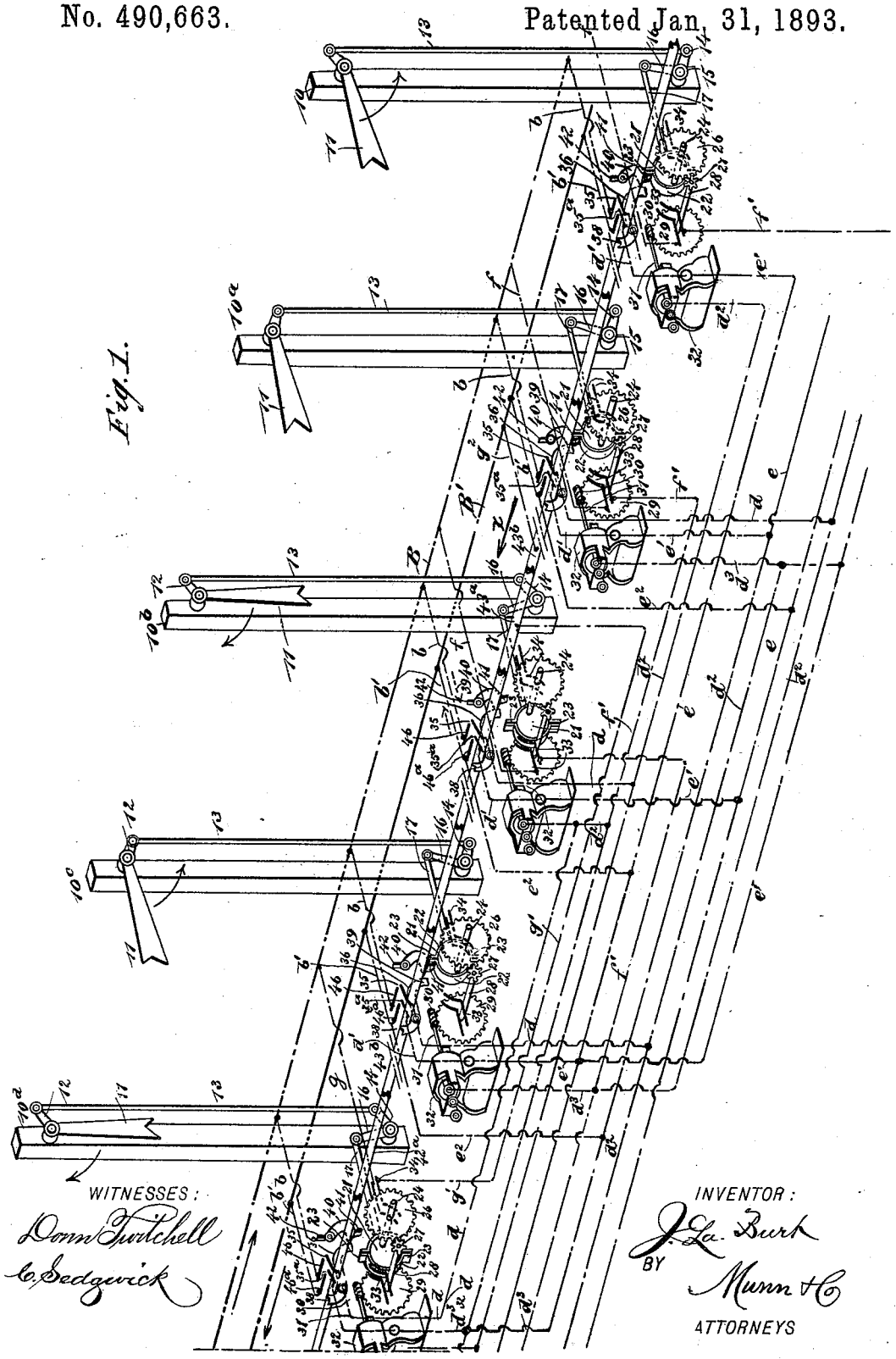
(No Model.) 4 Sheets—Sheet 1.

J. LA BURT.

ELECTRIC BLOCK SIGNAL SYSTEM.

No. 490,663. Patented Jan. 31, 1893.

Fig. 1.



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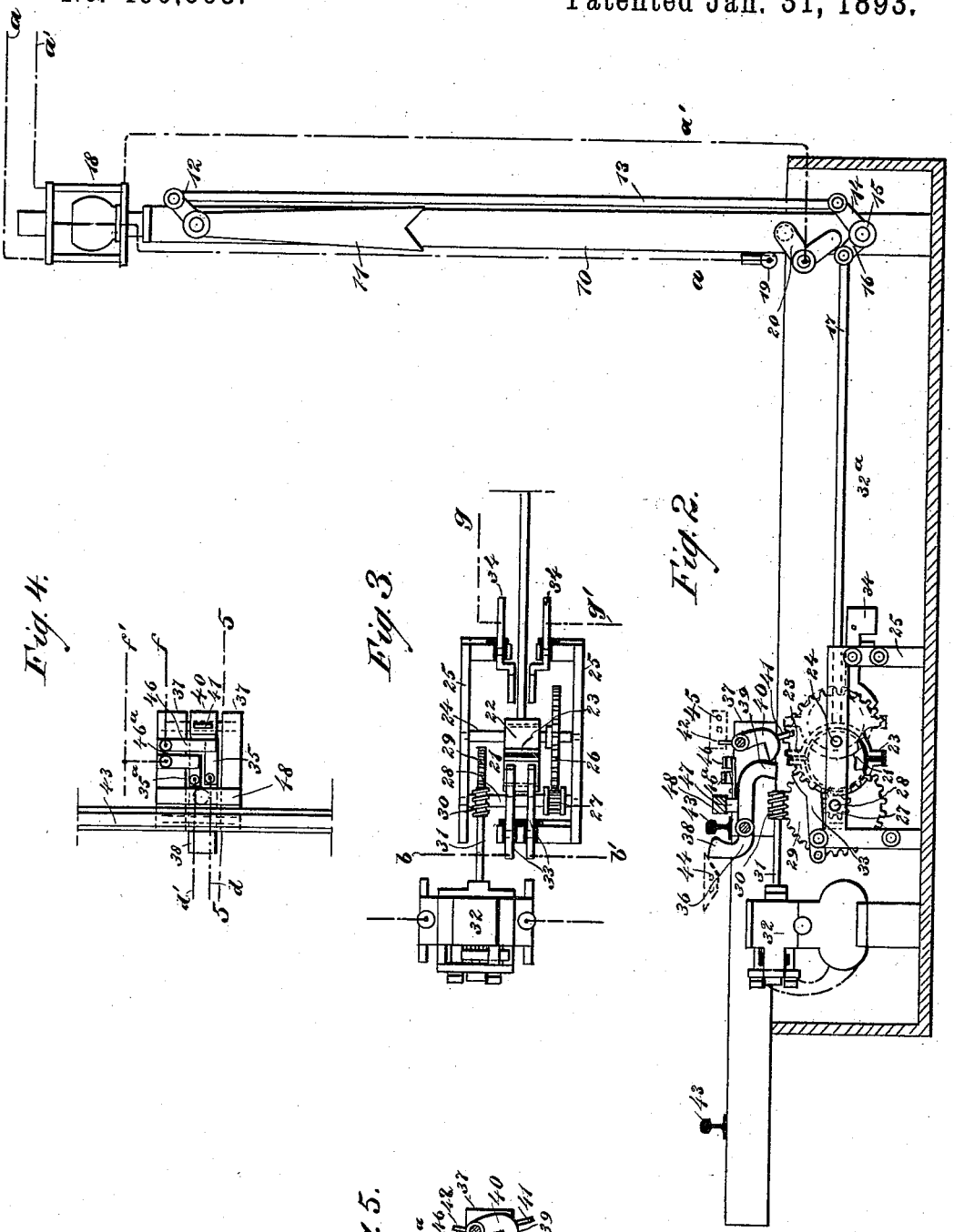
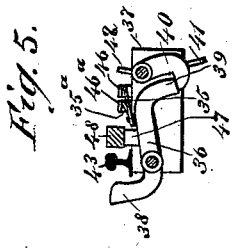


Fig. 4.

Fig. 3.

Fig. 5.



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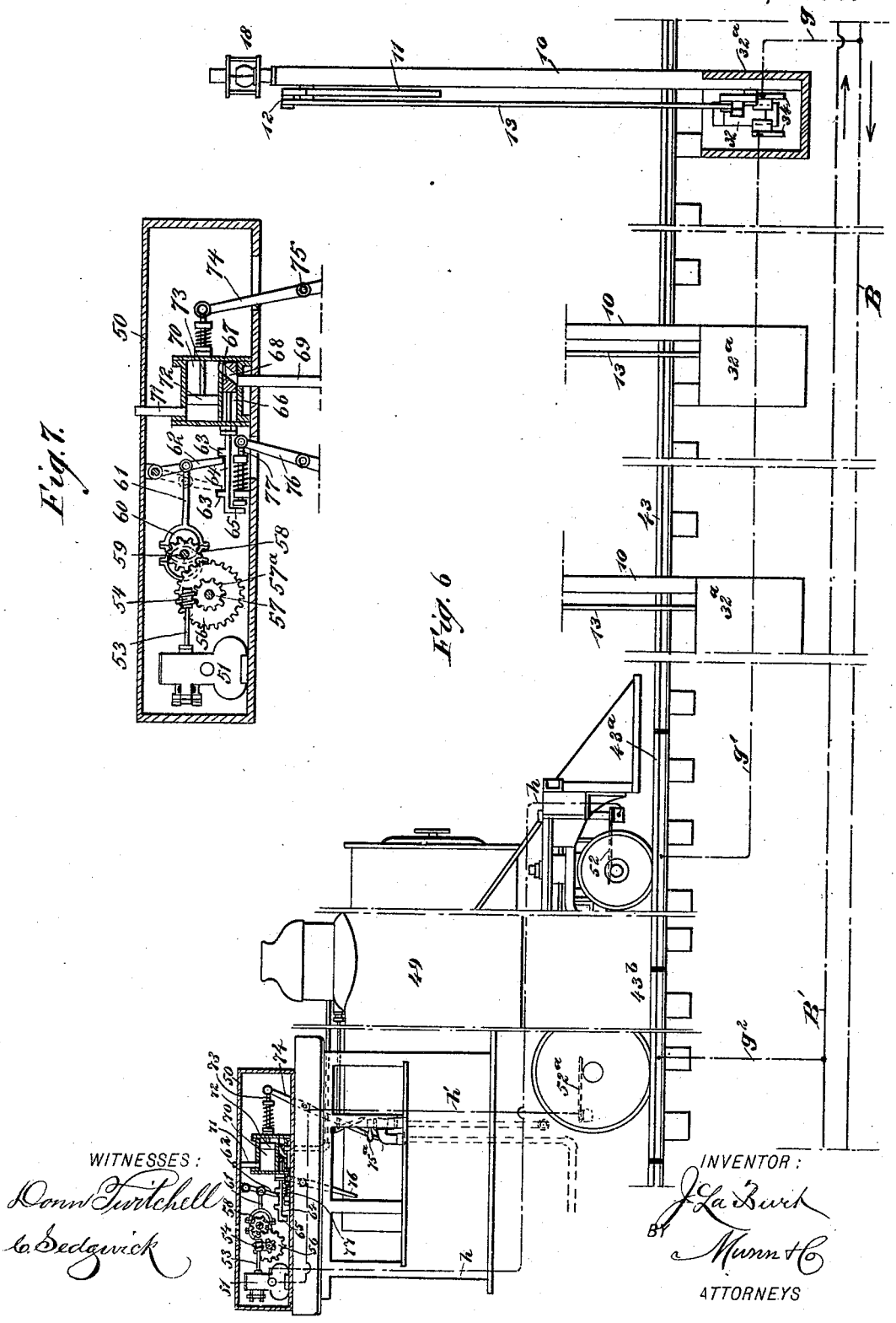

Fig. 7.

Fig. 6.

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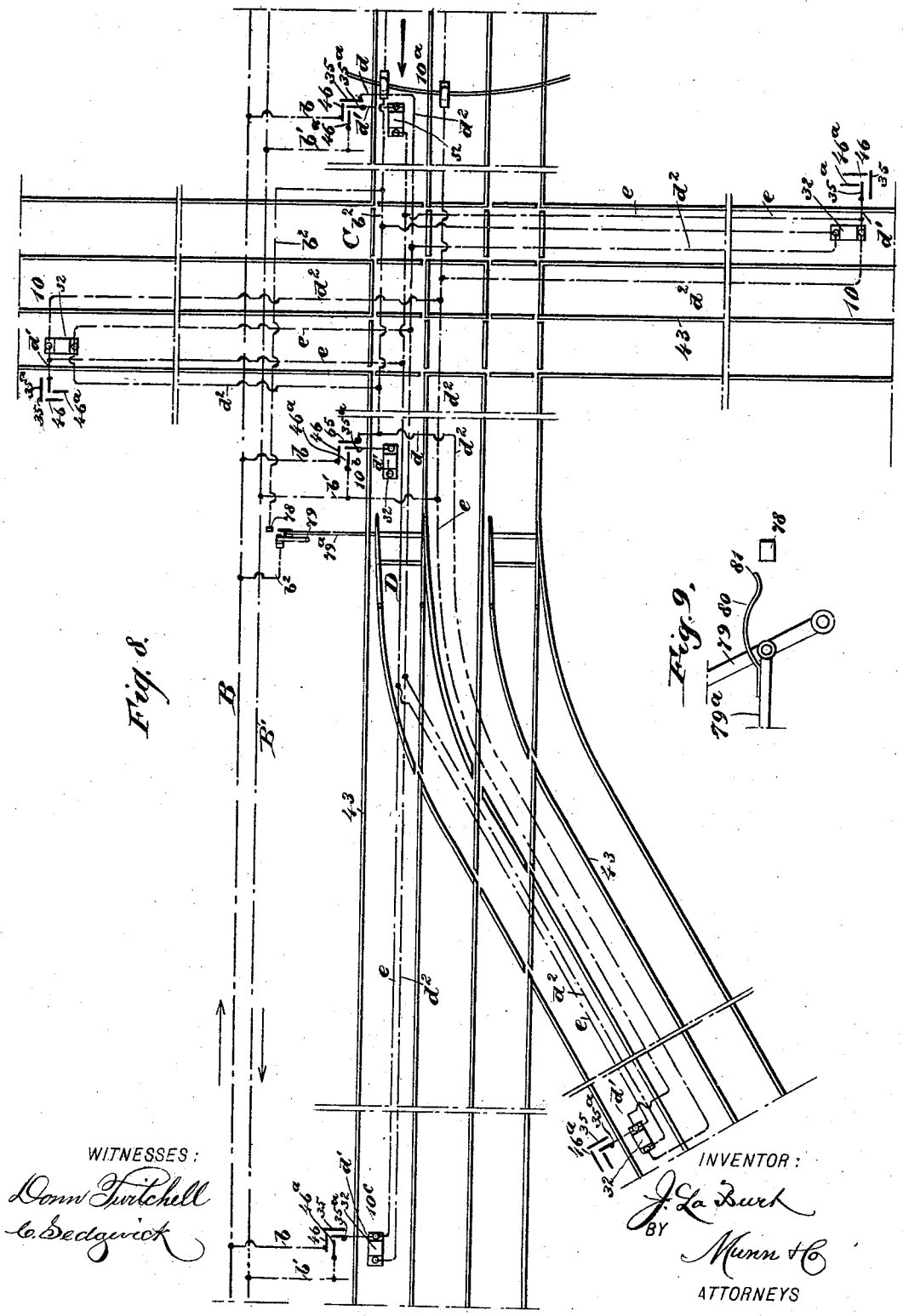

Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN LA BURT, OF NEW YORK, ASSIGNOR TO THE AGRICOLA LA BURT MANUFACTURING COMPANY, OF BROOKLYN, NEW YORK.

ELECTRIC BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 490,663, dated January 31, 1893.

Application filed December 14, 1891. Serial No. 415,000. (No model.)

To all whom it may concern:

Be it known that I, JOHN LA BURT, of the city, county, and State of New York, have invented a new and Improved Electric Block-Signal System, of which the following is a full, clear, and exact description.

My invention relates to improvements in signal systems for railroads, and the object of my invention is to produce a positive working system which will be automatically operated by the movements of the trains, which will operate signals in advance of and in the rear of every train so that danger from collision will be averted, and which will also operate to shut off the steam of a locomotive in case the engineer, through accident or mistake, runs over the signal.

My invention is especially intended as an improvement on the system for which I obtained Letters Patent of the United States, No. 461,760, dated October 20, 1891.

To this end my invention consists in a system and apparatus which will be hereinafter decribed and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a broken perspective view of the mechanism of the system showing also the diagram of the connections; Fig. 2 is a cross section showing the connections between one of the motors and an adjacent semaphore and showing also the mechanism for closing the electric circuit to start the motor; Fig. 3 is a broken detail plan of the motor, and the mechanism for closing the circuit through adjacent motors and also through the track rails; Fig. 4 is a broken detail plan view of the contacts adapted to close the circuit by pressure of a locomotive; Fig. 5 is a cross section of the same on the line 5—5 in Fig. 4; Fig. 6 is a broken side elevation, partly in section, showing the connections between the sections of the track rails, the connections between said connections and the mechanism on the locomotive, and the electrically operated mechanism carried by the locomotive and adapted to shut off the steam supply; Fig. 7 is an enlarged detail sectional view of the steam shut-off mechanism; Fig. 8 is a diagrammatic view showing the arrangement of the apparatus at a crossing and switch; and Fig. 9 is a detail view of the electric switch adapted to operate in unison with the rail switch.

At intervals along the track are erected the signal posts 10 which are provided with common forms of semaphores 11, adapted to swing thereon, the semaphores having cranks 12 connected therewith, and the cranks are pivotally-secured to rods 13 which extend nearly parallel with the posts and each rod is pivoted at its lower end to one arm 14 of a double crank or bell crank 15, which is pivoted on the lower portion of the post, and the opposite arm 16 of the bell crank is pivotally-connected with an eccentric rod 17 which extends transversely to the track and is operated by a motor, as described below. The above construction is substantially the same as that shown in my former patent referred to above, and I do not claim it as a part of this invention.

The signal posts and semaphores are all alike, but for convenience in describing their operation, I have marked them in Fig. 1, 10, 10^a, 10^b, 10^c and 10^d. Each post is provided at the top with an electric light as shown in Fig. 2, the lights being omitted from Fig. 1, as that figure is intended merely to show the connections, and the lights are provided with the usual connecting wires a and a', the wire a being connected to a contact 19 near the base of the signal post, and an elbow switch 20 is pivoted on the post adjacent to this contact, the switch extending into the path of the crank arms 14 and 16, so that when the said crank arms are operated to set the semaphore, the circuit will be closed or opened as the case may be, thus lighting or putting out the electric lamp.

The lights are intended for use in the night when the semaphores cannot be seen, and the mechanism described is also shown in my former patent. The eccentric rod 17 of each signal extends inward toward the track and at its inner end it is connected with the usual

form of eccentric 21 which is provided with a metallic face 22, the faces on opposite sides being insulated from each other and also from the eccentric, and the faces are also bent outward at top and bottom to form stops 23 the upper of which is adapted to trip the circuit closing mechanism and hold the semaphore from being depressed as hereinafter described.

The eccentric 21 is carried by a shaft 24 which is pivoted in a suitable supporting frame 25 and which is provided with a gear wheel 26 which meshes with a pinion 27 on the shaft 28, the latter being also supported in the frame 25, and the shaft 28 connects by means of a worm wheel 29 with a worm 30 on the end of the armature 31 of the motor 32. The motor 32 may be of any approved construction, and a motor is provided for each semaphore, and the motor and the parts just described and those presently to be referred to, are inclosed in a casing 32^a located below one of the track rails. In the path of the eccentric and in the front and rear thereof are pairs of contacts 33 and 34, the contacts 33 being insulated from each other and being arranged so as to strike the conducting face of the eccentric when a semaphore is down, as shown at 10^b in Fig. 1, and the contacts 34 are also insulated from each other and are adapted to strike the rear conducting face of the eccentric when a semaphore is up and the eccentric is in its back position, as shown at the semaphore 10^a in Fig. 1. The connections with these contacts and the circuits operated by them will be described below.

Adjacent to one of the track rails and opposite each semaphore are spring contacts 35, 35^a, which are insulated from each other, and which are carried on a crooked lever 36 extending beneath the track rail and pivoted on a suitable supporting frame 37. The lever has one end 38 bent upward so as to extend to a point adjacent to the tread of the rail so that it will be struck by the wheel of a passing locomotive as best shown in Fig. 2, and the opposite end of the lever is bent downward, as shown at 39 in the same figure. Pivoted on the frame 37 adjacent to the inner and depending end of the lever 36 is a latch 40 which is shaped so that it will swing by gravity beneath the end of the lever when said end is raised, and this latch has at its lower end, a projection 41 which extends into the path of the stop 23 on the upper side of the eccentric 21 and on the upper end of the latch is another projection or pin 42 which is adapted to be operated by a moving portion of a draw bridge.

The apparatus is intended to work from contact with a draw, as well as from contact with the wheels of the locomotive, as illustrated in Fig. 2, where a beveled portion 44 of the draw bridge indicated by dotted lines is about to engage the upper end of the lever 36, and it will be seen that by so engaging the lever, it will tilt it and cause the lower end to be raised so that the latch 40 may swing beneath the said lower end and hold it elevated. When the draw moves in the opposite direction, the part 45 thereof is adapted to strike the pin 42 on the latch, thus releasing the latter and breaking the circuit.

Supported adjacent to the lever and at right angles to the contacts 35 and 35^a are other contacts 46 and 46^a, which are adapted to contact with the contacts 35 and 35^a when the latter are raised. A rail or support 48 is placed nearly parallel with the track rail 43 so as to extend above the inner portion of the lever 36 and on the under side of this support is a rubber block 47 which is adapted to contact with the lever and the block is large enough and solid enough so that it will prevent the weight of a man from operating the lever 36 and closing the contacts and electric circuit, and it will thus be seen that the block will prevent any tampering with the signal apparatus.

The connections between the motors and the various contacts are as follows: Each contact 46 connects by a wire b with one of the line wires B which runs parallel with the track and the opposite contact 46^a connects by a wire b' with the return line wire B'. The contact 35 which is adapted to be struck by the contact 46 connects by a wire d with a wire d^2 which runs parallel with the track and connects with motors in front and rear of the particular contacts described, and the contact 35^a connects by means of a wire d' with the nearest motor 32 from which the wire e' connects with a wire e also running to the motors in front and rear of the particular motor with which the wire is directly connected. The contact 46^a also connects directly by the wire e^2 with one of the wires e and the several motors are connected with the wires d^2 by wires d^3. One of the contacts 33 connects directly with the line wire B by a wire f, and the adjacent contact 33 connects by a wire f' with the wires d^3 leading to motors along the line.

The contacts 34 are connected as follows: One of them connects by a wire g with the line wire B, as shown at the signal 10^d in Fig. 1, and the adjacent contact connects by a wire g' with an insulated section 43^a of the track 43, an adjacent section 43^b of the track being directly connected with the line wire B' by a wire g^2. These insulated sections 43^a and 43^b of the track are placed such a distance apart that when the locomotive comes opposite them, the front wheel and front driver of the locomotive will rest upon the adjacent sections, as shown in Fig. 6, and the circuit will thus be closed through the mechanism of the locomotive, as described below. On account of the number of circuits and to avoid confusion only enough of them is shown in Fig. 1, to illustrate clearly how the parts are connected up as it will be understood that the motors at each semaphore are similarly connected. The electric currents run in different directions through the same wires to perform different operations and these opera-

tions will be clearly set forth and the circuits followed in describing the operation of the apparatus.

The locomotive 49 is provided with a case 50 which is preferably carried on the cab of the locomotive but may be arranged in any convenient place, and in this case is an electric motor 51 which connects by means of wires h and h' with brushes 52 and 52^a adapted to contact with the hubs of two of the locomotive wheels, as shown in Fig. 6, so that when said wheels are on sections 43^a and 43^b, the circuit through the motor will be closed and the motor started.

In the drawings I have shown an ordinary motor, but have not shown it in detail. It will be noticed that the motor must act very quickly in order to make a revolution and complete the operation of the valve actuating mechanism, as hereinafter described, and it is necessary that a special motor be used which will make a revolution when the circuit is closed but momentarily through it. The special form of motor is not shown however, as it forms no part of this invention.

The motor has its armature shaft 53 prolonged and the shaft terminates at one end in a worm 54, as best shown in Fig. 7, and the worm meshes with a pinion 57^a on a shaft 57 mounted in the case 50, and the shaft has a pinion wheel 56 thereon which meshes with a gear wheel 58 carried by a shaft 59 and on the latter shaft is a common form of eccentric 60, the eccentric rod of which is pivotally-connected with a swinging lever 62 which is pivoted in the upper portion of the case and extends downward therein, the lower end of the lever moving between the lugs 63 on the rod 64 which rod, at its outer end is bent downward as shown at 65 and has its inner end extended into a small steam chest 66, so as to reciprocate therein and form the stem of a slide valve 67 which moves in the chest and which has a diagonal port 68 extending through it, the port being adapted to connect with the steam supply pipe 69 and also with a port in the steam cylinder 70, which cylinder has an exhaust 71 at one end and is provided with a sliding piston 72, the piston rod 73 of which projects outward and forward through the end of the cylinder and is repressed by a spring, the front end of the rod being pivoted to a lever 74 which lever is centrally pivoted as shown at 75 and is adapted to connect with the engineer's shut off lever. At the opposite end of the steam cylinder 70 is a lever 76 which is adapted to move in a slot in the case 50 and which connects with a spring pressed rod 77, the end of which is adapted to contact with the bent end 65 of the rod 64 and by means of this lever 76, the rod 64 may be pulled back so as to shut off the steam supply to the cylinder 70. When the circuit is closed to the motor it will begin to revolve and to move the eccentric rod so as to force forward the rod 64 and open the valve 67, and the incoming steam will push back the piston 72 and thus shut off the steam from the locomotive so that the locomotive will stop. This shut off mechanism is intended to operate only when the engineer has over-run a signal, and the circuit through the motor will not be closed at any other time, as described below. The shut off mechanism with the exception of the motor and its connection with the lever 62 is similar to the mechanism shown and described in my patent above referred to.

The operation of the device is as follows: To guard against collisions, the system is arranged so as to operate the second semaphore in front and rear of a train. We will suppose that a train is moving in the direction of the arrow x in Fig. 1, and is about to pass the signal 10^b. In this case, the semaphore of the signal 10^b will be down, the semaphore of the signal 10^d will be down, and the semaphores of the signals 10, 10^a and 10^c will be up. When the wheel of the locomotive strikes the bent end 38 of the lever 36 opposite the signal 10^b it will close the contacts 35, 35^a and 46, 46^a, and when the semaphore is down the contacts 33 will be in connection with the front insulating face of the eccentric 21. When the contacts 35, 35^a and 46, 46^a are closed, the first circuit will be from the wire B through the wire b, the contacts 46 and 35, the wire d, the wire d^2, the wire d^3 to the motor 32 opposite the signal 10, thus setting the motor in motion so as to turn down the semaphore of said signal, thence through the wire e', the wire e^2, the contact 46^a and the wire b' to the line wire B'. The current flowing through the above circuit will thus operate the semaphore 11 of the signal 10 and turn it down as described. The circuit will also be completed through the wire b, the contacts 46 and 35, the wire d to the wire d^2, thence forward to the motor 32 opposite the signal 10^d, thus operating the motor to raise the semaphore of the signal, thence through the wires d^2, d^3 and d', to the contacts 35^a and 46^a and the wire b' to the wire B'. At the same time a circuit will be completed which will be as follows: Through the wire f, the contacts 33, the wire f', the wire d^3 connecting with the motor 32 opposite the signal 10^c, thus starting the motor so as to throw down the semaphore of the signal, thence back through the wire e', the wire e, the wire e^2, the contact 46^a and the wire b' to the line wire B'. It will thus be seen that the passage of a train past a particular signal will throw down the next semaphore arm in advance of the train, throw up the second semaphore arm in advance so as to warn any approaching train on the same track, and it will throw down the second semaphore arm in the rear so as to permit the advance movement of a rear train, and this operation will be repeated at each signal passed. When the semaphore arm is up, the back insulated face of an eccentric 21 is in contact with the contacts 34, as shown at the signals 10, 10^a and 10^c in Fig. 1, and consequently the line wires

B and B′ are connected by means of the wires g g' and g^2 with the sections 43^a and 43^b of the track in front and rear of the said signals. It will thus be seen that when the two wheels of a locomotive rest upon these connected sections as in Fig. 6, the circuit will be closed through the motor 51, the circuit being from the front wheel of the locomotive, through the brush 52, the wire h, the motor, the wire h', the brush 52^a, the driver of the locomotive, back to the section 43^b. If, then, the locomotive should overrun a signal, the circuit through the motor 51 will be automatically closed, and the motor started so as to shut off the steam, and as a further precaution, an electric light 75^a is arranged within the cab and in the motor circuit, so that the light will be started in unison with the motor, and the light may be provided with a common switch so that it may be shut off during the daytime.

In Fig. 8, I have shown the application of the system to a railroad crossing and to an ordinary switch. The connections in this case are substantially like those in the single track, except at the crossing C, the wires e and d^2 connecting the motors of two tracks are coupled together so that when a locomotive on either track sets the semaphore of its particular track, it will also set the semaphores of the other track, and thus the semaphores will be displayed on all sides of the crossing or they will be co-instantaneously turned down.

To provide for setting the semaphores by the movement of the switch D, the following mechanism is employed: The siding tracks of the switch are provided with signals exactly like those already described, and the wires e and d^2 of the siding are connected with the similar wires of the main track. The switch lever 79 which connects with the switch bar 79^a in the usual way is placed adjacent to a contact block 78 which connects with the main line wire B by the wire b^2 and also connects with the motor wires of the semaphore by the same wire, and the lever 79 has a spring contact 80 extending laterally from it, which contact is connected with the wire b^2 and serves as an electric switch, the spring 80 having a bent free end 81 adapted to make a sliding and intermittent contact with the block 78. It will thus be seen that when the switch is closed, the part 81 of the spring will slide over the contact block 78 and the circuit through the various semaphore motors will be momentarily closed so as to raise the semaphore arms and thus warn trains approaching from any direction and when the switch is opened, the circuit will again be momentarily closed, but the motors will operate to turn down the semaphore arms. When the circuit is closed through one of the motors and the semaphore arm is down, the motor will operate, and the motors connected with other semaphores which are down will also operate, until the upward and backward movement of the eccentric causes the stop 23 to engage the pin 41 on the latch 40 thus swinging the latch from beneath the lever 36 and permitting the lever to drop, thus breaking the circuit, and the arm will then be up and the stop 23 will operate so as to prevent the backward movement of the eccentric caused by the weight of the semaphore arm, and the arm will thus be held raised until the motor is again started in the manner already described.

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

1. In a block signal system, the combination with the signal posts, the swinging semaphores thereon, the motors opposite the signal posts and the eccentrics or equivalents operated by the motors and having a crank connection with the semaphores, the eccentrics having also insulated conducting faces, of contacts arranged in the path of the eccentrics, double contacts arranged adjacent to the track rail and connected with a source of electricity, means for closing the circuit through the double contacts by the movement of a train, and connections between the double contacts, the eccentric contacts and the motors along the track, substantially as described.

2. In a block signal system, the combination with the signal posts and the swinging semaphores thereon, of motors arranged adjacent to the signals, eccentrics geared to the motors and having crank connections with the semaphores, the eccentrics also having insulated conducting faces, contacts arranged in the paths of the eccentrics and connected respectively with a source of electricity and with adjacent motors, movable contacts arranged adjacent to the track rails and connected with a source of electricity and with the several motors, and means for closing the circuit through the movable contacts by the passing of a train, substantially as described.

3. In a block signal system, the combination with the contacts 46 and 46^a connected with a source of electricity and with the track motors as described, of the bent lever pivoted adjacent to the track and carrying contacts adapted to connect with motors along the track, the said lever having one end bent upward into the path of a locomotive wheel and having a depending end, a gravity latch adapted to engage the depending end of the lever and hold it in a raised position, and means for automatically releasing the latch, substantially as described.

4. In a block signal system, the combination with the motors and eccentrics connected with the semaphores as described, the eccentrics having stops on their upper sides, of the contacts 46 and 46^a connected with the line wires and motors, the bent lever pivoted adjacent to said contacts and having one end extending into the path of the locomotive wheels, and the opposite end bent downward, contacts carried by the lever and adapted to engage the contacts 46, 46^a and close the cir-

cuit through adjacent motors, and a gravity latch adapted to engage the bent lever, said latch having a pin projecting into the path of an eccentric stop, substantially as described.

5. In a block signal system, the combination with the semaphores and the eccentrics connected therewith, said eccentrics having an insulated conducting face, of insulated track sections connected with electric contacts arranged in the paths of the eccentrics, and an electrical signaling apparatus carried by the locomotive and having electrical connections with the wheels of the locomotive, whereby the circuit will be closed through the apparatus by the contact of the wheels with the track sections, substantially as described.

6. The combination with electrically-connected track sections, the motor operated semaphores along the track, and circuit closing eccentrics operated by the semaphore motors and adapted to close the circuit through the track sections and an engine carried by the locomotive and adapted to operate the shut off valve thereof, of an electric motor carried by the locomotive and geared to operate the valve of the engine, and connections between the motor and the wheels of the locomotive, whereby the circuit through the motor will be closed by the contact of the wheels with the track sections, substantially as described.

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