No. 619,890. Patented Feb. 21, 1899.

T. B. KEELER.

RAILWAY SIGNAL SYSTEM.

(Application filed July 21, 1898.)

(No Model.)

Fig. 1.

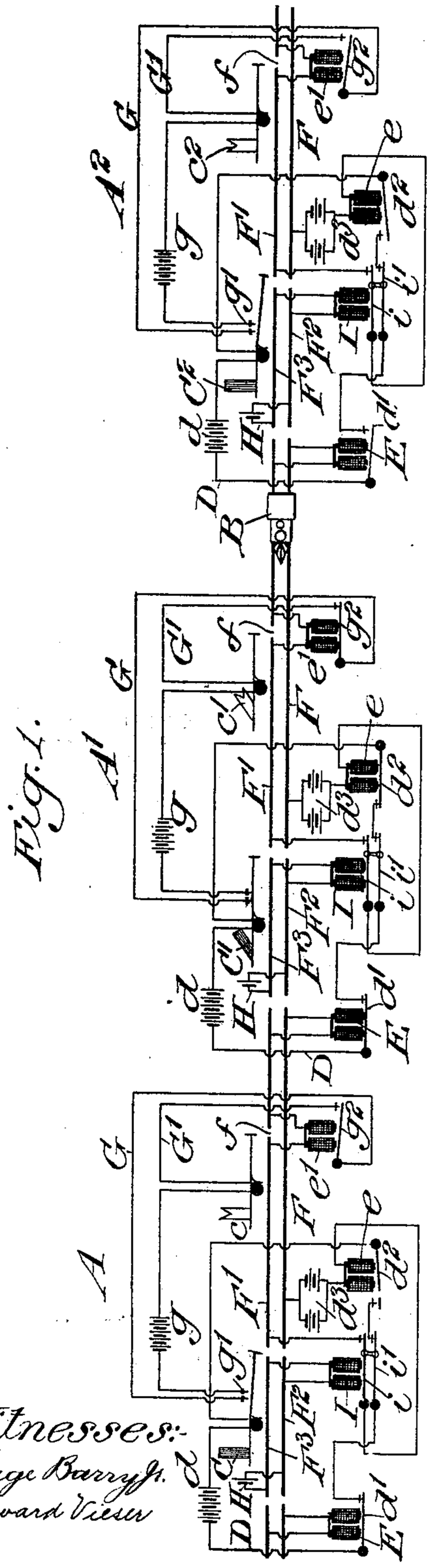
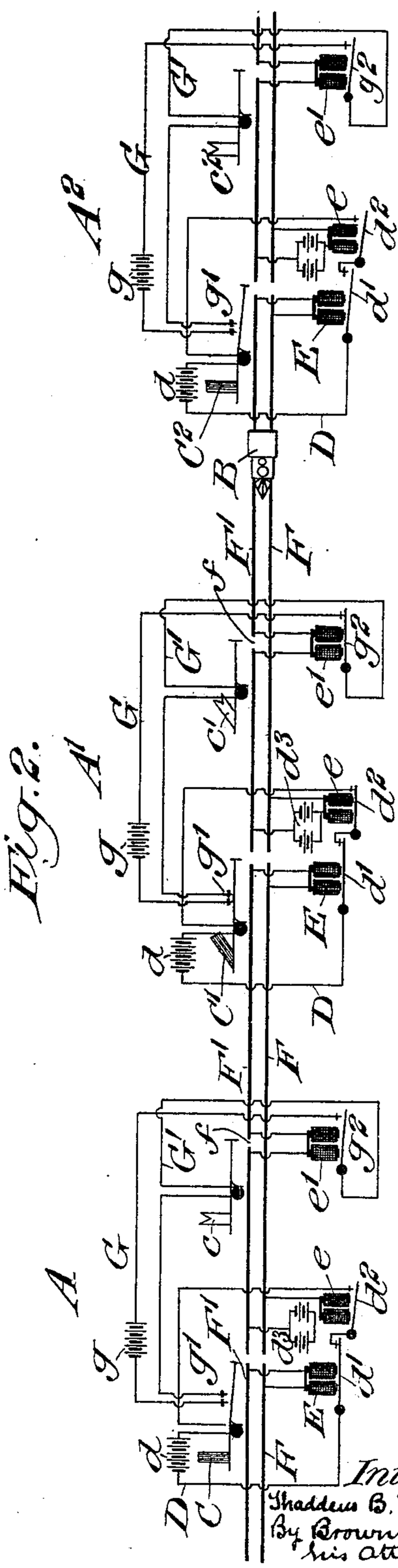


Fig. 2.



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UNITED STATES PATENT OFFICE.

THADDEUS B. KEELER, OF RAHWAY, NEW JERSEY, ASSIGNOR TO THE STANDARD RAILROAD SIGNAL COMPANY, OF ARLINGTON, NEW JERSEY.

RAILWAY SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 619,890, dated February 21, 1899.

Application filed July 21, 1898. Serial No. 686,508. (No model.)

To all whom it may concern:

Be it known that I, THADDEUS B. KEELER, a citizen of the United States, and a resident of Rahway, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Railway Signal Systems, of which the following is a specification.

My invention relates to an improvement in railway signal systems, and more particularly to an automatic system in which signals are set normal at "danger," with the object in view of avoiding the use of back contacts in relays by providing for the making and breaking of the several electric circuits by front contacts only, and thereby securing greater constancy and safety, as well as simplicity, in the operation of the system.

In the accompanying drawings I have represented in Figure 1 three towers or stations of the system and the two blocks included by them and including an auxiliary track-circuit at the entrance of each block, and in Fig. 2 I have shown a similar number of towers and blocks with the auxiliary track-circuits at the beginning of the blocks omitted.

In describing the invention I will first describe the system represented in Fig. 2 as the more simple arrangement and then by means of Fig. 1 show the arrangement of the auxiliary track-circuit in connection with the system shown in Fig. 2.

It is to be assumed that the several relays and batteries are to be suitably incased and protected and that the signals are to be operated by electric, pneumatic, mechanical, or other well-known or approved power under the control of one or more electric circuits to set them in operation to move the signal into and out of its positions of "danger" and "clear."

As my present invention does not relate to the structure of the signal-operating mechanism, but only to the combination and arrangement of electric circuits for setting such mechanism in operation, I have omitted to show such signal-operating mechanism other than diagrammatically.

The corresponding stations in Figs. 1 and 2 are denoted, respectively, by A, A′, and A^2, and for the purposes of the present explanation a train of cars (denoted by B) is supposed to be on the track intermediate of the stations A′ A^2 and advancing toward the station A.

In using the word "station" I refer to the terminus of a block—the point where one block terminates and another begins.

The signals in the present system stand normally at "danger" on an open-line circuit and are affected by the approaching train as follows: At each station there are a home signal and a distant signal, the home signals being denoted by C C′ C^2 and the distant signals by c c' c^2. The electric circuit, which, when closed, sets in operation the mechanism for lowering the signal C to "clear," is denoted by D and includes a battery d, the armature d' of an electromagnet E, and the armature d^2 of an electromagnet e. The electromagnet E has its poles connected, the one with the rail F of the track and the other with the rail F′ of the track at the beginning of a block, while the electromagnet e has one of its poles connected through a battery d^3 with the rail F′ of a preceding block and its opposite pole connected with the rail F of the preceding block at or near the terminus of the said preceding block. The distant signal c has its operating mechanism connected by wires G and G′ with the opposite poles of a battery g, the wire G leading from the signal-operating mechanism to a contact-piece g' at the home signal C and thence to one pole of the battery and the wire G′ leading through the armature g^2 of an electromagnet e' to the opposite pole of the battery g. The contact-piece g' is so located that the lowering of the home signal C to "clear" will close the contact, the said contact remaining open and forming a break in the circuit as long as the home signal C remains at "danger." The electromagnet e' has its opposite poles connected with the rail F′ of the track upon opposite sides of a break f in the rail.

As the arrangement is similar at each station, the lettering of the several magnets, batteries, and connecting-wires is repeated, and in explaining the operation of the system the distinction between the relays at the different stations will be made by calling attention to the stations at which they are located.

The electromagnets E are of much higher resistance than the electromagnets *e e'*, so that when the parts are in the normal condition shown at station A the flow of the electric current from the battery d^3 through the electromagnets *e e'* at station A, through the rails F F', and through the electromagnet E at station A' will, because of the high resistance of the electromagnet E and the comparatively low resistance of the electromagnets *e e'*, affect the armature *d'* of the electromagnet E at station A', causing it to close circuit to the armature d^2 of the electromagnet *e* at station A', but will not close the armatures d^2 and g^2 of the electromagnets *e e'* at station A, and hence will leave the circuits through the home and distant signals C *c* at station A broken, and hence the signals at normal "danger." The same condition will prevail between any two succeeding stations so long as no train enters upon the block between the two stations. When, however, a train enters the block between two stations—as, for example, in the position shown by the train B between the stations A' and A^2—the high-resistance magnet E at station A^2 will be cut out of circuit through the battery d^3 and through the electromagnets *e e'* by the trucks of the train bridging the rails, and the current now being passed solely through the electromagnets *e e'* will be sufficient to attract their armatures d^2 and g^2, causing them to close the break at d^2 in the circuit D for operating the home signal and one of the breaks in the circuit for controlling the distant signal C' and one of the breaks in the circuit for controlling the distant signal *c'* at station A'. The effect of this will be first to set the signal-operating mechanism at home signal C' in operation to drop the signal to "clear." The movement of the signal C' to "clear" will mechanically close the contact *g'*, and in so doing will complete the circuit through the battery *g* for setting in operation the signal-operating mechanism at the distant signal *c'* and it will be in turn dropped to "clear." Particular attention is called at this point to the fact that it is necessary to lower the home signal C' to "clear" before the distant signal *c'* can drop to "clear." The engineer of the approaching train upon seeing the distant signal at "clear" is assured of the fact that the next succeeding block is open for his advance under full headway. The effect upon the electromagnet E at station A^2 when the rails were bridged by the train B advancing toward station A' was to deenergize it and cause its armature *d'* to break circuit through the home signal C^2 at station A^2, thereby permitting it to return to its normal danger position. The return of the signal C^2 to its normal "danger" mechanically opened the contact *g'* in the circuit for controlling the distant signal c^2 at its station, and the distant signal c^2 thereupon promptly returned to "danger." As the wheels of the advancing train pass the break *f* in the rail F' and bridge the rails between said break and the terminus of the block the electromagnet *e'* will become deënergized and its armature g^2 will drop into the position shown at station A^2, and when the last wheels of the train have passed the points where the battery d^3 is connected with the rails the electromagnet *e* will become deënergized and its armature d^2 will be dropped into the open position shown at station A^2 by the difference in resistance between the electromagnet E at station A^2 and the electromagnets *e e'* at station A', as has heretofore been explained. If, however, a train shall have come onto a preceding block and cut out the magnet E before the train B has "cleared" the block, it will be impossible for such a train to secure a clear-signal until the train advancing has left the block, because of the break in the home-signal circuit made by the opening of the armature *d'* of the electromagnet E at the rear of the advancing train, as shown at station A^2.

In the arrangement shown in Fig. 1 there is introduced into the system shown in Fig. 2 and hereinabove particularly described an auxiliary block at the beginning of each main block and insulated from the adjacent main blocks, which auxiliary block may be extended to any predetermined distance from the station for the purpose of switching trains and the like at the station without putting the signals at the previous station into a condition to be dropped to "clear" by a following train.

In the stations A A' A^2 in Fig. 1 the rails of the auxiliary block or section are denoted by F^2 F^3. They are in circuit with a battery H at or near their forward ends and with an electromagnet I at or near their rear ends. The armature of the electromagnet I is denoted by *i*, and it has coupled to swing with it an armature *i'*. The armature *i'* makes and breaks the circuit D for controlling the home signal C, while the armature *i* makes and breaks the circuit through the rails F F' and battery d^3, which controls the high-resistance electromagnet E of the preceding station, as hereinabove described. From this arrangement it follows that so long as wheels of the train bridge the rails F^2 F^3 of the auxiliary section the electromagnet I will be cut out from its battery H and the armatures *i i'* will be dropped away from the magnet, breaking both the circuit D for controlling the home signal and keeping it at "danger," and also the track-circuit leading to the high-resistance electromagnet E of the preceding station, thereby retaining the home signal C' at that station at "danger." When, however, the last pair of wheels has passed from the auxiliary section, the battery H will again energize the magnet I, and the armatures *i i'* will be drawn into position to close contact in both the home circuit D and the track-circuit leading to the preceding station, and the oncoming train will now effect the throw of the

signals at the advance station to "clear" in the same manner as already described in connection with the system illustrated in Fig. 2.

In the system including the auxiliary section represented in Fig. 1 the distant signals are under the control of the contact g' to be mechanically closed and opened by the dropping and raising of the signals C C′ C² in a manner quite similar to that already described in connection with the system represented in Fig. 2.

What I claim is—

1. In combination a track-circuit; electromagnets of different resistances and a source of electric energy common to the said electromagnets, included in said track-circuit; independent signal-circuits; signal-operating means and a source of electric energy, included in each of said signal-circuits; the armatures of the said electromagnets of different resistances, each forming a part of one of the said signal-circuits, substantially as set forth.

2. In combination a track-circuit; electromagnets of different resistances and a source of electric energy common to the said electromagnets, included in said track-circuit; an electromagnet for controlling a distant signal also included in said track-circuit; independent signal-circuits; signal-operating means and a source of electric energy, included in each of said signal-circuits; the armatures of the said electromagnets included in the track-circuit, each forming a part of one of the said signal-circuits, substantially as set forth.

3. In combination main track-circuits, an auxiliary track-circuit interposed between said main track-circuits and independent thereof; electromagnets of different resistances and a source of electric energy included in each main track-circuit; an electromagnet and source of electric energy included in the auxiliary track-circuit; independent signal-circuits; signal-operating means and a source of electric energy, included in each of said signal-circuits; the armatures of one of the magnets of different resistances and of the magnet in the auxiliary track-circuit forming parts of the signal-circuit, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 30th day of March, 1898.

THADDEUS B. KEELER.

Witnesses:
FREDK. HAYNES,
EDWARD VIESER.