R. J. HEWETT.

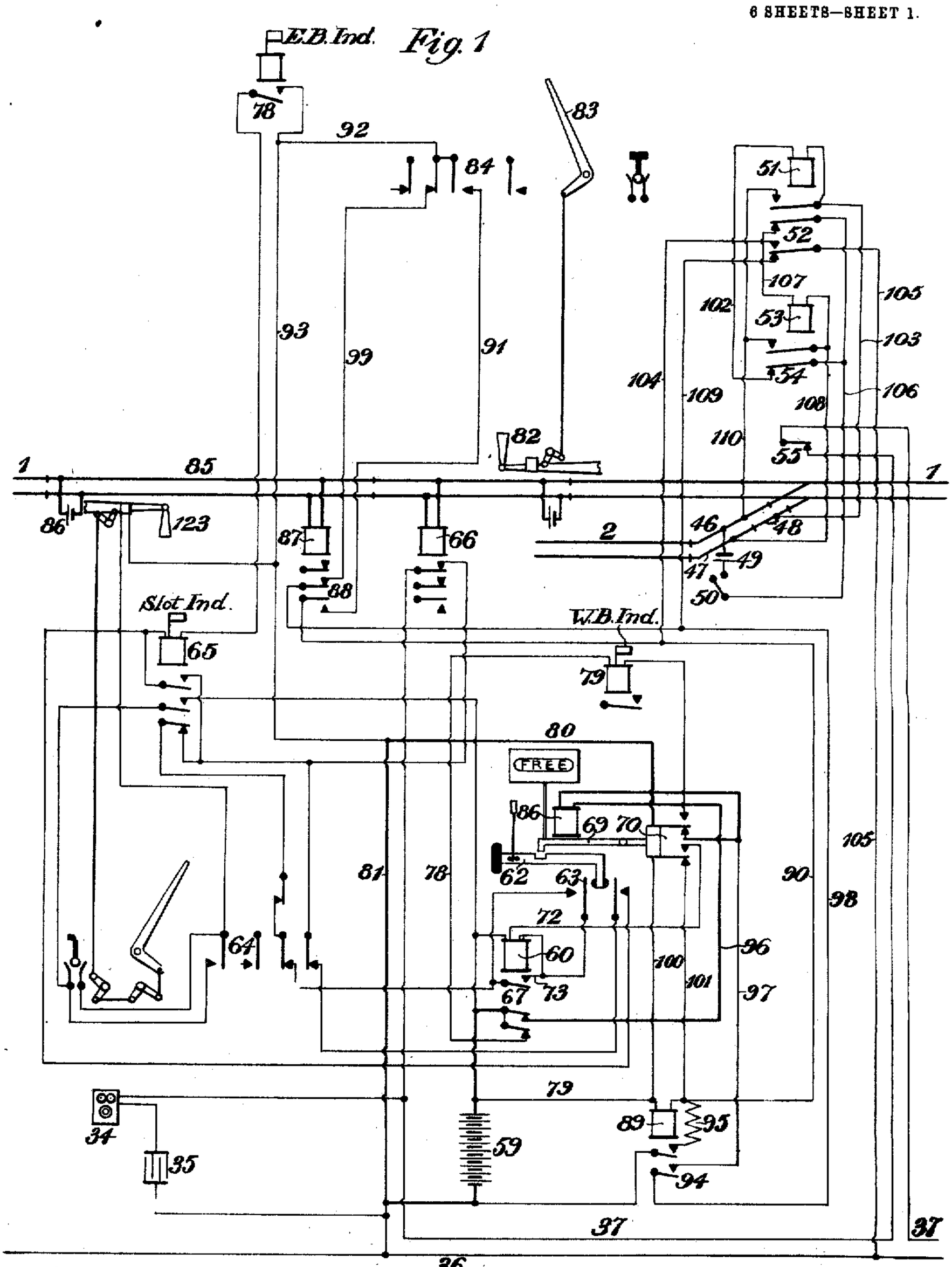
LOCK AND BLOCK SIGNAL SYSTEM.

APPLICATION FILED JAN. 10, 1908.

906,800. Patented Dec. 15, 1908

6 SHEETS—SHEET 1.

Fig. 1



Witnesses

Edward S. Cowen

Harry Leuro

Inventor

Robert J. Hewett

by Henry D. Williams

Attorney

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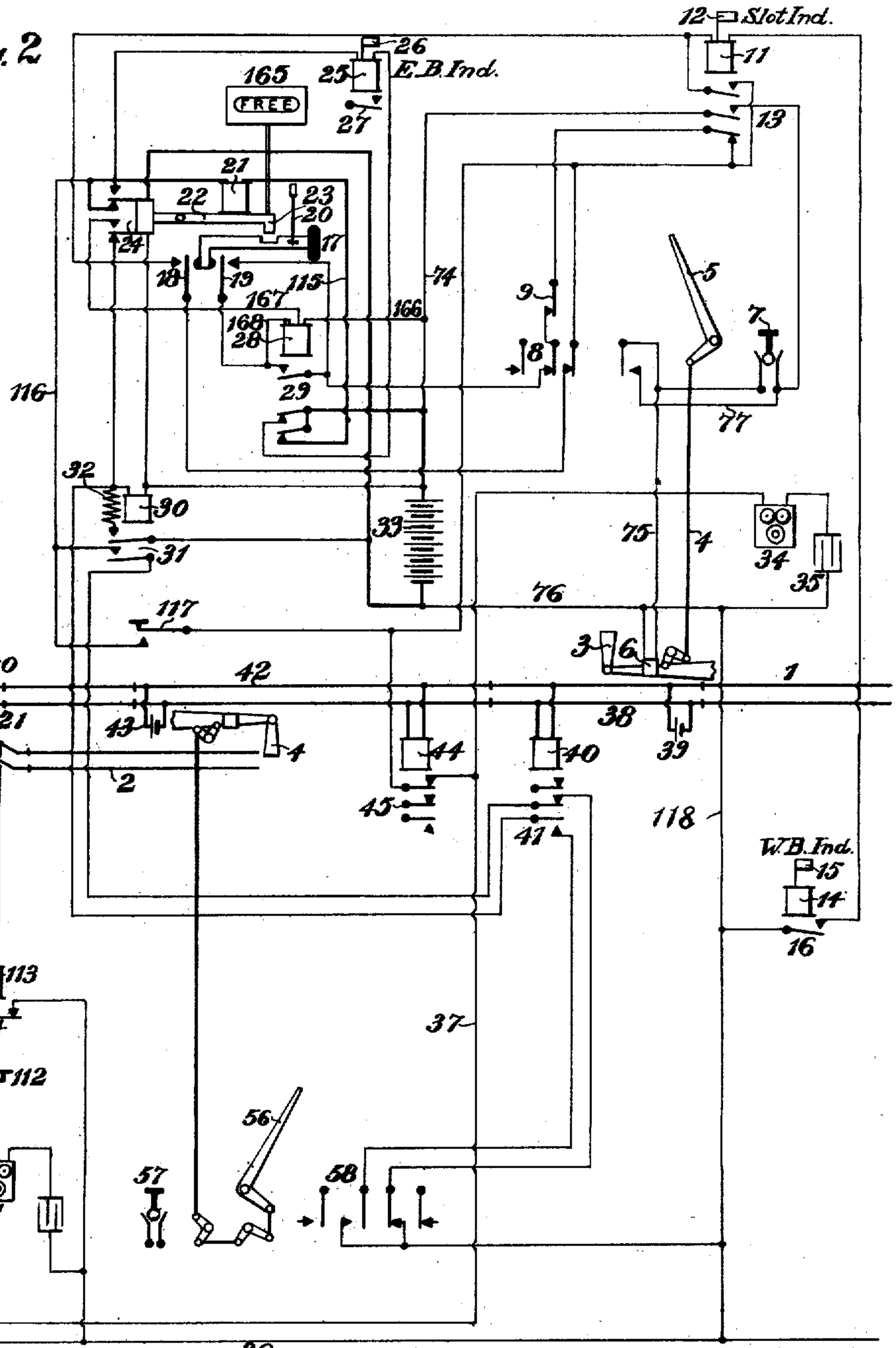
6 SHEETS—SHEET 2.

Fig. 2



Witnesses

Bernard Cowen

Harry Lewis

Station A

Inventor

Robert J. Hewett

by Henry B. Williams

Attorney

R. J. HEWETT.

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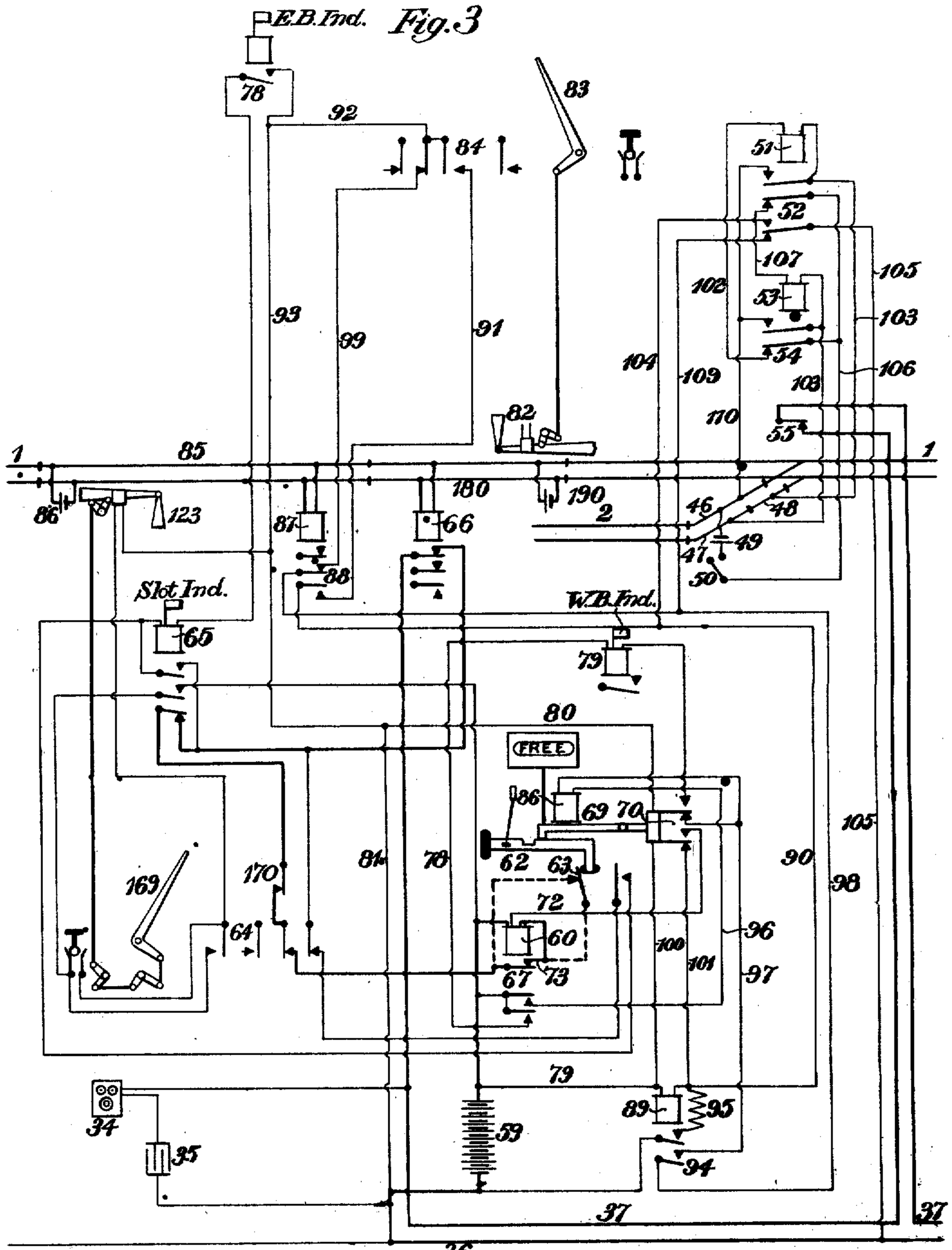
6 SHEETS—SHEET 3.

E.B. Ind. *Fig. 3*



Witnesses

Harry Lewis

Station B

Inventor

Robert J. Hewett

by Henry B. Williams

Attorney

R. J. HEWETT.

LOCK AND BLOCK SIGNAL SY[illegible]

APPLICATION FILED JAN. 10, 1908.

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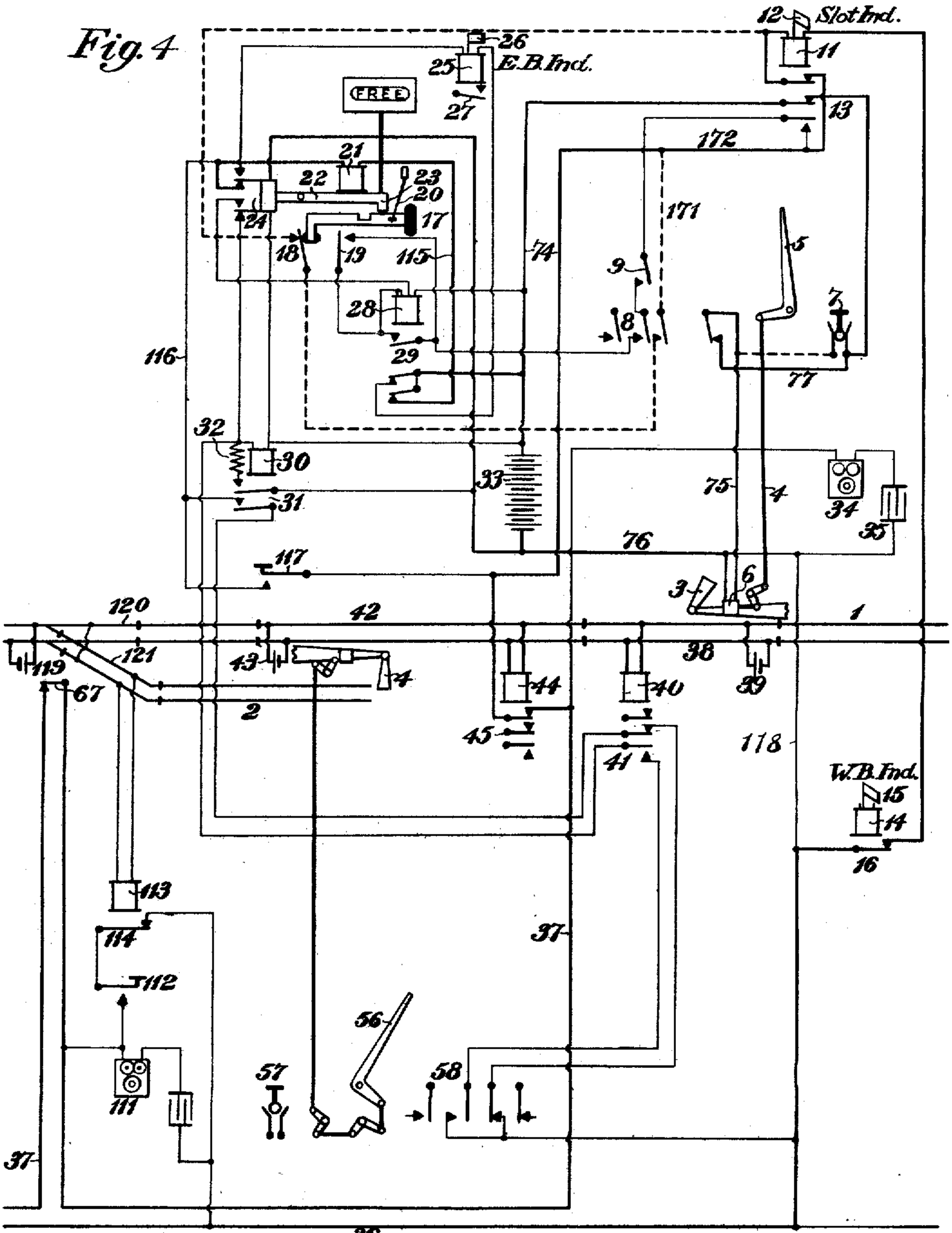
6 SHEETS—SHEET 4.

Fig. 4



Witnesses

Station A

Inventor

Robert J. Hewett

by Henry D. Williams

Attorney

R. J. HEWETT.

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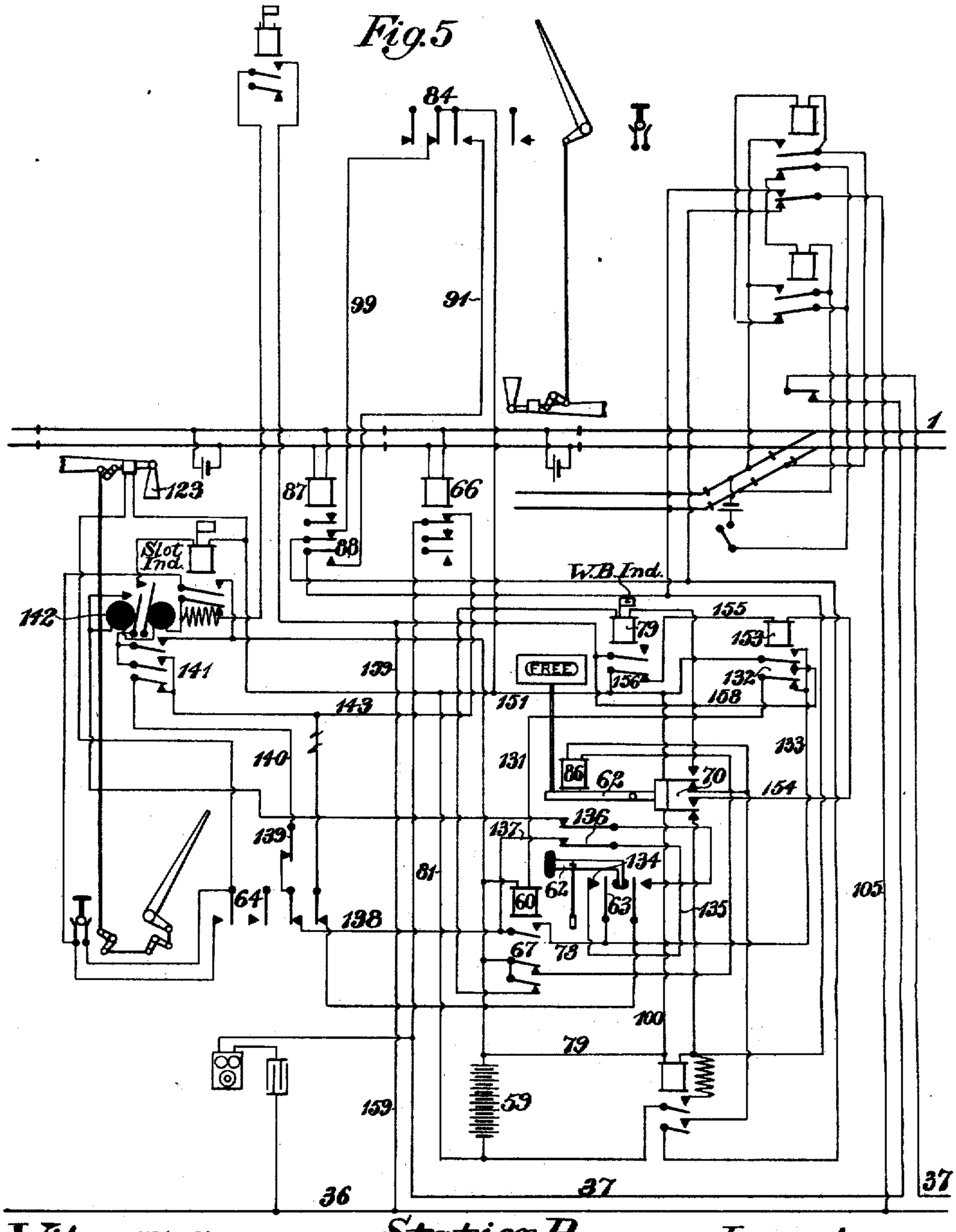
6 SHEETS—SHEET 6.

Fig. 5



Witnesses

Harry Lewis

Station B

Inventor

Robert J. Hewett

by Henry D. Williams

Attorney

R. J. HEWETT.

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APPLICATION FILED JAN. 10, 1908.

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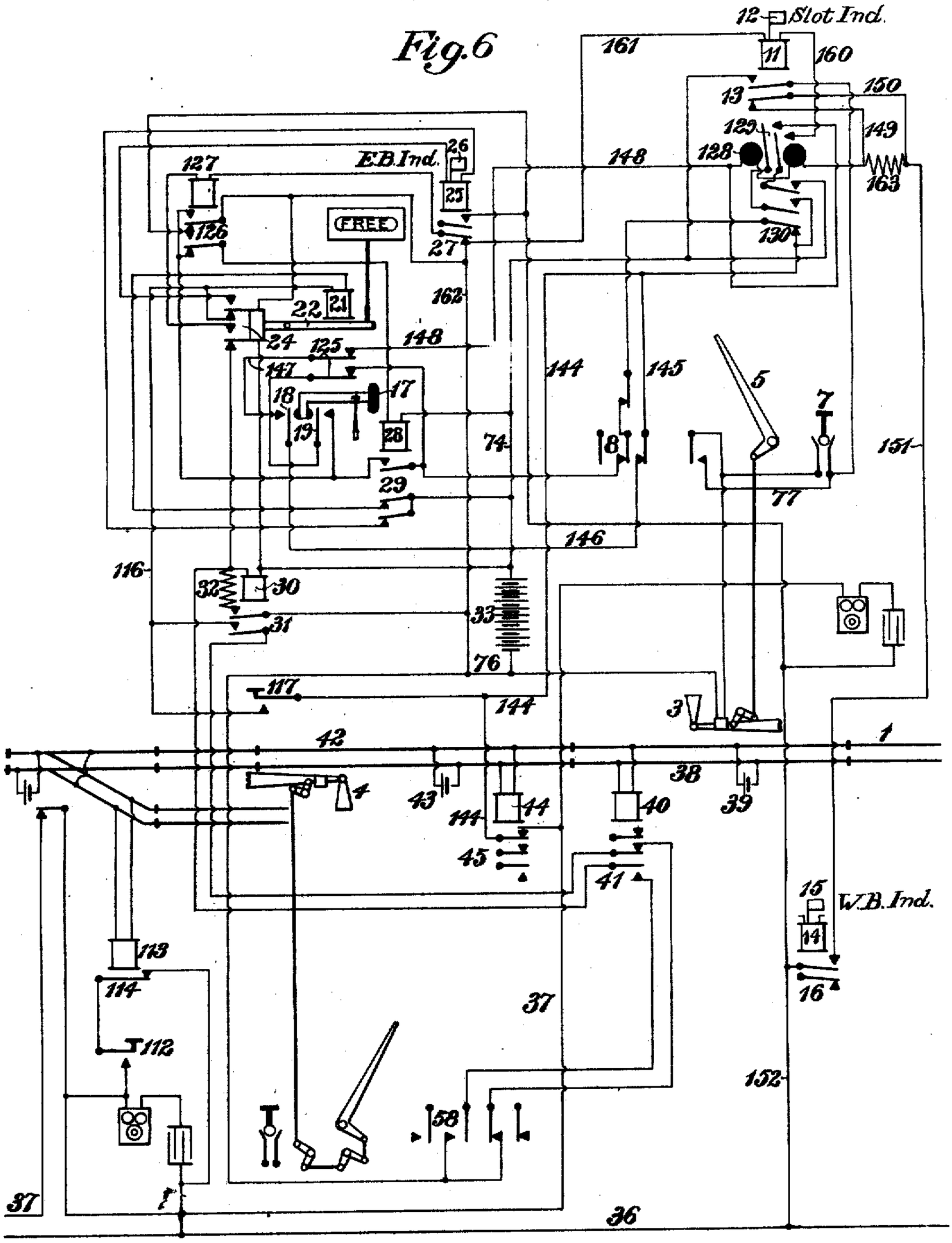
6 SHEETS—SHEET 6.

Fig. 6



Witnesses

Bernard Lowen

Harry Lamb

Station A

Inventor

Robert J. Hewett

by Henry D. Williams

Attorney

UNITED STATES PATENT OFFICE.

ROBERT J. HEWETT, OF WESTFIELD, NEW JERSEY, ASSIGNOR TO THE HALL SIGNAL COMPANY, A CORPORATION OF MAINE

LOCK AND BLOCK SIGNAL SYSTEM.

No. 906,800. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed January 10, 1908. Serial No. 410,278.

To all whom it may concern:

Be it known that I, ROBERT J. HEWETT, a citizen of the United States, residing at Westfield, in the county of Union and State of New Jersey, have invented a certain new and useful Improvement in Lock and Block Signal Systems, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates particularly to signal lock and block systems for use in connection with single-track railways, although it embodies various novel features applicable as well to double-track systems.

One object of the invention is to produce a signal system in which the operation is partly automatic and partly manually-controlled, but in which the various portions of the apparatus are so connected that any failure either in the apparatus itself or in the accuracy of the signal operator in the performance of his duties will result in leaving the signals in danger position, to which they have a normal bias, so that the operator is constrained to perform all his duties in proper order and to maintain every part of the apparatus in working condition in order to clear the signals and admit trains to the block.

The system, as applied to a single-track road, is designed to prevent the admission of a train at either end of the block as long as any portion of the block is occupied, but it comprises arrangements by which a train diverted from the main line to a siding may automatically effect a release of the signaling apparatus in the same manner as if the train had passed through the block.

Another object of the invention is to secure economy both in line construction and in consumption of current.

The apparatus is so constructed that a single circuit alone is necessary to connect the stations for all operations relating to traffic in both directions, the necessary changes in the condition of the apparatus at the intercommunicating stations being secured by three conditions of this circuit with respect to the flow of current therein. In the preferred form of the invention these three conditions are, first, that in which no current flows—the normal condition of the circuit—second, that in which a current of comparatively small strength flows, and, third, that in which a current of comparatively great strength flows. Currents of opposite polarity may, however, be substituted for the currents of different strength of the second and third conditions, by the use of suitable polarized apparatus, as is hereinafter more particularly set forth. The economy in current consumption is effected by the use of apparatus for automatically reducing the line current to a minimum by the use of resistance except at the moment when the maximum current is necessary for the initial actuation of the apparatus.

The invention comprises various combinations and arrangements of apparatus which will be more specifically described in connection with the accompanying drawings, in which—

Figures 1 and 2 are diagrams of two signal stations located at opposite ends of a block, showing so much of the apparatus at each station as is necessary to their coöperation, the apparatus being represented in its normal condition. Figs. 3 and 4 are diagrams showing the condition of the apparatus after a signal has been set to admit a west-bound train to the block. Figs. 5 and 6 show a modified form of apparatus.

The drawings show the arrangement of the apparatus of the two signal stations at opposite ends of the same block. The apparatus is shown completely in so far as it pertains to the control of this block, but apparatus and circuits which would be provided at these stations for communication with the next stations beyond are omitted, to simplify the drawings.

A single track 1 serves for traffic in both directions, and is provided with a siding 2 at each station, and the sidings and their switches are interconnected electrically with the signal system. At station A there is a west-bound signal 3 and an east-bound signal 4. The signal 3 is connected, by mechanical connections 4, with a signal lever 5 by which it may be actuated. Its operation is dependent, however, on an electric "slot" 6, which serves, in a well known manner, to connect the signal and the signal lever when the slot is energized. The signal has a normal bias to danger, so that when the slot is deënergized the signal moves automatically to danger position. The signal 4 is controlled in a similar manner, but its electrical connections are omitted for the reasons heretofore stated.

The manual control of the electrical apparatus is effected by a plunger 17, which is normally held in neutral position by a spring 20, but may be pushed to actuate a circuit closer 18, in receiving a release, or pulled to actuate a circuit closer 19, in sending a release to station B.

Coöperating with the plunger is an automatic device for locking it after it has been pulled to transmit a release, in order to lock the apparatus until the train has left the block. This device comprises a plunger-lock magnet 21 which controls an armature or locking lever 22 provided with a tooth 23 which may engage a notch in the plunger when the latter is in neutral position. An indicator 165 actuated by the locking lever indicates whether the plunger is locked or free.

The completion of a release at station A is indicated by a slot indicator 12 actuated by a relay 11, which controls also several circuits, through contact fingers 13. This relay is normally deënergized.

The admission of a west-bound train to the block extending to the east of station A is indicated by a west-bound indicator 15, actuated by a relay 14. The circuit including the magnet of this relay is omitted, but the magnet, normally deënergized, is energized by the operation of transmitting a release from station A to the next station on the east. This relay controls the circuit through the magnet of relay 11 by means of a contact finger 16 which is normally open.

In transmitting a release the plunger 17 closes a circuit through the magnet of a relay 28, which is normally deënergized and actuates three contact fingers 29 controlling various circuits. Relay 28 has two coils, one of relatively high and the other of relatively low resistance, which are connected, respectively, with wires 166 and 167 and have a common return wire 168.

The admission of an east-bound train to the block at B is indicated at A by an east-bound indicator 26 actuated by a relay 25 which has a contact finger 27. The circuit controlled by this contact finger is omitted, however, as it does not pertain to the control of traffic in the block A B.

The plunger 17 is normally unlocked, the magnet 21 being energized by a local circuit indicated in heavy lines, Fig. 2. This circuit passes, from battery 33, through a contact finger of relay 28, through magnet 21, through a contact finger of a circuit controller 24 which is actuated by locking lever 22, and thence back to the battery.

At station B the apparatus is similar in every respect to that at A, but the arrangement of the drawing is different, for convenience in representation. Here a plunger 62 corresponds to plunger 17 at station A, and the normal local circuit is from battery 59 through a contact finger 67 of a line relay corresponding to relay 28, through plunger-lock magnet 86 and circuit controller 70, and back to the battery. The stations are connected by line wires 36 and 37, and provided with telephones 34 which bridge the line circuit through condensers 35.

Certain parts of the apparatus not already described will be referred to in connection with the description of the operation of the apparatus as a whole.

Suppose a train previously admitted to the block to the east of A reaches the end of the block and it becomes necessary for operator A to set signal 3 to admit the train to block A B. At this time the apparatus is all in the normal position of Figs. 1 and 2, except that west-bound indicator relay 14 at station A has been energized by the previous operation of transmitting a release from A to the next station on the east, so that contact finger 16 is raised, closing its circuit. Operator A now telephones to operator B for a release, and operator B responds, if the line is clear, by pulling plunger 62, while operator A pushes plunger 17. A circuit is now completed in the line wires between the two stations. This circuit is shown in Figs. 3 and 4. In these figures heavy lines indicate closed circuits, and the broken portions of the heavy lines indicate portions of the circuit which are merely temporary, being succeeded by alternative paths afforded by the succeeding operation of the apparatus. The line circuit, starting from battery 59 at station B, passes through the high-resistance coil of line relay 60, corresponding to relay 28 at station A, thence to circuit closer 63, actuated by plunger 62, and thence to a normally-closed contact piece of a multiple circuit controller 64 which is connected with and actuated by the signal lever 169 which actuates east-bound signal 123. From circuit controller 64 the circuit passes through a circuit breaker 170, which is operated by signal 123 and is closed when the signal is in normal danger position. From circuit breaker 170 the circuit passes through a contact finger of slot-indicator relay 65, corresponding to relay 11 at station A, and then through a contact finger controlled by a track relay 66. The track relay is connected with an insulated track section 180 and is normally energized by a track battery 190. From relay 66 the circuit passes by line wire 37, through a switch contact 55 located at the siding 2 and controlled by the siding switch. This contact is normally closed, but is opened by the opening of the switch. From switch contact 55 the circuit passes, by line wire 37, through switch contact 67 at the other end of the block to station A. Here it passes through a normally-closed contact finger of track relay 44, to wire 171, represented by a broken line, through a circuit controller 8 ac-

tuated by signal lever 5, through circuit closer 18, which has been actuated by plunger 17, through the magnet of slot-indicator relay 11, through contact finger 16 of west-bound indicator relay 14, and back to station B through line wire 36.

The closing of the line circuit has no immediate effect at station A, for the reason that the current is not at first of sufficient strength to actuate slot-indicator relay 11, owing to the fact that only the high-resistance coil of relay 60 at station B is in circuit upon the first closing of the circuit. At station B, however, relay 60 is at once energized, raising its contact fingers 67, with the double effect of breaking the local circuit through plunger-lock magnet 69 and of closing a stick circuit for relay 60 through wire 73.

Although the plunger-lock magnet is deenergized the locking lever 69 cannot fall until the plunger is released by the operator and permitted to return to normal position. This the operator is free to do at once, however, owing to the closing of the stick circuit through wire 73, and as soon as the plunger returns the locking lever falls. The release is now transmitted automatically by the action of circuit controller 70, which is actuated by the locking lever. A branch circuit through the low-resistance coil of relay 60 is thereby formed, by way of wires 79 and 100, circuit controller 70, and wire 72. This so augments the strength of the current in the line circuit that slot-indicator relay 11 at station A is energized, thereby raising contact fingers 13. By this operation a path is afforded for the current through wire 172 instead of wire 171, directly to the magnet of relay 11, so that operator A may now release plunger 17. If now operator A presses a foot key 7 near signal lever 5 a local circuit is completed through slot 6. This circuit passes, from battery 33, through wire 74, and a contact finger of relay 11, thence to foot key 7, thence, by wire 75, to slot 6, and thence, by wire 76, back to battery. The operator may now set signal 3 at safety by means of signal lever 5. By the movement of the lever a branch circuit 77 is closed, through the action of a contact piece of circuit-controller 8, which is actuated by lever 5, and this branch circuit renders unnecessary the further retention of foot key 7 in operative position. After it is returned to its neutral position the plunger 62 at station B is locked by the locking lever 69 being released and its tooth engaging the notch in the plunger as the result of the contact finger 67 being raised and the circuit through the magnet 86 being opened thereby, as before stated, in consequence of the act of the operator in pulling the plunger in response to the request of operator A for a release, etc.

As soon as the train has passed the signal at A the operator may restore the lever 5 and the signal to danger position, but if he fails to do so the signal is released automatically by the passage of the train over insulated section 42 of the track. The train short-circuits the track relay 44, which is normally energized by a track battery 43, and the contact fingers 45 thereupon fall and interrupt the current through the line wire. The slot-indicator relay 11 is thereby deënergized, and the contact-fingers 13 fall, interrupting the current in the local circuit through the slot and releasing the signal, which returns, owing to its normal bias, to danger position. The interruption of the current in the line wire operates also to set the west-bound indicator at station B to indicate the approach of the train. The relay 60 is deënergized and the contact fingers 67 fall. A local circuit is thereby established from the battery through a contact finger 67, by wire 78 to the magnet or relay indicator 79, through the circuit controller 70, and back, through wires 80 and 81 to the battery, and the indicator is set by the relay 79. The operator thereupon communicates with the next station on the west to release his west-bound signal apparatus, by means of a plunger apparatus similar in all respects to plunger 62 and its connections.

The unlocking of the plunger 62 at station B and the restoration of the apparatus to normal condition depends upon the operation of the signal operator conjoint y with the automatic action of the train in passing over an insulated track section 85 in the rear of the signal. Supposing the west-bound signal 82 to have been set to safety by the operator, the contact pieces or circuit controller 84, connected with the signal lever 83, are moved to the right from their position in Fig. 3. Now when the train moves upon an insulated track section 85 in leaving the block, it short-circuits the battery 86 connected therewith, and deënergizes the track relay 87, thereby allowing contact fingers 88 to fall. A local circuit is thereby established which energizes a releasing relay 89, as follows: from battery 59 through wire 79, the magnet of relay 89, wire 90, one of contact fingers 88, wire 91, circuit controller 84, wires 92, 93 and 81, and thus back to the battery. The relay 89 is energized, and its contact fingers 94 are raised. The immediate effect of this operation is merely to render relay 89 self-sustaining by forming an alternati e path for the current through resistance coil 95 and one of contact fingers 94, and to complete the operation of releasing the plunger 62 the circuit controller 84 must be returned to normal position by the return of signal lever 83 to danger position, and the relay 87 must be again energized in consequence of the passage of the train from the insulated track section 85. As soon as these events have occurred a local circuit is completed from the battery through

a contact finger 67 of relay 60, wire 96, plunger-lock magnet 86, wire 97, a contact finger 94, of relay 89, wire 98, a contact finger 88 of track relay 87, circuit controller 84, and back, by wires 92, 93 and 81 to the battery. The plunger-lock magnet is thus energized and raises the locking lever and depresses circuit controller 70. The latter reëstablishes the normal circuit through the plunger-lock magnet by way of wire 80, and it also acts to deënergize relay 89 by short-circuiting it through wires 100 and 101. The circuit controller 94 falls, and the entire apparatus is then in its normal position again.

It will be seen that the arrangements by which the plunger is unlocked are such that after a release has been given by operator B to operator A, resulting, usually, in the admission of a west-bound train to the block, the plunger remains locked and operator B is precluded from giving another release to admit a second train, until all the usual and proper operations have been performed in the passage of the train into the next block, including the setting of the west-bound signal at B to safety to pass the train out of the block, the passage of the train over insulated track section 85 at the end of the block A—B, and the return by operator B of his west-bound signal to danger. If the train should stop for any reason on the track section 85 instead of passing completely out of the block, the relay 89 would operate but the circuit through the plunger-lock magnet 68 would not be made until the train left section 85. The same result occurs if a portion of the train breaks loose and remains on the section. If the operator neglects to return the signal lever to danger position he is unable to operate the plunger until the omission is corrected.

When a train is diverted to the siding at station B, as, for example, when an east-bound train and a west-bound train meet there, the plunger 62 must be unlocked by means operating independently of the track relay 87, and this function is performed by a siding relay 51. When the siding switch is opened for the entrance of the train on the siding, a switch contact 50 is closed. As soon as the train makes contact with the insulated rail sections 46 and 48 the relay 51 is energized by a circuit completed from the battery 49 through the switch contact 50, wire 106, a contact finger 54 of a normally deënergized relay 53, through wire 102, the magnet of relay 51, wire 103 to rail 48, and thence through the car wheels and axles to rail 46 and the battery. The contact fingers 52 are raised, and the local circuit through releasing relay 89 is thereby completed by way of wires 90, 104, one of contact fingers 52, wire 105, and line wire 36. At the same time relay 51 becomes self-sustaining by the formation of an alternative return for the current of battery 49 by way of a contact finger 52 and wire 110. When the siding switch is closed after the passage of the train upon the siding and the switch contact 50 is opened, the relay 51 is deënergized, the contact fingers 52 fall, and the plunger-lock releasing circuit is formed by way of a contact finger 67 of relay 60, wire 96, plunger-lock magnet 68, wire 97, a contact finger 94 of relay 89, wire 98, wire 109, a contact finger 52 of relay 51, wire 105, and return wire 36 to the battery, and the plunger is released and the apparatus returned to normal condition.

The function of the relay 53 is to prevent the operation of the siding relay 51, and the release of the plunger, when a train on the siding is passed to the main track. The switch contact 50 being closed, by the opening of the switch, as soon as the train touches the rails 46 and 47 a circuit is completed by way of the switch contact, wire 106, contact finger 52, and wire 107 to the magnet of relay 53 and thence back to the battery by wire 108, rail 47, and rail 46. The contact fingers 54 of the relay 53 are thereby raised, and the formation of a circuit through the magnet of relay 51 is prevented, while the relay 53 becomes self-sustaining by the formation of an alternative return for the current by way of a contact finger 54, wire 110, and rail 46. The relay 53 is deënergized again by the closing of the switch and the opening of the switch contact 50.

At station A is shown another arrangement for effecting the release of the plunger lock, when the train enters the siding, this arrangement being manually operated. A telephone apparatus 111 and a hand key 112 are located at the siding switch. A contact finger 114, in circuit with the hand key, is sustained by a relay 113 which is normally energized by a battery 119 connected with insulated sections 120 and 121 on the main track and the siding respectively. When a train has passed to the siding the switch operator communicates by telephone with the signal operator, and by mutual arrangement the switch operator presses the key 112 while the signal operator presses a hand key 117. The plunger-lock magnet 21 is thereupon energized by a circuit completed as follows: from battery 33 through a contact finger 29 of line relay 28, wire 115, plunger-lock magnet 21, wire 116, key 117, a contact finger of track relay 44, line wire 37, key 112, contact finger 114, common return wire 36, and wires 118 and 76 back to the battery. The plunger-lock magnet is energized and the parts returned to normal position thereby. If it be attempted to secure this result while a train is still upon the switch or the adjacent portion of the main line this is prevented owing to the fact that the relay 113 is short-circuited and deënergized by the presence

of the train on the track sections 120 and 121, and contact finger 114 being thus released, the circuit cannot be completed by closing the hand keys.

The switch contacts 55 and 67, located in the line wire 37 and connected, as before described, with the siding switches, are for the purpose of preventing any communication between the stations while a siding switch is open, to insure against the release of the signaling apparatus at such time. To clear the east-bound signal 123 at station B to admit an east-bound train into the block the operations heretofore described are reversed, the plunger 62 being pushed and the plunger 17 pulled, and the succeeding operations occur as before described but with the stations in reverse relation.

Instead of locking the plungers mechanically, the same result may be accomplished by breaking the circuits including the plunger-operated circuit controllers. Such an arrangement is illustrated in the modified form of the invention illustrated in Figs. 5 and 6. Referring to Fig. 6, the plunger actuated circuit closers 18 and 19 are connected with their respective circuits through the circuit breakers 125, which are controlled by the plunger-lock magnet 21. When the magnet is deënergized and the locking lever 22 falls, these circuit breakers fall and open their respective circuits, and thereafter, although the plunger may still be pushed or pulled, no effect will be produced. A similar arrangement is shown at station B, in Fig. 5, the circuit breakers being designated by reference numeral 136.

In the embodiment of the invention illustrated in Figs. 1 to 4 the two operative conditions of the circuit involve the passage of currents of two different strengths, as before described, but a similar result may be secured in other ways, as, for example, by the use of currents of different polarities, and Figs. 5 and 6 illustrate an arrangement in which this is accomplished by the use of polarized relays and pole-changing switches.

Referring to Fig. 6, the line relay 28 has, in this case, only a single winding, but a pole-changing switch 126, actuated by a magnet 127, is used to reverse the direction of the current in the line circuit, this reversal producing the same effect as the augmentation of the current produced in the other form of apparatus. The slot circuit is controlled by a relay 128, which has two polarized contact fingers 129, which tend normally to assume the open-circuit position of the drawings, but move to the right to close the circuits controlled by them upon the passage through the relay of a current of suitable polarity. The relay 128 controls also neutral contact fingers 130, which are responsive to currents in either direction in the relay magnet. The apparatus is otherwise, in general, the same as in the arrangement first described, and is duplicated at station B.

In the operation of this apparatus, the operator at A, to secure a release, pushes his plunger, and operator B pulls his. The line circuit is now completed as follows: from battery 59, at station B, through the magnet of line relay 60, wire 131, pole-changing switch 132, wire 133, circuit closer 134, wire 135, circuit breaker 136, wires 137 and 138, circuit controllers 64, circuit breaker 139 on signal 123, wire 140, one of neutral contact fingers 141 controlled by polarized relay 142, which corresponds to relay 128 at station A, through wire 143, a contact finger of track relay 66, and line wire 37 to station A. At station A the circuit includes a contact finger of track relay 44, wires 144 and 145, circuit controller 8, wire 146, circuit closer 18, wire 147, circuit breaker 125, wire 148, the magnet of relay 128, wire 149, a contact finger of relay 11, wires 150 and 151, contact finger 16 of indicator relay 14, wire 152, and, by line wire 36, back to station B. At station B the line relay 60 closes its stick circuit, by a contact finger 67 and wire 73, and opens the local circuit through lock magnet 86, so that the locking lever 62 falls and the circuit breakers 136 open both plunger-controlled circuits, thereby "locking" the plunger. At station A the polarized relay 128 raises the contact fingers 130, but the contact fingers 129 are not at first affected, as the initial current is not of the proper polarity. Upon the release and fall of the locking lever 62 and the circuit controller 70 at station B, the pole-changing switch magnet 153, however, is energized by a local circuit formed as follows: from battery 59, through wires 79 and 100, circuit controller 70, wire 154, magnet 153, wire 155, contact finger 156 controlled by west-bound indicator relay 79, and thence, by wires 151 and 81, back to the battery. The magnet 153, being energized, raises the pole-changing switch 132, and the current in the line circuit is thereby reversed, passing now from battery 59 through the magnet of relay 60, wire 131, switch 132, wires 158, 159, and 36 to station A, and, returning, through wire 37, a contact finger of relay 66, wire 143, a contact finger 141 of relay 142, wire 140, circuit breaker 139, circuit controller 64, wire 138, contact finger 67, wire 73, pole-changing switch 132, and wires 151 and 81 back to the battery. This reversal causes the polarized contact fingers 129 of the relay 128 at station A to move to the right and close the local circuit through the slot-indicator relay 11, the circuit passing, from battery 33, through wire 74, contact fingers 130 and 129, wire 160, the magnet of relay 11, and wires 161, 162, and 76. The slot indicator relay being energized, its contact fingers 13 are raised, thereby closing the slot circuit as in the first-described arrangement

One of the contact fingers 13 acts, also, to cut out the wires 149 and 150, so that the line circuit is directed through a resistance coil 163, with the object of economizing current. The reopening of the line circuit at A by the automatic action of the train, and the automatic release of the plunger at B occur, through the operation of the track relays, in substantially the same manner as in the first-described arrangement, and need not be particularly described. This polarized arrangement has the advantage that it reduces the danger of an accidental release through crossing of the line wires with other conductors, or by the action of lightning.

The present invention provides a system in which the signaling operations are safe-guarded at every point, the accomplishing of a release requiring the proper condition and operation of every portion of the apparatus, the proper performance of his duties by the operator, and the absence of previously admitted trains from the block. It is a particular advantage of the arrangement described that the transmission of a release is not directly accomplished by the action of the plunger, but only by and simultaneously with the operation of the plunger-locking device, so that in case the latter fails to work no release is transmitted. Another advantage of the system results from the fact that the line circuit is normally open, the batteries being in circuit only with the station apparatus, which is of comparatively high resistance, so that the normal current consumption is slight.

It is obvious that various modifications may be made in the embodiment of the invention herein described and illustrated in the drawings within the nature and scope of the invention as defined in the following claims.

In the claims the term "lock," as applied to the manual controlling member, is intended to designate any operation by which an actuation, or an attempt to actuate, such member is rendered ineffective, whether by locking the member mechanically, or by interrupting the circuits controlled by it.

I claim:—

1. In an electric lock-and-block signal system, a circuit connecting signal stations, a manual controlling member operative indirectly to transmit a release, circuit breakers interposed in the circuit and controlled by the traffic, and means acting automatically, upon the operation of the manual controlling member, to lock the same and transmit a release.

2. In an electric lock-and-block signal system, a circuit connecting signal stations, circuit breakers interposed in the circuit and controlled by the traffic a manual controlling member operative to close the circuit, and means acting automatically to lock said member and transmit a release when the circuit has been so closed.

3. In an electric lock-and-block signal system, a circuit connecting signal stations, a manual controlling member operative to close the circuit, circuit breakers interposed in the circuit and controlled by the traffic, and means acting automatically to lock said manual controlling member and transmit a release when the circuit has been closed by said member.

4. In an electric lock-and-block signal system, a manual controlling member operable either in receiving or transmitting a release, and means acting automatically to lock said member upon its operation to transmit a release.

5. In an electric lock-and-block signal system, a manual controlling member operable either in receiving or transmitting a release, and means acting automatically to lock said member in neutral position after its operation to transmit a release.

6. In an electric lock-and-block signal system, a manual controlling member operable either in receiving or in transmitting a release, means acting automatically to lock said member in neutral position after the transmission of a release, and traffic-controlled means for effecting the unlocking of the manual controlling member.

7. In an electric lock-and-block signal system a circuit, normally open, connecting signal stations, circuit breakers interposed in the circuit and controlled by the traffic manual controlling members at the stations controlling the circuit and conjointly operated to close the circuit and effect a release, and means operating automatically to lock one of said members upon the transmission of a release.

8. In an electric lock-and-block signal system, a circuit, normally open, connecting signal stations, circuit breakers interposed in the circuit and controlled by the traffic manual controlling members at the stations controlling the circuit and conjointly operated to close the circuit and effect a release, means operating automatically to lock one of said members upon the transmission of a release, and traffic-controlled means for effecting the unlocking of said member.

9. In an electric lock-and-block signal system, a circuit, normally open, connecting two signal stations, a manual controlling member at one station, electrically-controlled means for locking said member, electrically-controlled signal-releasing means at the other station, a circuit controller operated by the manual controlling member and acting to transmit through the circuit a current operative to throw the locking means into operation but not to effect the signal-releasing means, and a circuit controller operated by the locking means and acting to

transmit a current operative to effect the signal-releasing means.

10. In an electric lock-and-block signal system, a main track, signaling devices controlling traffic thereon, a siding, traffic-controlled means connected with the main track for releasing the signaling devices upon the passage of a train from a block over the main track, and traffic-controlled means connected with the siding and operating to release the signaling devices when a train passes from the main line to the siding but inoperative when a train passes from the siding to the main track.

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

ROBERT J. HEWETT.

Witnesses:

BERNARD COWEN,

WM. ASHLEY KELLY.