No. 763,515. PATENTED JUNE 28, 1904.

W. B. SEVERANCE.

TRAIN OPERATED TIME SIGNAL SYSTEM FOR RAILWAYS.

APPLICATION FILED NOV. 10, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1

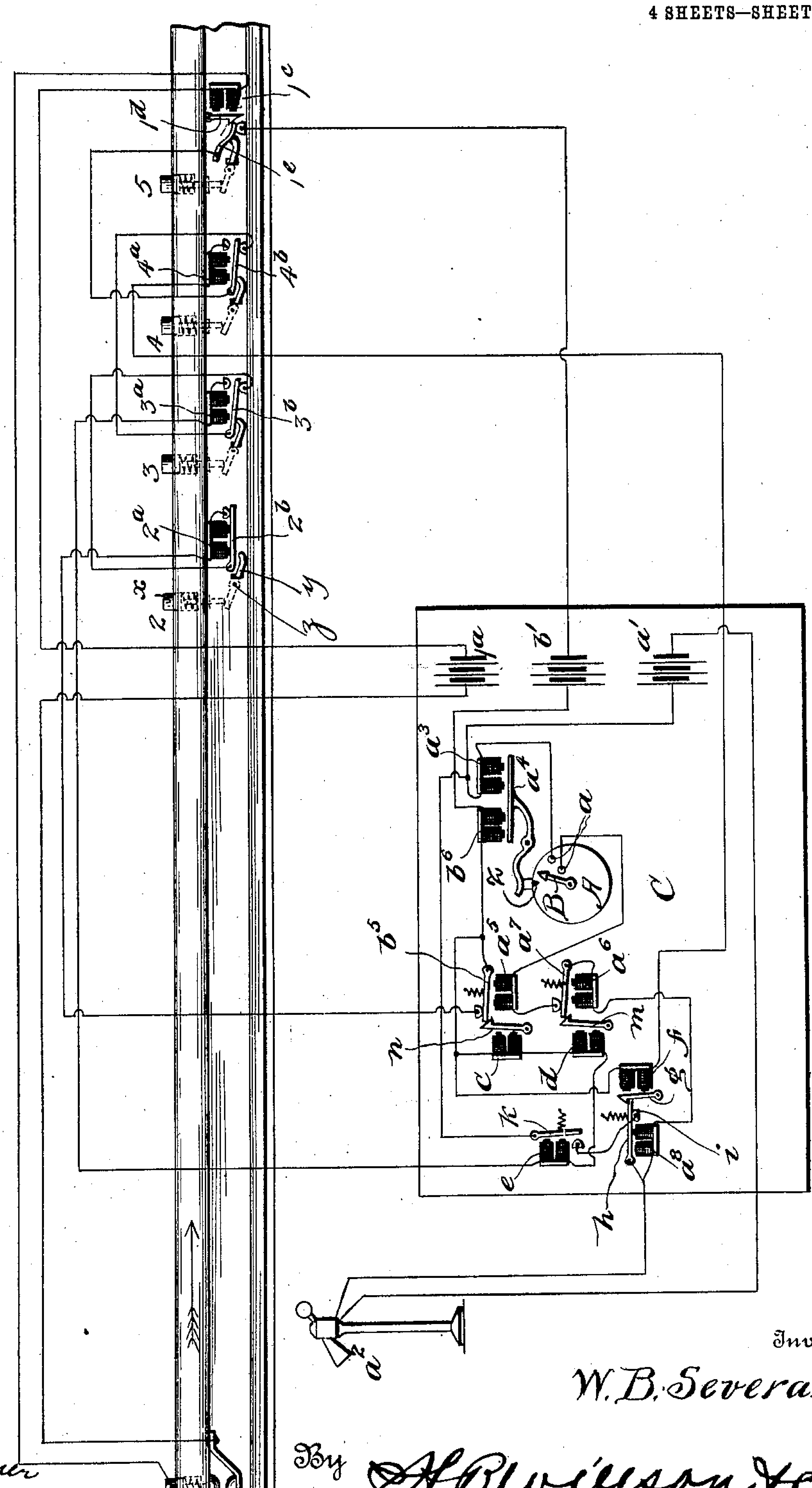

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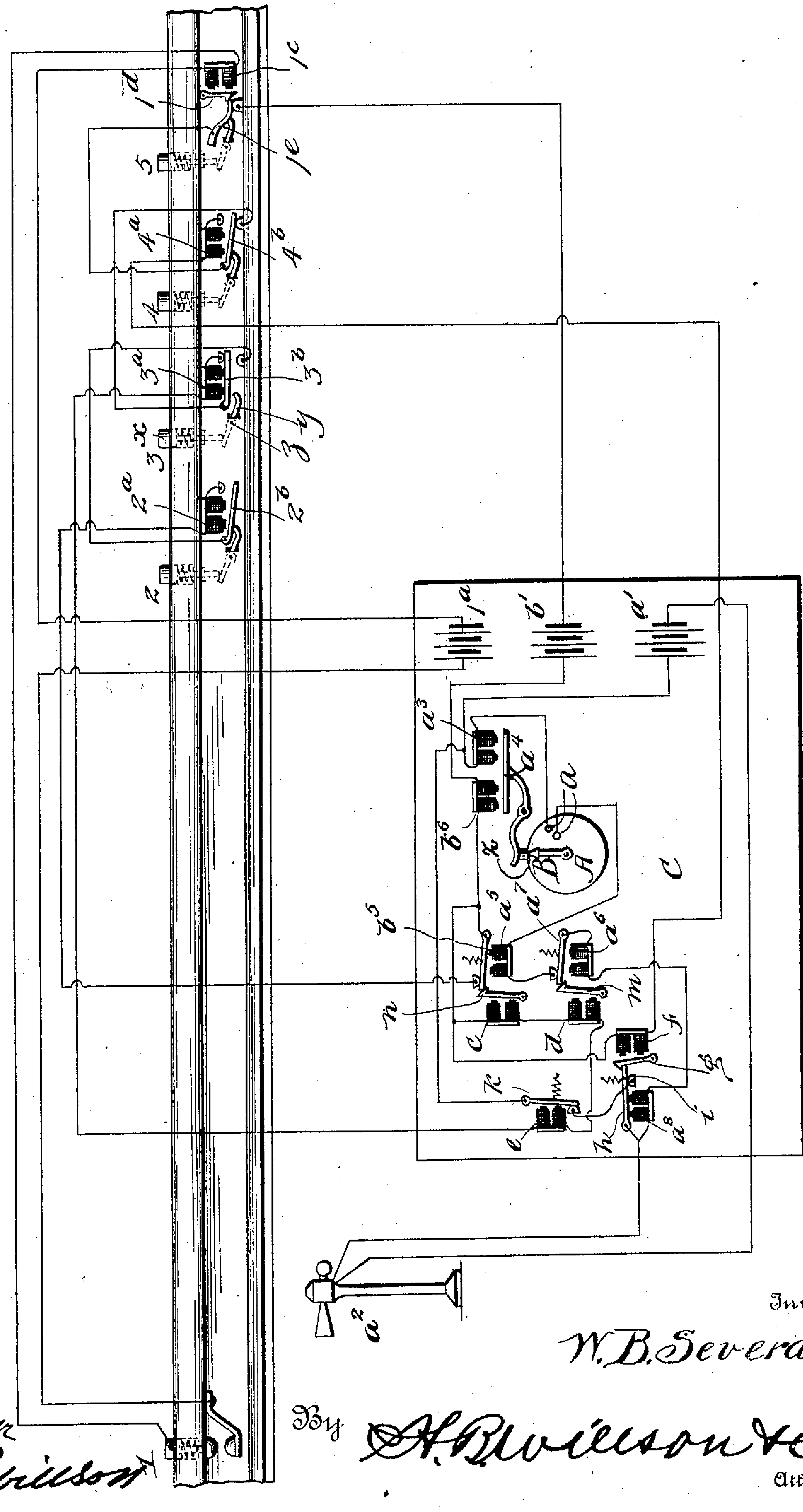
Fig. 2



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NO MODEL.

4 SHEETS—SHEET 3.

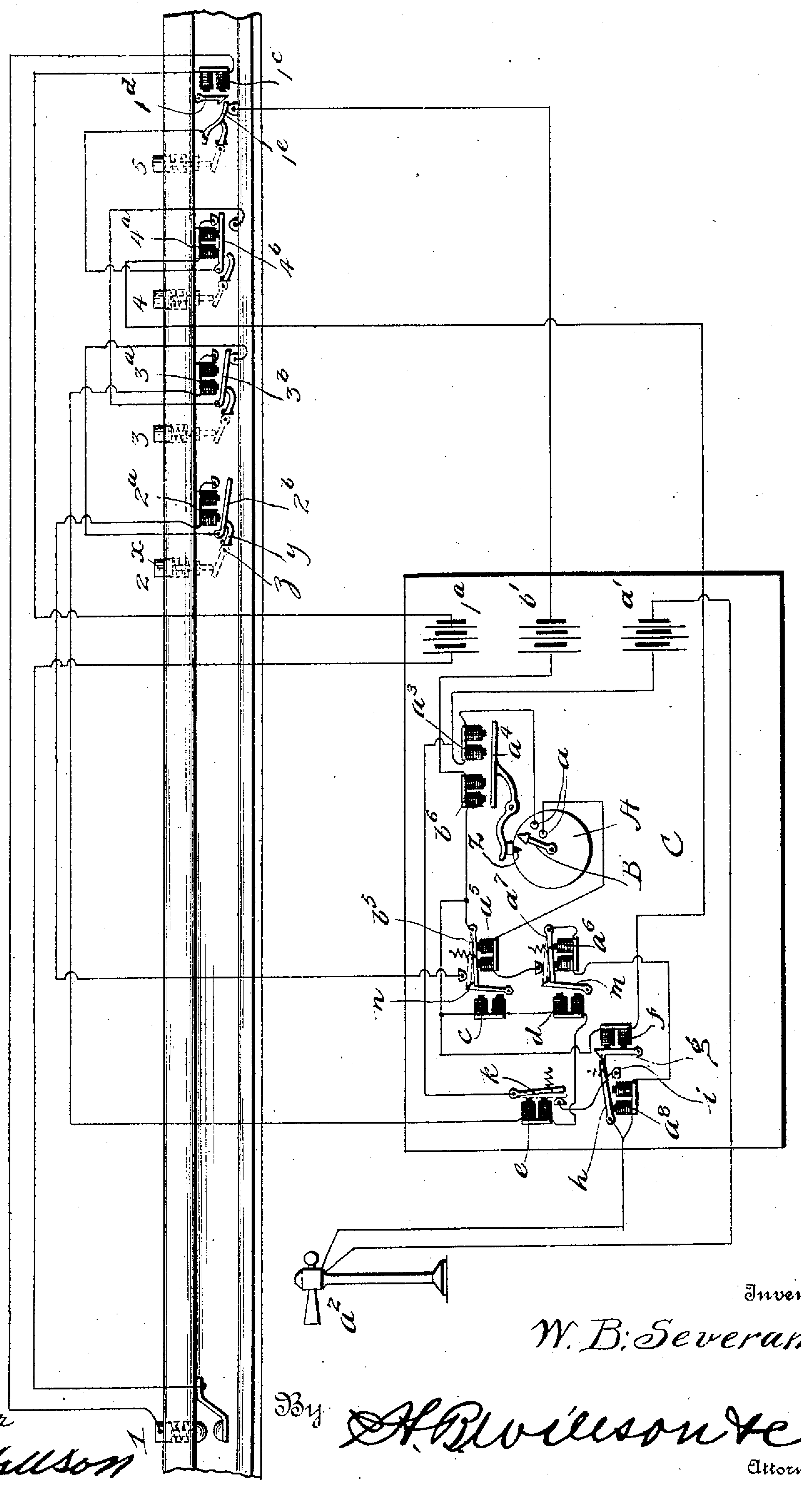

Fig. 3

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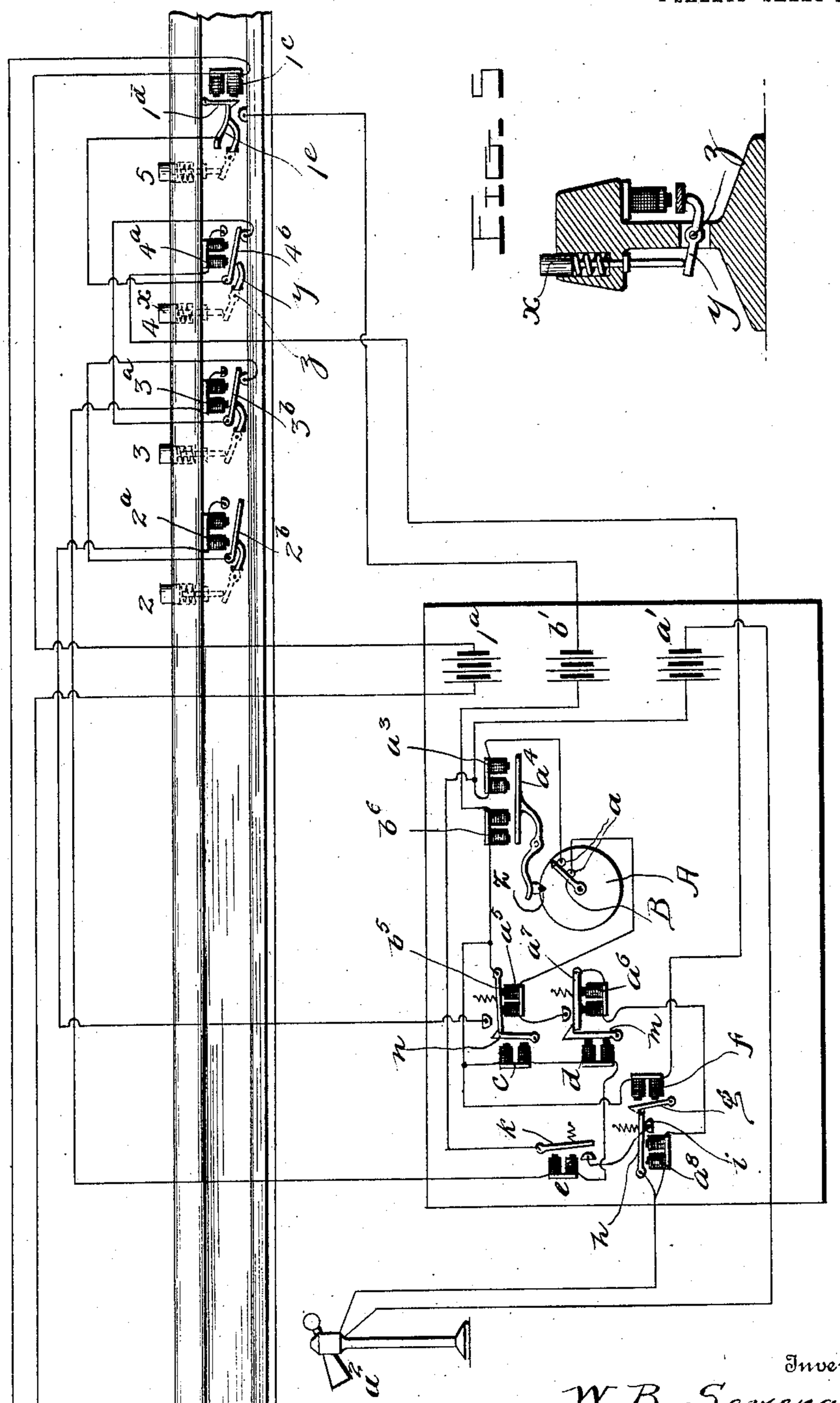
NO MODEL. 4 SHEETS—SHEET 4.

FIG. 4



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No. 763,515. Patented June 28, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM BERNARD SEVERANCE, OF AUBURN, NEW HAMPSHIRE.

TRAIN-OPERATED TIME-SIGNAL SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 763,515, dated June 28, 1904.

Application filed November 10, 1902. Serial No. 130,731. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BERNARD SEVERANCE, a citizen of the United States, residing at Auburn, in the county of Rockingham and State of New Hampshire, have invented certain new and useful Improvements in Train-Operated Time-Signal Systems for Railways; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is an improved train-operated time-signal system for railways for setting a signal at "danger" as a train passes a station, maintaining the signal at "danger" during an appropriate period of time, and at the expiration thereof setting the signal at "safety" to prevent rear-end collisions.

My invention consists in the combination and arrangement of devices hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a diagrammatic plan view of a train-operated railway time-signal embodying my invention, showing the electromagnetic circuit-closing device 2 closed to stop the time mechanism and showing the signal set at "safety," it being assumed that the time limit has not expired to permit the controller to close the circuit at *a a*. Fig. 2 is a similar view showing the electromagnetic circuit-closing device 3 closed, the hand of the time mechanism turned back to the starting-point, and the signal set at "danger." Fig. 3 is a similar view showing the electromagnetic circuit-closing device 4 closed to start the time mechanism in operation. Fig. 4 is a similar view showing the normal positions of the various mechanisms of the system after a train has passed and operated the electromagnetic circuit-closing device 5 and at the expiration of the period of time at which the time mechanism closes an electric circuit which effects the operation of the signal and returns the latter to "safety." Fig. 5 is a detail view of one of the train-operated circuit-closers.

Referring to the drawings, A represents a stop-clock or time mechanism having an operating-stem which when first pressed—assuming the clock to be in operation—stops the clock, when pressed the second time turns the hand back to the starting-point, and when pressed the third time starts the clock in operation again. Usually the time mechanism is constructed to operate at each starting thereof for a period of five minutes; but this may be varied as may be required or desirable. The stop-clock will be at a station *c* midway, or substantially so, between the train-operated devices 1 to 5 in the track, disposed and adapted to be operated by the wheels of passing trains.

The device 1 may be a circuit-closer of any suitable form. It should be located in the track at least a train's length from one side of the station and is in circuit with a battery 1^a and an electromagnet 1^c.

The stop-clock or time mechanism has a pair of electrodes *a* in an open circuit, in which is included a battery *a'*, an electrically-operated signal a^2, and an electromagnet a^3, the armature a^4 of which is connected by a lever to the stem of the stop-clock, which may be operated when the electromagnet a^3 is energized. Also included in this circuit are electromagnets a^5 a^6. The armature a^7 of the latter is included in its circuit, which it breaks when the electromagnet a^6 is energized. An electromagnet a^8 is also included in this circuit.

The armature 1^d of the electromagnet 1^c forms a catch or detent to engage and retain a make-and-break 1^e when the electromagnet 1^c is inert and to release the make-and-break when said electromagnet is energized. The make-and-break is here shown as a spring-conductor to engage and disengage a conductor in a line in which is included a battery *b'*, an electromagnet b^6 to operate the stem of the stop-clock, a switch-armature b^5, and an electromagnet 2^a, and in open circuit armature 2^b and armatures 3^b 4^b. Electromagnets *c*, *d*, *e*, and 3^a are also included in open shunt-circuit therewith. Electromagnets *f* and 4^a are also included in open shunt-circuit therewith.

At suitable distances from the circuit-closer 1 and from each other are train-operated devices 2 3 4 5, each of which comprises a spring elevated press-rod *x* and a lever *y*. The former is here shown as guided in an opening

in the head of the rail, and the latter is shown pivoted at *z* and extending to one side of the rail. The rod is normally elevated by its spring, so that it projects above the rail until depressed by a wheel of a passing train to operate the lever. The lever of the device 2 when operated closes the make-and-break armature 2^b of the electromagnet 2^a. That of the device 3 performs the same office for the make-and-break armature of electromagnet 3^a. That of the device 4 performs the same office for the make-and-break armature of electromagnet 4^a. That of device 5 moves the make-and-break 1^e into engagement with the detent-armature 1^d of electromagnet 1^c.

The armature *g* of electromagnet *f* is a detent adapted when said electromagnet is energized to release the armature *h* of electromagnet a^8, which armature is included in a make-and-break at *i*. A make-and-break armature *k* of electromagnet *e* is included in a shunt between the battery *a'*, electromagnet a^8, and electromagnet a^6. The armature *m* of electromagnet *d* is a detent, which when the said electromagnet is energized releases said armature to cause it to close the circuit between electromagnets a^5 a^6. The armature *n* of electromagnet *c* is a detent to engage and release the make-and-break or switch-armature b^5.

Initially the position of the several movable devices of the apparatus will be as shown in Fig. 1, excepting that the conductor 1^e will be engaged by the detent 1^d and the conducting-armature 2^b will be in position to break the circuit of the electromagnet 2^a. It will be understood that as a train approaches in the direction of the arrow in Fig. 1 it will first operate the circuit-closer 1 and afterward successively operate the devices 2, 3, 4, and 5 and that each of said devices will be depressed as a wheel reaches it and immediately thereafter raised when the wheel has passed it.

The signal which I use in connection with my improved system is the Union Electric Banner Signal, well known to those practically skilled in the art to which my invention relates and which requires a current to set it at "danger" and another to set it at "safety." The showing at Fig. 1 assumes that the last train has just passed. When the first wheel of the approaching train reaches and depresses the device 1, the battery-circuit 1^a is closed, exciting the electromagnet 1^c, causing the armature 1^d to be attracted and to release the spring make-and-break 1^e and cause the latter to close one side of the circuit, in which the battery *b'*, electromagnet b^6, switch-armature b^5, and electromagnet 2^a are included. When the train reaches and depresses the device 2, said device closes the armature 2^b, thus establishing a circuit from the battery *b'* through the electromagnet b^6, switch-armature b^5, electromagnet 2^a, make-and-break armature 3^b, make-and-break armature 4^b, and make-and-break 1^e. Electromagnet b^6 being thus excited attracts the armature a^4 and causes the latter to operate the stem of the clock and stop the time mechanism. When the device 3 is reached and operated by a wheel of the passing train, the armature 3^b is closed, thereby cutting out the electromagnet 2^a and making a circuit through the electromagnet 3^a, battery *b'*, and electromagnets b^6, *c*, *d*, and *e*. The magnet *b*, by again attracting the armature a^4, causes the stem of the stop-clock or time mechanism to turn the hand back to the starting-point, which is indicated at Z. The electromagnet *c* attracts its detent-armature *n*; but since the switch-armature b^5 is already disengaged the said magnet *c* in the present instance performs no function. The action of the electromagnet *d* causes the detent-armature *m* to release the make-and-break armature a^7, and thereby establish electrical connection between the electromagnets a^5 a^6, and the action of the electromagnet *e* causes the make-and-break armature *k* to establish a circuit between the battery *a'* and the signal through the armatures *h* and *k*, thus causing the signal to turn to "danger." When the train reaches and operates the device 4, the switch or make-and-break armature 4^b establishes a circuit through the electromagnet 4^a, battery *b'*, and electromagnets b^6 and *f*, cutting out the electromagnet 3^a, and hence cutting out the electromagnet *e* also. The electromagnet *f* by attracting its detent-armature *g* releases the make-and-break armature *h*, thus breaking the contact between the latter and the point *i*, included in the circuit between the signal and the battery *a'*. The electromagnet b^6 by attracting its armature a^4 operates the stem of and starts the stop-clock or time mechanism. The same continues to run—say five minutes—until its hand connects with the electrodes *a*, with which it is provided, thereby causing the current from the battery *a'* to excite the electromagnets a^3, a^5, a^6, and a^8 and to pass to the signal a^2 to set the latter at "safety." The electromagnet a^5 attracts the armature b^5, thus breaking the circuit between the battery *b'* and electromagnet 2^a and causing the said armature to be engaged and locked in open or circuit-breaking position by the detent-armature *n*. The electromagnet a^3 by attracting its armature a^4 operates the stem of the clock and causes the latter to stop. The electromagnet a^6 by attracting its armature a^7 breaks its own circuit, and the same continues broken by reason of the engagement of the armature make-and-break a^7 by the armature-detent *m*. The electromagnet a^8 moves its armature-switch *h* into engagement with the detent-armature *g* and into contact with the point *i* ready to reëstablish electrical connection between the battery *a'* and the signal, when the switch-armature *k* is attracted by its electromagnet *e*, as hereinbefore described. As the wheels of the train pass over the de-

vice 5 they cause the make-and-break 1^e to be engaged by the detent-armature 1^d, thereby breaking the circuit between the electromagnet 4^a and the battery b'.

The only function of the device 2 and its connections, as hereinbefore described, is to stop the time mechanism. I have also stated in this specification that the hand of the time mechanism as it reaches the end of the time limit closes a circuit which employs the magnet a^3 and armature a^4 to stop the time mechanism. Hence if the next train which follows does so after the expiration of the time limit there will be no necessity for stopping the time mechanism, since the same is not in operation, and hence under such conditions the device 2 and its connections will not perform this function; but the said following train by operating the device 3 as hereinbefore described will close the circuit including the electromagnet c, and hence the armature n will be caused to release the switch-armature b^5.

The time mechanism is an indicator which indicates the length of time that has elapsed since the passage of a train, as will be understood. The armature a^4 and the electromagnets a^3 b^6 constitute a controller for the time mechanism.

It will be understood from the foregoing that my system is operative only in connection with trains moving in one direction and that in practice the same will be duplicated to be effective in protecting trains moving in both directions.

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

1. In combination with a primarily-open electric circuit including an electromagnet b^6 and a switch-armature b^5, a time mechanism, a controller therefor actuated by the said electromagnet b^6, electromagnets c, d and e, in a shunt, excluding the switch-armature, of said circuit, electromagnet f in another shunt also excluding the switch-armature, of said circuit, an electric circuit, including an electromagnet a^3 to actuate the controller of the time mechanism, an electromagnet a^5 to operate the switch-armature, a make-and-break armature a^7, electromagnet a^6, therefor, electromagnet a^8 and an electrically-operated signaling device, a closer for said circuit, operated by the time mechanism, a detent n operated by the electromagnet c for the switch-armature b^5, a detent m for the make-and-break armature a^7, operated by the electromagnet d, a make-and-break armature h operated by the electromagnet a^8, a detent g, operated by the electromagnet f, for said make-and-break armature h, and a make-and-break armature k operated by the electromagnet e, and included in a shunt of the last-mentioned circuit, said shunt excluding electromagnets a^3, and including make-and-break armature h and the electrically-operated signaling device, and train-operated means to close and reopen said circuits.

2. In combination with an electrically-operated signaling device, normally open electric circuits, each including the same, a time mechanism having a closer for one of said circuits, a controller for the time mechanism, electrically-operated means in the said circuits, to actuate the controller, and train-operated means to close and reopen said circuits.

3. In combination with an electrically-operated signaling device, normally open electric circuits each including the same, a time mechanism having a closer for one of said circuits, a controller for the time mechanism, electrically-operated means in the said circuits to actuate the controller, train-operated means to close and subsequently reopen one of said circuits, and train-operated means, effective during the interval between the closing and reopening of the said circuit, to control said circuits, to effect repeated operation of the time-mechanism controller, for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM BERNARD SEVERANCE.

Witnesses:
THOMAS S. EMERY,
BLANCHE WOOD.