 7) which extends between and is attached to the disks. The throw of the switch blades into their closing position may be limited by engagement of the weight arm 81 with the upper end of the support 73, as shown in Fig. 2.

The disks are held in their normal position to open the motor circuit by means of a vertically swinging latch 85 which is pivoted at its rear end to the support 73 and is upheld by a suitable spring against a tooth 86 carried by a cross bar 87 extending between and attached to the disks in the manner shown in Figs. 3, 4 and 6. Said latch is herein shown as provided with a contact roller 88 arranged between the lat-

eral members of the latch (Fig. 7) and which is directly engaged by said tooth 86. The latch is normally locked up against the tooth 86 by means of the armature 90 of an electromagnet 91 that is included in a branch of the controlling circuit on the locomotive, as will be hereinafter described, the arrangement being such that when said magnet 91 is energized the armature 90 will be drawn away from the nose 89 of the latch and thereby permit the switch disks to rotate, under the impulse of the weight 80, from the position shown in Fig. 3 to that shown in Fig. 2, to close the motor circuit. The closing of the branch circuit through the magnet 91 is but momentary, and when the said circuit is again opened the armature 90 raises into locking position, under the influence of a suitably applied spring, to the position shown in Fig. 2. In order to permit the tooth 86 of the switch disks to pass the roller contact of the latch 85 when the disks are returned to their normal closing position, the said tooth is arranged to slide upwardly through the bar 87 against the action of a spring 93, shown best in Fig. 6, thereby permitting said tooth to retreat sufficiently to pass the contact roller of the latch. The said switch disks are restored to normal or opening positions by the following devices which operate upon the closing movement of the release valve of the train service pipe. 95 designates a horizontally reciprocating rod which has guiding engagement in a sleeve or bearing 96 carried by the upper end of a standard 97 rising from the base plate 43. The forward end of said rod is connected by a short link 98 with the upper end of the cam actuated rocking lever 41. The rear end of the said rod 95 carries a gravity catch 99 pivoted thereto and provided with a detent 100 which lies in the path of a tooth 101 that extends upwardly from the cross bar 83 to which the weight arm is attached. The said catch is provided at its end opposite the detent with the weight 102. When the rod 95 moves outwardly, during the opening movement of the valve, the detent 100 will ride over the tooth 101, permitted by the swinging action of the catch, and when the guide rod moves in the other direction during the closing movement of the valve the weight 102 holds the detent in position to catch the tooth 101 in a manner to turn the switch disks into their opening positions, and thereby open the motor circuit.

The branch circuit, in which is included the magnet 91, includes also a battery 105 (Fig. 9) and is normally open. It is closed between two contact points 106, 106, by the armature 107 of a relay magnet 108 in circuit with the battery 105, as herein shown. The relay circuit 108 is normally closed through the contact wheels or brushes and the track rails in a manner presently to be described. The said contact wheels or brushes 16 are insulated from each other and from the main frame of the locomotive and tender. When the said wheels or brushes 16 are running on the continuous rails, or rails that are energized and bonded together, the battery 105 and the relay 108 will be in a circuit which is maintained closed through the contact wheels or brushes and through the adjacent locomotive and tender wheels and their axles. The circuit at such time will be from one side of the relay magnet 108, through the contact wheel or brush 16, thence along the track rail at one side of the track to the adjacent locomotive and tender wheels on that side of the track, thence through the axles of said wheels to the corresponding locomotive and tender wheels on the other side of the track, thence through the track rail to the adjacent contact wheel or brush 16, and thence through battery 105 to the opposite side of relay magnet 108. The armature 107 is therefore held normally against the poles of the relay magnet. An interruption of said circuit has the effect to deënergize said magnet 108, whereupon the armature 107 drops to the terminals or back stops 106 of the branch circuit and closes said circuit, through the magnet 91, thereby attracting the armature 90 away from the nose of the switch holding latch 85 and permitting the switch to close under the action of the weight 80, in the manner before described.

The interruption of the controlling circuit to thus close the motor circuit may be effected in a variety of different ways. I have shown in Fig. 9 an arrangement generally similar to that illustrated in my aforesaid prior application and is made as follows: The section of track illustrated in said Fig. 9 embraces two full signal blocks A, B and a portion of an advance block C, on which latter block is indicated one of the transient motor controlling circuits which is carried by the locomotive of a train. D designates a train on the block A. The several blocks of the track are shown as equipped with a familiar form of block signal apparatus in which there is employed at each block a battery 110 bridged between the track rails to normally energize a track magnet 111, the armature 112 of which controls a local signal circuit 113 located at the entrance to the block. Said local signal circuit embraces a battery 114 and a relay magnet 115, which when energized, will operate a target or semaphore to indicate a clear block ahead. Said circuit is closed by a contact 117 on the swinging armature lever 112 which, by the swinging movement of the armature, is moved into and out of contact with spring terminals 118 included in said circuit. When the train B enters upon the block A,

for instance, the track battery 110 will be short circuited, thus deënergizing the magnet 111 and opening the local signal circuit to display a danger signal.

The armature 112 is provided with a second contact 120 adapted to connect spring contacts 121 which are electrically connected with two short rail sections 122, 122 located in line with, and insulated from, the main track rail 17, 17, said insulated sections being located at a suitable distance inside of the far end of the block. Bond wires 125 extend around the insulated rail sections to maintain electric conductivity of the track rails of each block at both sides of said insulated rail sections. Said insulated rail sections are of such length that when the contact wheels or brushes 16 are in contact with the same in passing thereover, none of the regular engine or tender wheels will at the same time occupy or engage said sections. The terminals 121, the insulated rail sections 122 and the connecting wires constitute a loop through which the controlling circuit is closed when the contact wheels or brushes are riding over the insulated rail sections, and at which time the circuit is broken between said contact wheels or brushes and the regular traction and supporting wheels of the locomotive. That is to say, the controlling circuit will be so closed when the contact 120 is engaged with the terminals 121 of the loop circuit, so that at such time there will be no interruption of the controlling circuit and no operation of the valve operating mechanism. When the loop is open however at the terminals 121, the passage of the contact wheels or brushes on the insulated rail section will interrupt or open the controlling circuit and thereby close the motor circuit to set the valve operating mechanism in motion.

In order to avoid the contingency of short circuiting the controlling circuit of the relay 108, I may provide in said circuit a suitable resistance, indicated at 130, located near or in the structure of the contact wheels or brushes 16, and provide in another part of the circuit adjacent to the relay 108 a fuse 131, (Figs. 9 and 10). In case the controlling circuit be short-circuited between said resistance and the fuse, the overload on the fuse will open the circuit, with the same result as though it were opened under the usual or predetermined conditions. Suitable testing appliances will be provided for said circuit so that the engineer may inform himself as to whether or not the circuit is in normal condition.

In Figs. 10 and 11 I have shown the adaptation of the disk form of motor circuit switch to another arrangement of controlling circuit, wherein the circuit that is closed through the rails operates directly by its interruption to effect the closing of the switch. As shown in this arrangement the magnet 135 is included in circuit with a battery 136 that is normally closed through the track rails. The said magnet 135 operates directly on a tripping mechanism for the switch, the latter designated as a whole by 137, the terminals or binding posts of which are in circuit with the motor 138 and a battery 139 or other source of electrical energy. The tripping mechanism referred to comprises a swinging locking latch 141 that is pivoted to a support 142 and acts at one end against the holding or locking tooth 86 of the switch disks. The other end of said latch is connected by a link 142′ with the armature 143 of the magnet 135, and said armature is provided with a tail piece 144 that is connected by a spiral contractible spring 145 with the base 146 of the device. With this arrangement when the armature 143 is drawn downwardly by the energized magnet 135 the latch 141 is held up in locking position to lock the switch disks in their opening position. When the controlling circuit is broken and the magnet deënergized the spring 145 or analogous device releases the locking latch from the tooth 86 and permits the switch to move into closing position to close the motor circuit.

It will of course be understood that the controlling circuit may be operated in conjunction with, or independently of, local signals, such as semaphores at the junctions of blocks, and it will furthermore be understood, that, so far as is concerned the general arrangement and construction of the valve actuating mechanism, and certain features of the circuit, the controlling circuit may be otherwise arranged to transmit starting impulses to the valve actuating mechanism at predetermined points along the track. It will be understood that the circuit described may operate a signal device in the cab either together with or independently of the val controlling devices.

The operation of the system or apparatus will be plain from the foregoing but may be briefly restated as follows: When the contact wheels or brushes 16 are traveling on track rails electrically continuous with those on which the locomotive and tender wheels travel, the controlling circuit, including the relay 108 (or the relay 135) is maintained closed. When the contact wheel or shoe pass onto the insulated rail sections 122 at a time when the loop, including the terminal 121, is open, the said controlling circuit will be open, thereby deënergizing the magnet 108 (or 135), whereby the valve operating mechanism will be set in motion in the manner described. The motor drives the cam disk 47 continuously in one direction and in each cycle of operation of the mechanism the rocking lever 41 acts, through the link 40 and crank arm 36, to first open the valve,

hold it open for a predetermined period and then close the valve, and during the closing movement of the valve the detent 100 of the pivoted catch 99 engages the tooth 101 of the switch disks to shift the switch to its opening position and open the motor circuit and arrest further operation of the valve mechanism until the controlling circuit is again opened.

I claim—

1. An electric control or signal system for railway trains comprising, in combination, a controlling or signaling apparatus carried upon the locomotive, an electro-magnet carried by the locomotive adapted, when energized, to render said apparatus inoperative, a normally closed controlling circuit for said electro-magnet including a battery carried by the locomotive and contact devices arranged to travel in engagement with the track rails, the contact devices being insulated from each other and adapted to complete the controlling circuit and hold it normally closed through the track rails and locomotive wheels, means at the track rails for opening said circuit at predetermined points and means for opening the controlling circuit upon a short circuiting thereof to deenergize said magnet.

2. An electric control or signal system for railway trains comprising, in combination, a controlling or signaling apparatus carried upon the locomotive, an electro-magnet carried by the locomotive adapted, when energized, to render said apparatus inoperative, a normally closed controlling circuit for said electro-magnet including a battery carried by the locomotive and contact devices arranged to travel in engagement with the track rails, the contact devices being insulated from each other and adapted to complete the controlling circuit and hold it normally closed through the track rails and locomotive wheels, and means at the track rails for opening said circuit at predetermined points, said circuit including a resistance element adjacent to the contact device and a fuse located adjacent to the electromagnet.

3. An electric control or signal system for railway trains comprising, in combination, a controlling or signaling apparatus carried by the locomotive, a motor for operating the same, a motor circuit including a source of electrical energy and a switch, means for locking said switch in its circuit opening position, a weight applied to the switch to shift the switch to its circuit closing position when the locking means are released, an electromagnet adapted, when deënergized, to release said locking means, a controlling circuit including said electromagnet and a battery carried by the locomotive and provided with contact devices which travel along the track rails, said circuit being normally closed through the track rails and locomotive wheels and means along the track for opening the normally closed controlling circuit and to thereby deënergize said electromagnet.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 3rd day of March A. D. 1910.

JAMES T. THOMPSON.

Witnesses:
W. L. Hall,
W. Goldberger.