

No. 857,446.

PATENTED JUNE 18, 1907.

M. G. COMSTOCK.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

APPLICATION FILED NOV. 24, 1903.

4 SHEETS—SHEET 1.

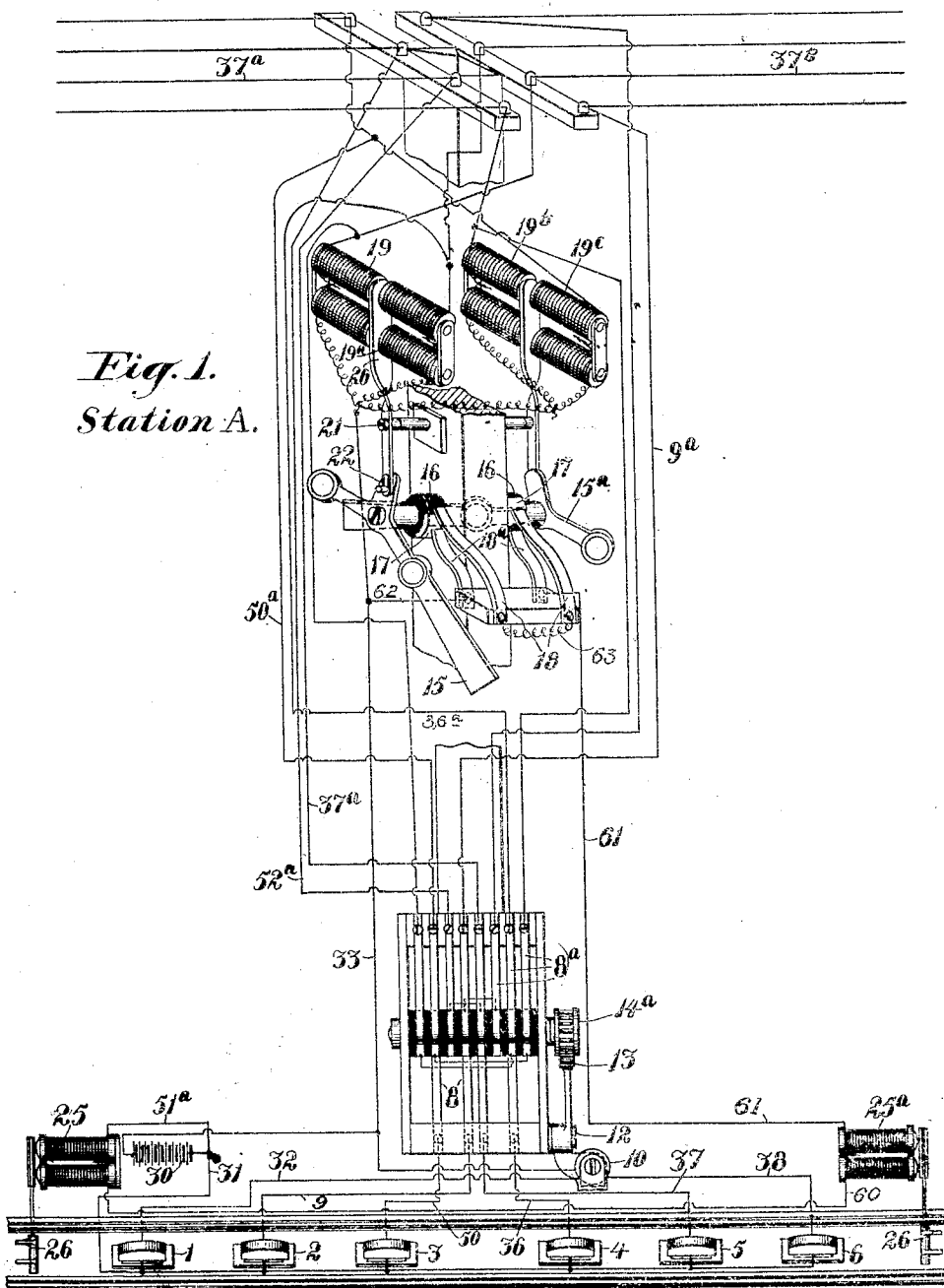


Fig. 1.
Station A.

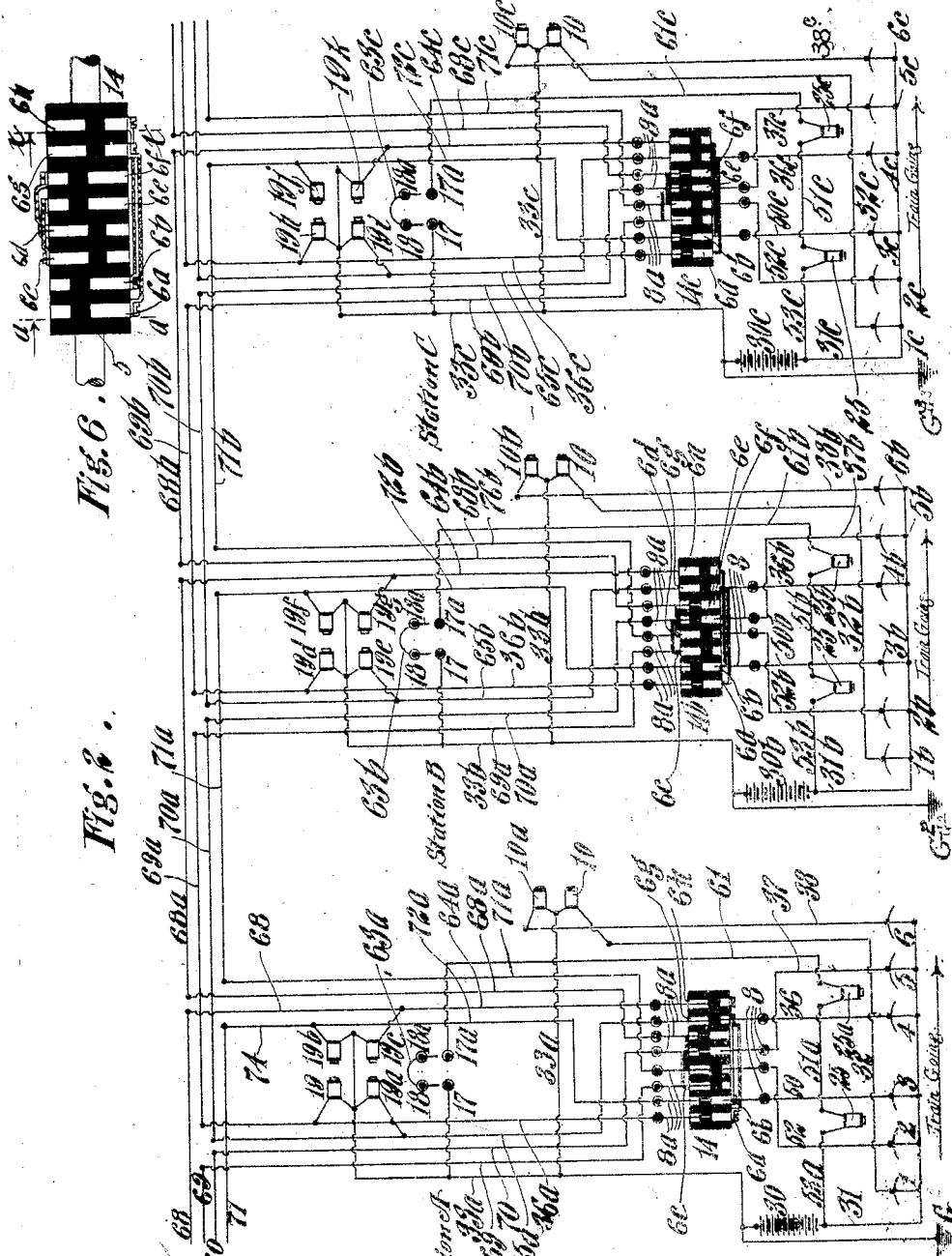
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BLOCK SIGNAL SYSTEM FOR RAILWAYS.

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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 3.

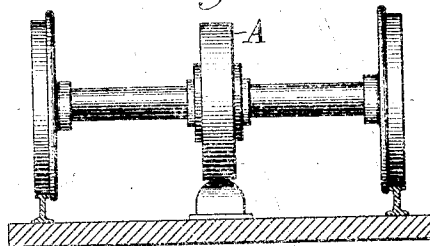


Fig. 4.

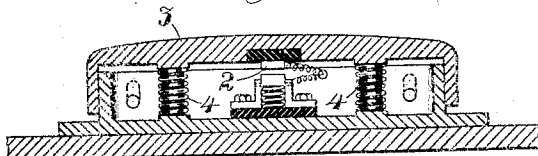


Fig. 5.

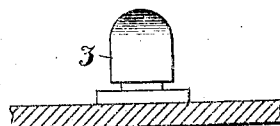


Fig. 7.

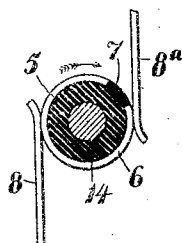


Fig. 8.

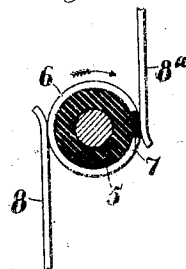
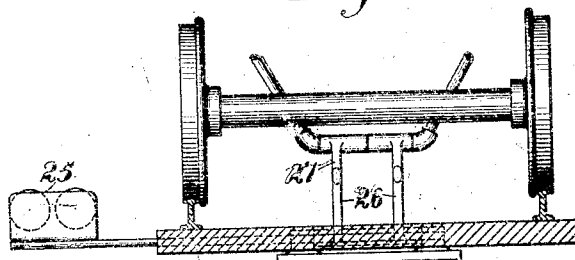


Fig. 9.



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4 SHEETS—SHEET 4.

Fig. 10.

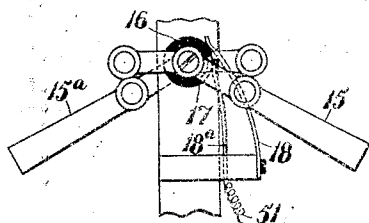


Fig. 11.

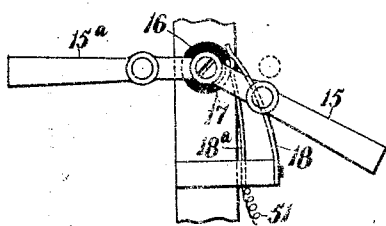
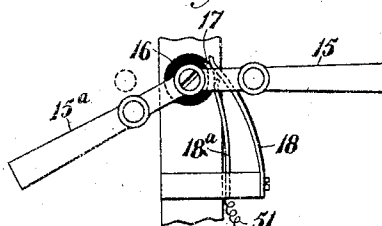


Fig. 12.

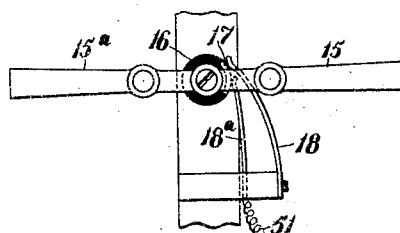


Fig. 13.

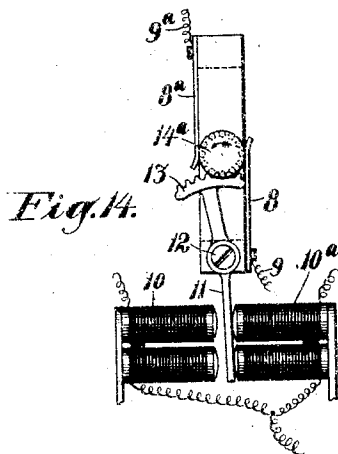


Fig. 14.

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UNITED STATES PATENT OFFICE.

HOMER G. COMSTOCK, OF SAN FRANCISCO, CALIFORNIA.

BLOCK-SIGNAL SYSTEM FOR RAILWAYS.

No. 857,448.

Specification of Letters Patent.

Patented June 18, 1907.

Application filed November 24, 1903. Serial No. 182,461.

To all whom it may concern:

Be it known that I, HOMER G. COMSTOCK, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Block-Signal Systems for Railways; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in automatic block signal systems, and consists in the combination of electrically actuated signals with mechanism located in the path of travel of trains; means carried by the trains by which said mechanism is actuated to successively close circuits; the first of which moves a switch which makes contact with wires leading to magnets which operate the signals at a distant station when the train enters a station or commencement of the block preceding that station. Other contacts are made by succeeding buttons being depressed as the train proceeds, one of which exposes the signal behind the train to protect it from the rear, and another sets the signal at the commencement of the preceding block to show that that block is clear. The switch is finally restored to its first position disconnecting previously made connections when the train passes the last of the devices which are operated by it. Means are similarly provided to set a signal which will notify a following train that the first train is still within that block; and means are also provided that if the signals are disregarded, the steam will be shut off and brakes applied automatically and without action by the engineer; means are also provided so that if two trains approach from opposite directions signals will be set to notify both trains, and mechanism by which one or both trains will be stopped automatically before reaching the danger point.

My invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a view showing one of the stations on an enlarged scale. Fig. 2 is a diagrammatic view of the stations, batteries, connections and actuating mechanism of three contiguous blocks or stations. Fig. 3 is a view of the locomotive or car wheels and the depression wheel carried by the axle thereof. Fig. 4 is a sectional elevation of

one of the track circuit closers. Fig. 5 is an end view of the same. Fig. 6 is a side view of the rotary commutator or switch. Fig. 7 is a transverse section through *a a* of Fig. 6. Fig. 8 is a similar section through *x x* of Fig. 6. Fig. 9 is a view of the track mechanism and safety devices by which the corresponding devices on the train are automatically operated to bring it to a stop. Figs. 10, 11, 12 and 13 are views of the signals in different positions. Fig. 14 is a view of mechanism for actuating the commutator or switch.

It is the object of my invention, first to provide a means for automatically operating the system of block signals by movement of the train or locomotive; second, to provide a device to prevent trains or locomotives running past a signal which is set to stop them; third, to provide a device for controlling the electrical connections, which is also thrown into and out of operation by the passing of the train.

The axle of a locomotive or car is provided with an auxiliary wheel A which serves to depress the successive track buttons or circuit closing devices shown at 2, and which buttons, when depressed, connect the wires of the desired circuits. These closing buttons are here shown as contained within inclosing cases and the cases have covers as shown at 3 which are normally held up by springs 4, these springs being so stiff that they will keep the contact points apart and prevent their being tampered with. The springs may be sufficient to support a weight of 10 to 20 thousand pounds, but will yield to the weight of the train when the pressure wheel A passes over them.

The commutator or switch 5 consists of fiber or other equivalent insulating material which is encircled by eight metallic strips or bands as at 6^a, having a piece of insulating material inserted between the ends of the bands as shown at 7, these bands being less length than the circumference of the cylinder which forms the switch.

The strips are insulated from each other and are so placed that the metallic strips 6^a, etc., will be in pairs; each pair alternating above and below a line drawn lengthwise of the cylinder so that the throw or turn of the switch need not be very great.

8—8^a are elastic plates or arms which may be suitably fixed above or below the switch

to a frame in which the switch is journaled and revoluble and these strips connect with wires leading to electric magnets by which the signals and other parts are to be actuated, as shown at 52, 71^a (Fig. 2).

10—10^a are electric magnets fixed at a short distance apart, and between them an armature 11 is suspended so as to be attracted by either one or the other of said magnets when energized. This armature is here shown as pivoted at 12 having an arm extending upwardly from the pivot and upon the upper end of the arm is carried a segmental rack 13. This rack engages a toothed pinion 14^a which is carried upon the commutator or switch shaft, and when the armature is attracted by magnet 10, it will move the segmental rack 13 so as to turn the commutator into a position where four of the elastic arms 8^a will rest upon four of the metallic strips 6^c, 6^d, 6^e, 6^f, and thus complete an electrical circuit through the wires with which the parts to be actuated by a train going in one direction are connected. When the other magnet 10^a is energized, the armature will be attracted in the opposite direction, and the switch will be rotated so that the elastic arms may rest upon the other four metallic strips 6^a, 6^b, 6^c, 6^d, and thus complete an electrical circuit through the wires with which the various parts to be actuated by a train going in the opposite direction, are connected.

Each of the "stations" as I term them, which form the ends of the blocks, is provided with a number of the track buttons or closing circuits which are here shown as numbered from 1 to 6 at station A; from 1^b to 6^b at station B; and from 1^c to 6^c at station C.

I have here indicated three stations as being sufficient to explain the operation of my apparatus. These stations will be located at any suitable distance apart, as from 4 to 5 miles, and the space between two adjacent stations form the block in each case. The signals 15—15^a are made in any suitable manner to be exposed or concealed, and they are mounted upon fiber or other non-conducting centers as at 16. These centers are here shown circular in form and having metallic segments formed in them in the periphery as shown at 17.

18—18^a are elastic arms suitably fixed with relation to the centers 16, and having their ends so disposed that when the signal is in one position the springs will both rest upon the metallic or conducting segment 17, and will complete the circuit through the conducting wires with which they are connected.

When the signal is moved to the other position, one of the springs will rest upon the non-conducting surface and the circuit will thus be broken. The movement of these signals is effected as follows: 19—19^a are magnets separated from each other a short

distance, and in the present drawing these magnets are shown as standing substantially horizontal. Between the two contiguous ends of each of these magnets is an armature 20. This armature is pivoted or fulcrumed as shown at 21, and the end extending beyond the fulcrum is connected with a short crank arm as at 22. This crank arm is connected with or carried by the signal shaft or bearing, and it will be seen that when the magnet 19 is energized the armature being attracted by that magnet will act through the crank arm 22 to move the signal in one direction and when the armature is acted upon by the magnet 19^a, the signal will be moved in the opposite direction. By this movement of the signal and the disk 16 the circuits are completed or broken through the spring arms 18—18^a.

The depression buttons marked 1 to 6 etc., at the different stations may be separated from each other about 100 feet more or less; the operation will then be as follows:

Suppose the train reaches station A coming from the left. It first depresses the button No. 1 and this completes the circuit from battery 30 through wire 31, through contact button 1, through wire 32, through electro magnet 10, thence through wire 33^a back to battery 30. The normal position of the commutator is that in which it is left by a passing train until changed by a train going in the opposite direction, with train moving from left to right as assumed, in the illustration, if a train has previously passed in the same direction, no change would occur, the elastic arms 8^a would rest upon metallic strips 6^c, 6^d, 6^e, 6^f. If previous train had passed from right to left the arms 8^a would rest upon strips 6^a, 6^b, 6^c, 6^d. The completion of this circuit energizes magnet 10, and this attracting the armature 11 (Fig. 14) operates through the segment 13 to rotate the switch 14 so as to make connection to complete an electric circuit from battery 30 through wire 52, spring arm 8, metallic strip 6^d, elastic arm 8^a, wire 71^a, through magnet 19^f, through wire 33^b to ground G. When the button 2 is depressed by the moving train it acts to complete the circuit from battery 30 through wires 31, 52, metallic strip 6^d, wire 71^a to magnet 19^f to set the signal 15^a at the next station or B to "danger" that is with the head on signal exposed. The train continuing depresses button 3, and this connects battery 30 through wires 31, 50, metallic strip 6^b, loop wire 6^b, wire 64^a to magnet 19^c wire 33^a to ground G, and thus lowers signal 15^a at station A to show a temporary clearance of the succeeding block, but this is to reverse the signal, i. e. the train having reached the end of the block at station A, it is no longer necessary to protect it from a train coming from the opposite direction but from a train following.

When button No. 4 is passed by the train it completes the circuit from the battery 30 through wires 31, 36, metallic strip 6^a, wire 65^a, to magnet 19^a, and this operates through
5 electro magnets 19^a, armature 20 and interposed mechanism to expose the signal 15 at station A to protect the entering train from the rear.

When button No. 5 is passed it will complete the circuit through the battery 30,
10 wires 31, 37, elastic spring 8, metallic strip 6^a, loop wire 6^d, spring 8^a, wire 69 to magnet 19 at the previous station thence through wire 33 to ground G, which as before described
15 may be as much as four miles away, and this energizes the electro magnet 19 at that station, which is similar to the magnet 19 at station A, thus attracting its armature 20 and through the intermediate mechanism setting
20 the signal 15 at that previous station to show that the block previous to station A is clear.

When button No. 6 is depressed it completes the circuit from the battery 30 through wires 31, 38, through the magnet 10^a, and
25 wire 33^a to battery, and this rotates the switch 14 back to a position which disconnects the previously made connections through the contact spring arms 8, 8^a and metallic strips 6^b, loop wire 6^a, 6^c, 6^e, loop
30 wire 6^c and makes connections through 6^a, 6^b, 6^c, 6^d, and prepares for a train coming from the right. These operations are repeated at each block.

If a second train is following on the same track with train 1, it will be notified of the position of the train 1 by the depression of the button No. 4 by the latter train at station A which will, as previously described, expose the signal at said station to the second
40 approaching train and notify it that train 1 is in the block between A and B.

Train No. 2 on entering the block previous to A and depressing the button No. 2 at that station will complete the circuit to set the
45 signal 15^a at station A, and close the circuit through the springs 18, 18^a which are operated by the movement of the signal through wires 61, 51^a, 53^a, 33^a and battery 30. The normal position of 18, 18^a is with the points
50 resting upon the non-conducting surface. When the position of signals 15, 15^a are at danger, contact is made through both commutators, and the circuit includes springs 18, 18^a. This energizes both the magnets 25,
55 25^a at station A as follows: From battery 30 through wire 53^a, through magnet 25, wire 51^a to magnet 25^a through wire 61, spring 18^a which rests on conducting surface of signal 15^a, through wire 63^a to the other
60 spring 18 resting on conducting surface of signal 15, wire 33^a to battery 30, and this acts to raise the levers 26, which are hinged in such relation with the passing train that when raised they will contact with levers or
65 appliances upon the train as at 27, and these

appliances are so connected as to shut off the steam and apply the brakes on train No. 2 if it arrives at station A before train No. 1 has left this block and entered the next, (between station B and C) and in case that the
70 enigneer or other official has not noticed the "danger" signals at A, this renders the stoppage of the train automatic and independent of any of the train officials. If, however, train No. 1 reaches station B before train
75 No. 2 reaches A, train No. 1 will act through the depression button 5^b at station B to set the signal at station A to show that the block between A and B is then clear. It also completes the circuit from the battery 30^b
80 through wires 37^b, metallic strip 6^b, loop wire 6^c, wire 69^a, from station B to station A, and this acts to set signal 15 to indicate safety, and by its movement de-energizes the magnet 25 which breaks the circuit through
85 25—25^a, and 18, 18^a so that 26 is lowered, and by releasing the armature of said magnet the arms 26 are allowed to drop out of the way of the contact appliances carried by
90 train No. 2. This clears the track in the block between A and B for train No. 2 and these operations will continue in successive blocks as long as the trains are not nearer together than the distance between the stations. If the train approach from the right
95 in the opposite direction from the movement of the trains previously described on reaching station C, it will first depress button 6^c at that station. The contact thus produced completes the circuit between battery 30^c at
100 station C which energizes the magnet 10^c at this station, and this acting through the intermediate mechanism, as previously described for No. 1, moves the commutator or switch 14^c so as to provide connections
105 through the spring arms 8, 8^a and connecting wires.

When button No. 5^c is depressed the current from battery 30^c at station C passing through wires 31^c, contact 5^c, wires 37^c, metallic strip 6^c, wires 70^b, magnet 19^c, which
110 sets signal 15 at station B to danger, and thus completes the circuit through spring arms 18, 18^a, connecting wires 61^b, 33^b, to set the safety devices 26 at station B, in addition
115 to the signal being set to danger at said station. This will be effected as follows: Train No. 1 having set the forward signal 15^a at station B as previously described, by depressing the button 2 at station A, train 3 when it
120 passes the station C will set the opposite or rear signal 15 at station B and will close the circuit through the contact springs and wires 18, 18^a to energize the magnets 25, 25^b at B and this raises both the front and rear safety
125 devices 26 which are located at each end of the space occupied by the depression buttons from 1 to 3, and will prevent train No. 1 from passing into the block between A and B, and thus meeting train No. 3 approaching from
130

the opposite direction. These safety devices being thus arranged we have an actual control of both trains, so that either train which first arrives at station B will be automatically stopped while the danger signals being also exposed will, if not overlooked, serve to inform the train officials of the positions of the other train.

The operations here described will be represented in any block and with relation to any two or three contiguous stations at the entrance to said blocks when trains are in either of the positions heretofore described.

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

1. The combination in a block signal system of signals located in pairs at the end of each block, depression buttons disposed in series at points adjacent to each signal, means carried by the train by which said buttons are successively depressed, batteries and connections whereby the depressions of said buttons close circuits, an interposed switch actuated by the closing of the first of the circuits, whereby circuits are closed at the distant and adjacent stations upon the entrance of the train into the block and the depression of other buttons, electro magnets energized by the closing of said circuits, and armatures and intermediate mechanism by which the signals are moved and the "danger" signals exposed.

2. The combination in a block system for railways of a series of signals located at the end of each block, depression buttons located in the path of the train, and mechanism carried by the train by which said buttons are successively moved, and electrical circuits closed to expose the "danger" signal at the ends of the block and the preceding block when the train enters said block, safety devices and electro magnets and connections controlled by said signals by which said electro magnets are actuated and the safety devices raised into position, appliances carried by the train and actuated by said devices when raised whereby another train is automatically arrested.

3. The combination in a railway block system of a series of signals located at the end of each block, and capable of being seen from each direction when exposed, devices located in the path of the train and contiguous to the end of each block, depression buttons, and mechanism upon the train whereby said buttons are successively depressed to complete electrical circuits whereby the signals are set to "danger" adjacent to and in advance of the train and restored to their normal position when the train leaves the block, and mechanism located in the path of the train and raised by mechanism controlled by an electrical circuit completed by the movement to danger of two adjacent signals whereby

contacts are produced between said mechanism and devices carried by the train so that any train is automatically arrested before entering the block still occupied by another train.

4. In a block system and railway signaling apparatus, signaling devices mounted upon levers, shafts to which said levers are fixed, cylindrical commutator switches carried upon the shafts of the levers, contact springs or brushes resting upon the periphery of the switch, electro magnets mounted in pairs, armatures movable between said magnets and connections between said armatures whereby the signals are moved and the commutator switches are rotated to make or break an electrical circuit through the contact brushes.

5. In a railway block and signaling apparatus, stations at the ends of each block, depression devices located at said stations, means carried by the train whereby said devices are successively actuated, contacts made by the first depression by which an electrical circuit is established, an electro magnet energized thereby, a revoluble commutator switch and actuating mechanism therefor, and an armature moved by the energizing of the magnet whereby the commutator is turned to complete circuits in readiness to actuate signals at the distant station.

6. In a railway block and signaling apparatus, depression devices located at the ends of each block and contacts by which electrical circuits are completed at each depression, a revoluble commutator switch, an electro magnet, armature, and mechanism actuated thereby to rotate the commutator and complete an electrical circuit with the distant station when the train enters the block, an electro magnet at the distant station, energized by said circuit, an armature, mechanism actuated by the movement of the armature and a signal exposed, and a second commutator switch set in unison with the movement of the signal to complete another circuit whereby a signal is set to protect the entering train.

7. In a railway block and signaling system, depression buttons or the like located at the ends of each block and means carried by the train by which said buttons are successively depressed, commutator switches, electro magnets, armatures and intermediate mechanism whereby the switches are moved by the entering of a train at either end of a block, and electrical connections established and a danger signal set at the opposite end, other commutator switches, and mechanism by which they are set in unison with the setting of said signals to complete new circuits through which electric currents are passed by the depression of subsequent buttons and the advance of the train.

8. The combination with the depression devices and signals of a railway block and

signaling system, of a revoluble commutator switch, said switch consisting of a cylinder with a series of encircling conducting bands, elastic arms disposed in pairs and resting on the periphery of the cylinder at each side of a plane through its axis, longitudinally disposed insulated surfaces upon which one set of said arms rest when the others rest upon the conducting bands, and mechanism to rotate the cylinder in unison with the approach of a train from either direction.

In witness whereof I have hereunto set my hand.

HOMER G. COMSTOCK.

Witnesses:

S. H. NOURSE,

JESSIE C. BRODIE.