No. 770,657. PATENTED SEPT. 20, 1904.

B. C. ROWELL.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

APPLICATION FILED MAR. 14, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

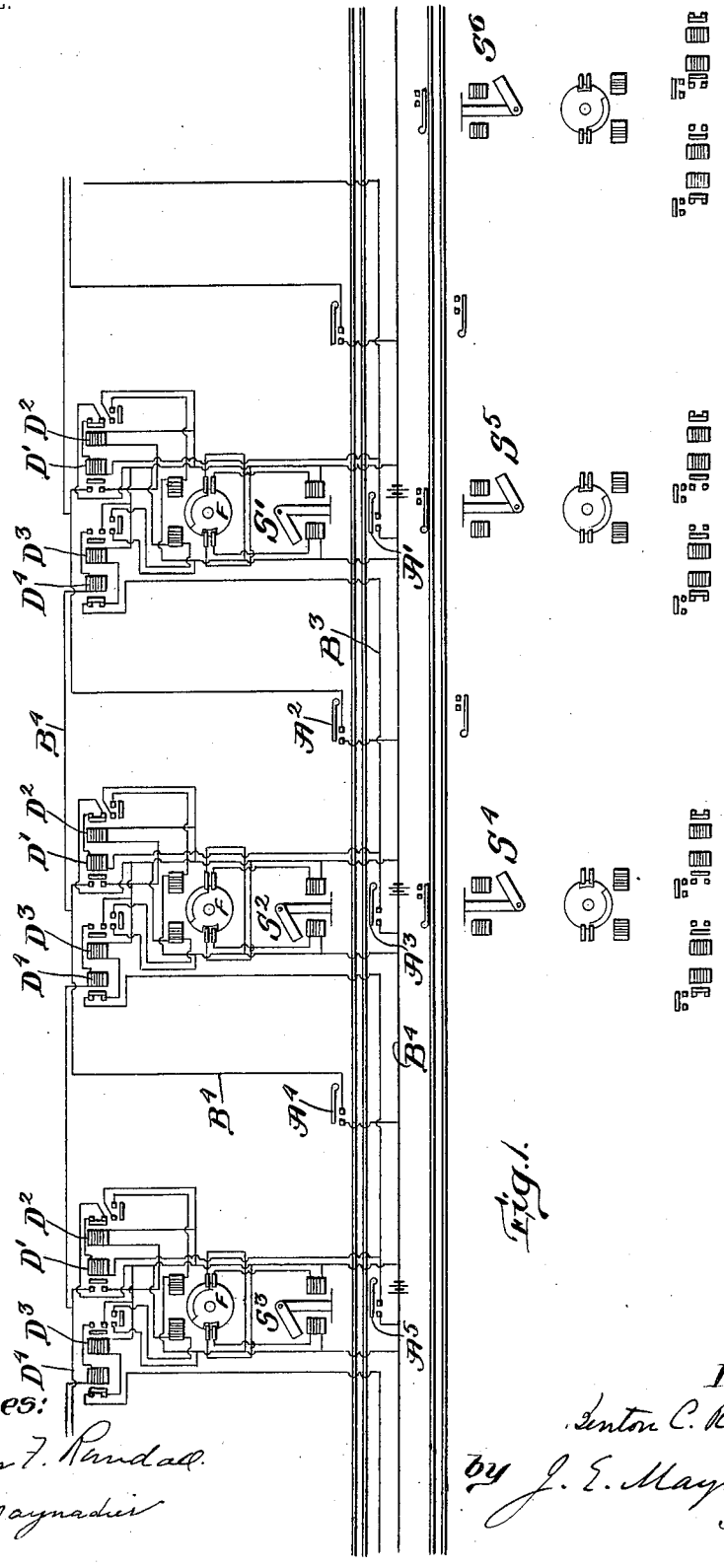


Fig. 1.

Witnesses:
Arthur J. Randall.
C. B. Maynadier

Inventor:
Benton C. Rowell
by J. E. Maynadier
Attorney.

No. 770,657. PATENTED SEPT. 20, 1904.

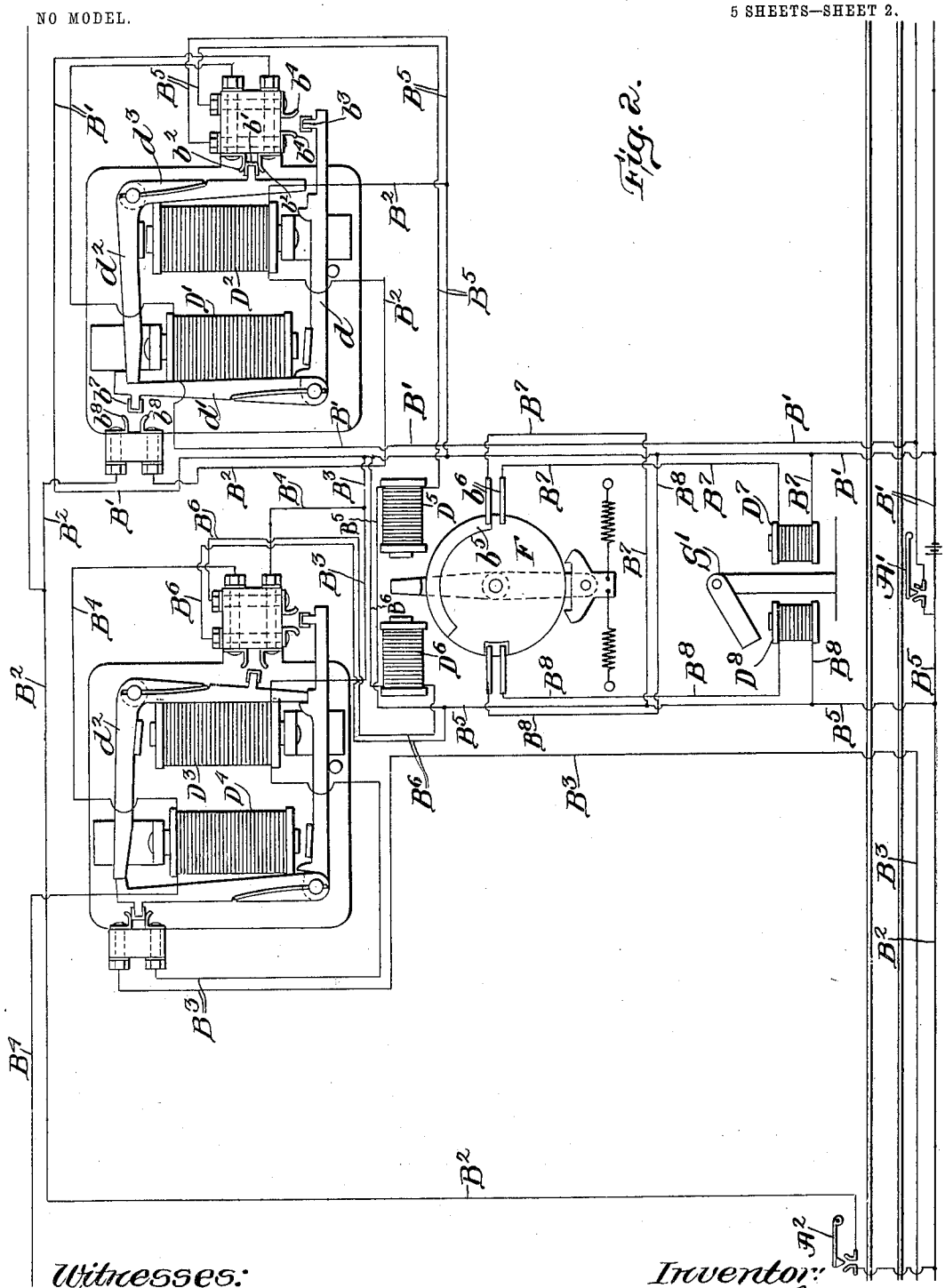
B. C. ROWELL.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

APPLICATION FILED MAR. 14, 1902.

NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
Arthur F. Randall.
C. B. Maynadier.

Inventor:
Benton C. Rowell
by J. E. Maynadier
Attorney.

No. 770,657. PATENTED SEPT. 20, 1904.

B. C. ROWELL.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

APPLICATION FILED MAR. 14, 1902.

NO MODEL. 5 SHEETS—SHEET 3.

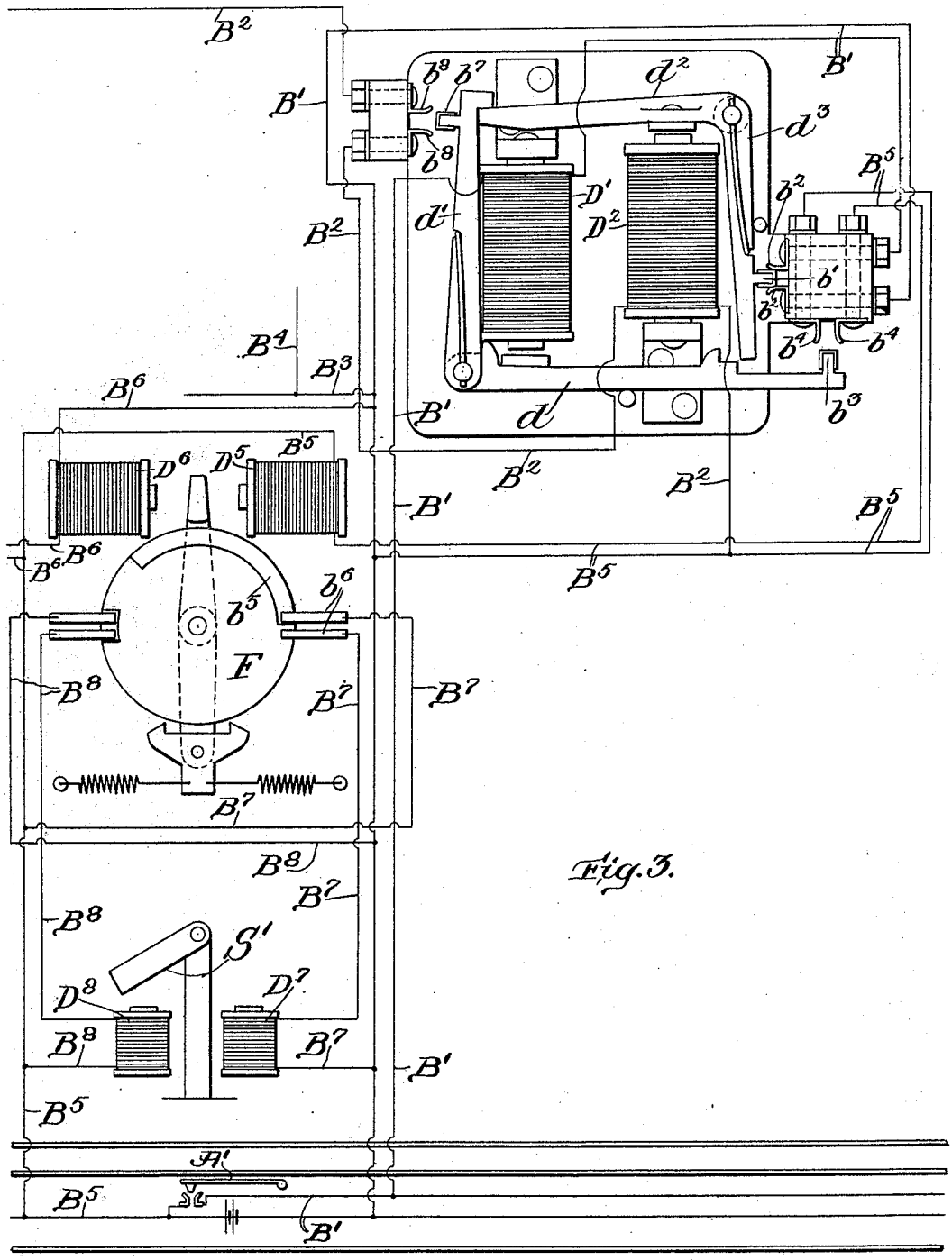


Fig. 3.

Witnesses:
Arthur F. Randall.
C. B. Maynadier.

Inventor:
Burton C. Rowell
by J. E. Maynadier
Attorney.

No. 770,657. PATENTED SEPT. 20, 1904.

B. C. ROWELL.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

APPLICATION FILED MAR. 14, 1902.

NO MODEL. 5 SHEETS—SHEET 4.

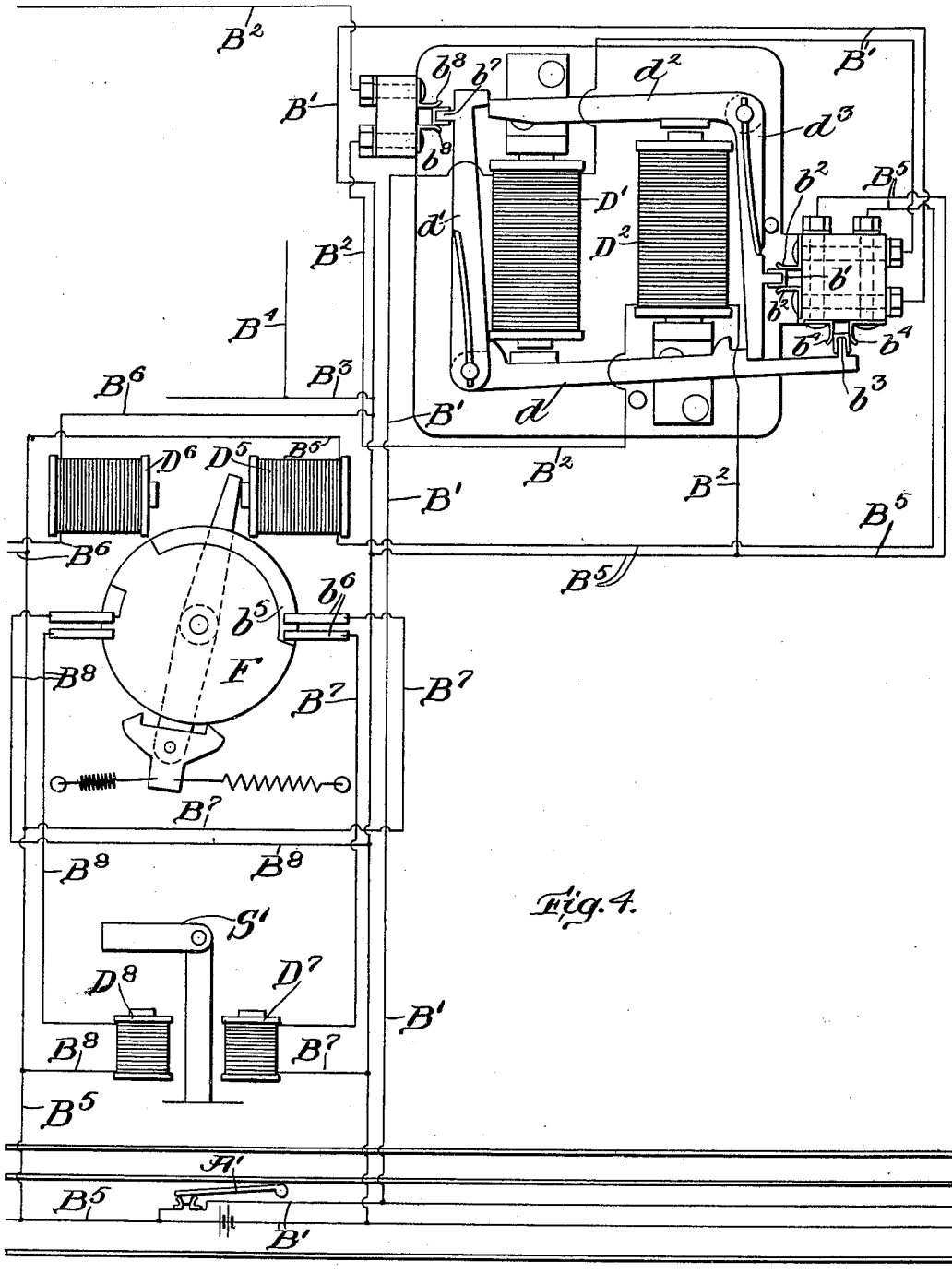


Fig. 4.

Witnesses:
Arthur T. Randall
C. B. Maynadier

Inventor:
Burton C. Rowell
by J. E. Maynadier
Attorney.

No. 770,657. PATENTED SEPT. 20, 1904.

B. C. ROWELL.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

APPLICATION FILED MAR. 14, 1902.

NO MODEL. 5 SHEETS—SHEET 5.

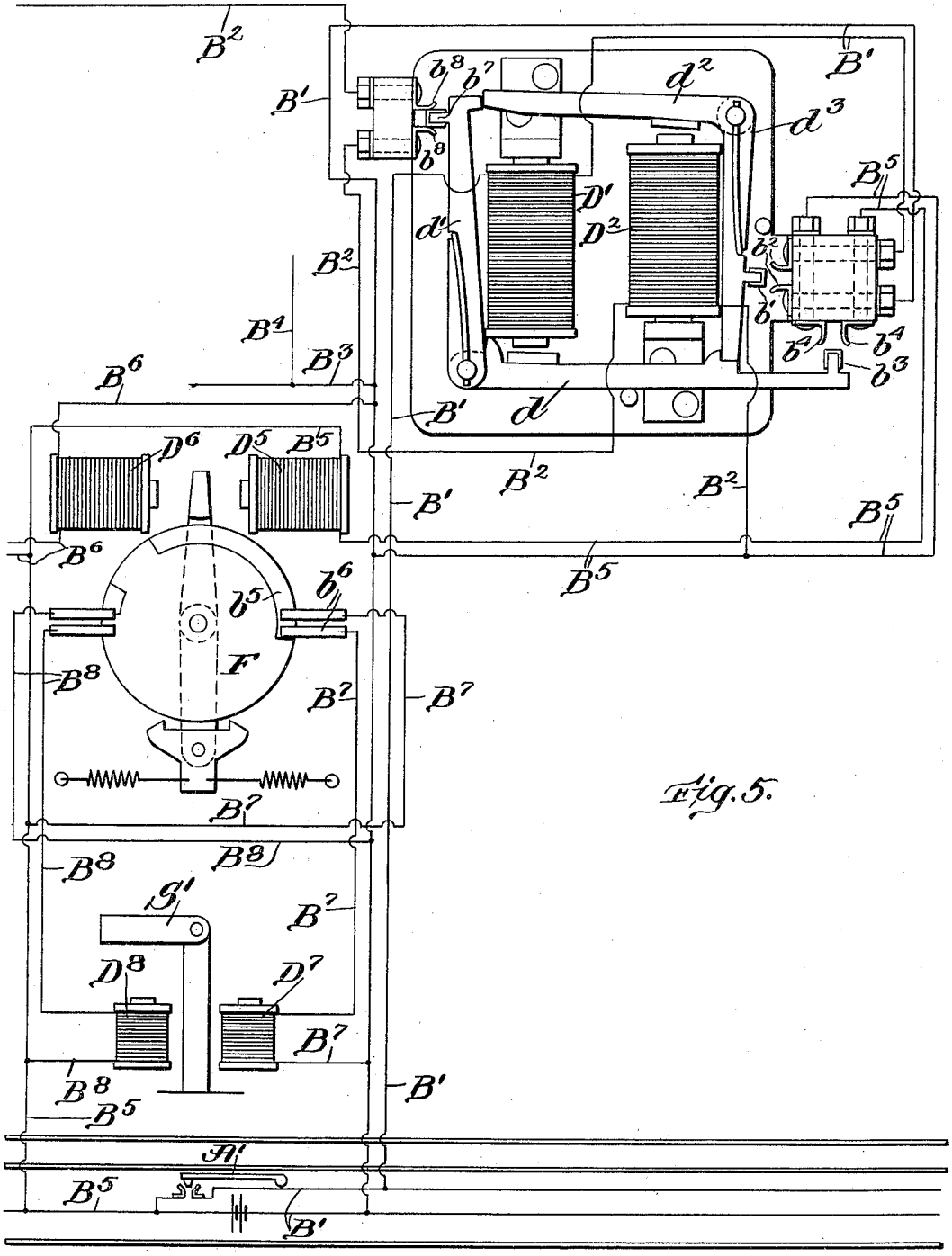


Fig. 5.

Witnesses:
Arthur F. Randall
C. B. Maynadier.

Inventor:
Benton C. Rowell
by J. E. Maynadier
Attorney.

No. 770,657. Patented September 20, 1904.

UNITED STATES PATENT OFFICE.

BENTON C. ROWELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO ROWELL POTTER SAFETY STOP COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

AUTOMATIC BLOCK SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 770,657, dated September 20, 1904.

Application filed March 14, 1902. Serial No. 98,232. (No model.)

To all whom it may concern:

Be it known that I, BENTON C. ROWELL, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Automatic Block System for Railways, of which the following is a specification, reference being had to the accompanying drawings, making a part hereof.

The object of my present invention is to provide a block system in which each train entering a section automatically shifts a signal behind it to "danger," which signal remains at "danger" until that train leaves that section, when the leaving train automatically shifts that signal to "safety" to unblock that section, and in addition to provide means by which in case one or more following trains enter the blocked section only the last train to leave that section will automatically shift the signal to "safety" and unblock that section. To attain these objects with practical certainty of operation has long been desired; and my invention consists in a block system comprising blocking appliances which are automatically operated in succession by a passing train by means of a train-circuit which is normally complete except at a track instrument, and which when completed at the track instrument automatically completes the shifting-circuit of a blocking appliance and shifts that blocking appliance to "danger," and also partially completes a second train-circuit which is normally broken at a second track instrument as well as at the point where it is partially completed by the automatic action of the first train-circuit, this partial completion of the second train-circuit by the automatic action of the first train-circuit resulting in breaking the first train-circuit and leaving it broken, and also in breaking the circuit for shifting the blocking appliance to "danger" and leaving it broken until the train has reached the track instrument of the second train-circuit. When this second train-circuit is closed at its track instrument by a passing train, it automatically breaks itself and restores the first train-circuit except at its track instrument, thereby leaving that train-circuit free to be operated by a following train after the blocking appliance has been shifted back to "safety" to allow the passing of a following train. This shifting of the blocking appliance back to "safety" is accomplished by a like train-circuit which is normally complete except at its track instrument and which when completed at its track instrument automatically completes the safety-circuit of that blocking appliance and shifts it back to "safety;" but this third train-circuit, like the first, also partially completes a fourth train-circuit like the second and operating in the same way. My new system is therefore characterized by two train-circuits, each completed by a track instrument, the first automatically closing a circuit for shifting the blocking appliance and also operating to open the second train-circuit at a point distant from its track instrument, and the second train-circuit operating to open itself at a point distant from its track instrument and to close the first at a like point; but as it is desirable for many reasons to use means not only for shifting the blocking appliances from "safety" to "danger" when a train passes, but also to use other means for shifting the blocking appliances from "danger" back to "safety" after the train has gone by a desired distance, my complete invention in its best form requires not only the two train-circuits and the shifting-circuit above described, but two additional train-circuits like the first and an additional shifting-circuit which shifts the blocking appliance back. Where a train-counter is desired, as shown in the drawings, two extra circuits for shifting it forward and back are also desirable, as will now be more fully explained in connection with a full, clear, and exact description of my invention and the principle thereof, together with the best means which I have contemplated for applying that principle so as to distinguish it from other inventions.

In the drawings, Figure 1 is a diagram of two sections of track each with three blocking appliances. Fig. 2 indicates diagrammatically the main apparatus for controlling

the circuits, the parts being in their normal positions. Fig. 3 indicates a part of that apparatus in one position. Fig. 4 indicates that part in a second position, and Fig. 5 indicates that part in a third position.

The blocking appliances S′, &c., are as usual and may be indicator-signals appealing to the engineer or prohibitive signals which when at "danger" automatically stop the train if disregarded by the engineer, as will be clear without detailed description. The track instruments A′, &c., are also well known and are tread-bars depressed by the wheels on one side of a train and when depressed bridging electrodes at A′, &c. As the wheels of each truck actuate each tread-bar the circuit B′ will be made at A′ as often as the wheels on one side of a train pass the tread-bar, and it is therefore highly desirable to automatically break that circuit B′ at another point, so that the second and following depressions of tread-bar A′ shall not affect magnet D′ which is in circuit B′. This is done as follows: When the parts are in the position shown in Fig. 3, a current through magnet D′ will swing its armature-lever d toward its magnet D′ and cause the shoulder on lever d to swing lever d' (for levers d and d' are not integral, but are capable of independent movement) away from lever d^2 of magnet D^2, and the bell-crank lever whose arms are the levers d^2 d^3 will be moved by its spring, (shown as a leaf-spring,) one end of which extends through a stud which is the fulcrum of the lever-arms d^2 d^3, and the parts will then take the position shown in Fig. 4; but the bridge b' of switch b' b^2 will not be wholly withdrawn from jaws b^2, and the circuit B′ through magnet D′ will not be broken. The levers d and d' are each pivoted loosely on the fixed pivot-stud through which one end of the leaf-spring passes, as shown in Figs. 2, 3, 4, and 5. This leaf-spring acts as a linchpin for lever d', just as a like leaf-spring acts for lever d^2 d^3, and these leaf-springs also act to move these levers in the desired directions. With the parts in this position the release of tread-bar A′ as soon as the first truck has passed over it and before the second truck reaches it will break circuit B′ through magnet D′, lever d will move away from magnet D′, and lever d^3 will move far enough to free bridge b' from jaws b^2, the parts then taking the position shown in Fig. 5, and circuit B′ is broken at b^2, so that the depression of tread-bar A′ no longer affects circuit B′. Lever d of magnet D′ carries bridge b^3, and when current flows through circuit B′ magnet D′ attracts lever d and forces bridge b^3 between jaws b^4, (see Fig. 4,) and this completes circuit B^5, which is closed by bridge b^3, carried by lever d of magnet D′, when the parts are in the position shown in Fig. 4; but as soon as circuit B′ is broken at A′, as above explained, circuit B^5 is also broken at b^4, for the parts then take the position shown in Fig. 5, and bridge b^3 is withdrawn from jaws b^4. This circuit B^5 is through magnet D^5, and when magnet D^5 is energized it rotates disk F one step, which causes conductor b^5 to bridge contacts b^6, and thereby closes circuit B^7 through the danger-magnet D^7 of the power machine, thereby starting that machine and shifting signal S′ from "safety" to "danger." The power machine is too well known to require description. Tread-bar A^2 is farther from tread-bar A′ than the length of the longest train, so that the rear of the train passes signal S′ (then at "danger") before the first truck depresses tread-bar A^2 to make circuit B^2 through magnet D^2 of signal S′, whereupon D^2 attracts its armature on lever d^2, thereby releasing lever d' and withdrawing bridge b^7 from jaws b^8 and breaking circuit B^2, when the parts take the position shown in Fig. 3 with circuit B′ made at b^2, circuit B^5 broken at b^4, and circuit B^2 broken at b^8. As soon as the train depresses tread-bar A^3 it makes a circuit which shifts signal S^2 from "safety" to "danger," as just explained with regard to signal S′, and also makes circuit B^3 (see Fig. 2) through magnet D^3 of signal S′, whereupon D^3 attracts its lever d^2 and breaks circuit B^3, as just explained in regard to magnet D^2 and circuit B^2—that is, arm d^2 of D^3, Fig. 2, is attracted and takes the position of arm d^2 of D^2, as shown in Fig. 2, thereby breaking circuit B^3, as already fully explained of circuit B^2. It is indeed obvious from Fig. 2 that energizing D^3 breaks circuit B^3 precisely as energizing D^2 breaks circuit B^2. Circuit B′ will be hereinafter called the "release-circuit" and its magnet D′ the "release-magnet," as they operate to release the lever d^2 of magnet D^2, which will be hereinafter called the "set-magnet" and its circuit the "set-circuit," as its lever d^2 operates to set or lock lever d' of the release-magnet D′, and it will now be plain that the circuits B′ at each signal are release-circuits, each passing through its release-magnet D′, and that the circuits B^2 at each signal are set-circuits, each passing through its set-magnet D^2. The circuit B^3 is also a set-circuit, but it extends from one signal, as S^2, to the signal in its rear, as S′. As soon as the train depresses tread-bar A^4 it makes circuit B^4 through release-magnet D^4 of signal S′, and energizing-magnet D^4 makes circuit B^6 through magnet D^6, (for energizing D^4 makes B^6 precisely as energizing D′ makes B^5, as will be plain,) which moves disk F one step back, thereby breaking circuit B^7 through the danger-magnet D^7 of the power-machine and making circuit B^8 through the safety-magnet D^8 of the power-machine, which shifts signal S′ from "danger" to "safety." When tread-bar A^4 is first depressed, it also makes a second circuit, which is the set-circuit for set-magnet D^2 of signal S^2. As soon as tread-bar A^5 is depressed by the train it makes a release-

circuit for release-magnet D′ of signal S^3 and a set-circuit for set-magnet D^3 of signal S^2, thereby shifting signal S^3 to "danger" and preparing signal S^2, so that it can be shifted to "safety" by track instruments, (not shown,) but in all respects like those already described; but of course if S^3 be the last signal in the block these track instruments may operate almost simultaneously, the first making a release-circuit for release-magnet D^4 of signal S^2 and also a set-circuit for set-magnet D^2 of signal S^3, the second making a set-circuit for set-magnet D^3 of signal S^3, and the third making a release-circuit for release-magnet D^4 of signal S^3, and thereby shifting that signal from "danger" to "safety." The automatic circuits and apparatus of the other track (indicated in Fig. 1) are the same as those above described, and need no further description.

The disk F has an important function not yet mentioned, which is that it is practically necessary at times to allow for the presence of two or more trains on a section, and to inhibit all of them except the last to leave the section from setting the signals in the rear to "safety." If a second train passes a signal which is at "danger," signifying that the section is blocked, each train so passing will operate the disk F one step in the same direction as the first train did; but each will on leaving the section operate disk F one step back, and only the last one to leave the section will make a safety-circuit through the safety-magnet of the power-machine and shift the signals in its rear to "safety." This is fully described in my Patent No. 695,648, dated March 18, 1902.

What I claim as my invention is—

1. The automatic block system above described comprising train-circuits, each with its track instrument operated by a passing train; shifting-circuits for shifting the blocking appliances; and means by which one train-circuit automatically completes its shifting-circuit, partially completes a second train-circuit, and breaks itself, and that second train-circuit partially completes the first train-circuit and breaks itself.

2. The automatic block system above described comprising train-circuits, each with its track instrument; shifting-circuits for shifting the blocking appliances; means by which one train-circuit automatically completes its shifting-circuit, partially completes a second train-circuit, and breaks itself, and that second train-circuit partially completes the first train-circuit and breaks itself; and other means by which a third train-circuit automatically completes its shifting-circuit, partially completes a fourth train-circuit, and breaks itself, and that fourth train-circuit partially completes the third train-circuit and breaks itself.

3. In an automatic block system the combination of two magnets; their armatures; two switches, one controlled by the first magnet and controlling the second magnet, the other controlled by the second magnet and controlling the first magnet; and means to automatically close the open switch of one magnet, and open the closed switch of the other, whereby the magnets are automatically left one in, and the other out, of operative condition, alternately.

4. In an automatic block system the combination of a circuit; a track instrument by which a passing train automatically makes and breaks that circuit at one point; a switch to automatically break and make that circuit at a distant point; a second circuit; a second track instrument like the first; a second switch to automatically make and break that second circuit at a distant point; and means to connect the two switches and cause the automatic closing of one to open the other and the automatic opening of one to close the other.

BENTON C. ROWELL.

Witnesses:
B. FRANK HATHAWAY,
GEO. WOODHULL CLARK.