No. 840,135. PATENTED JAN. 1, 1907.

W. B. LANE.

SIGNAL APPARATUS.

APPLICATION FILED JULY 25, 1906.

3 SHEETS—SHEET 1.

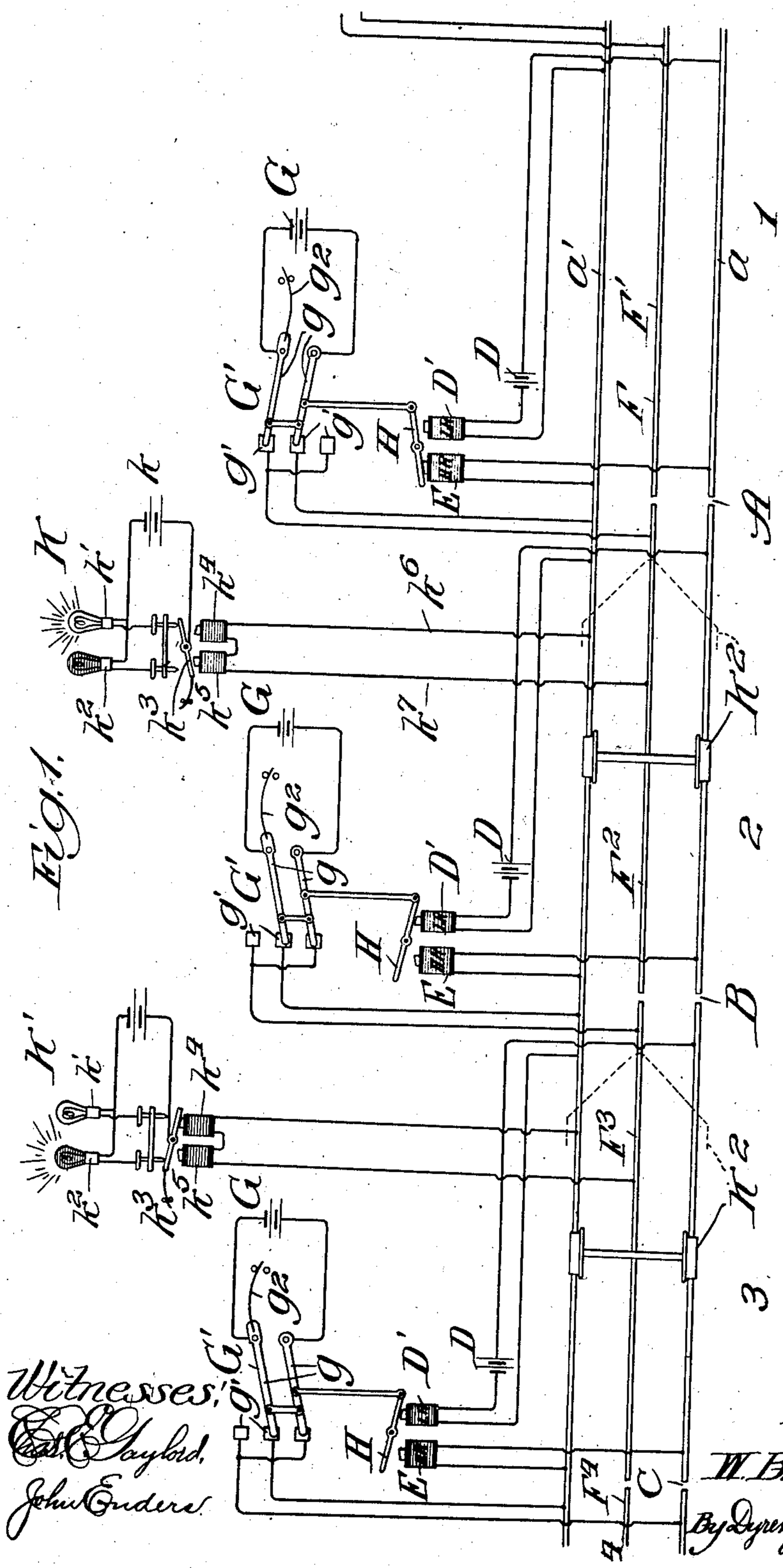

Fig. 1.

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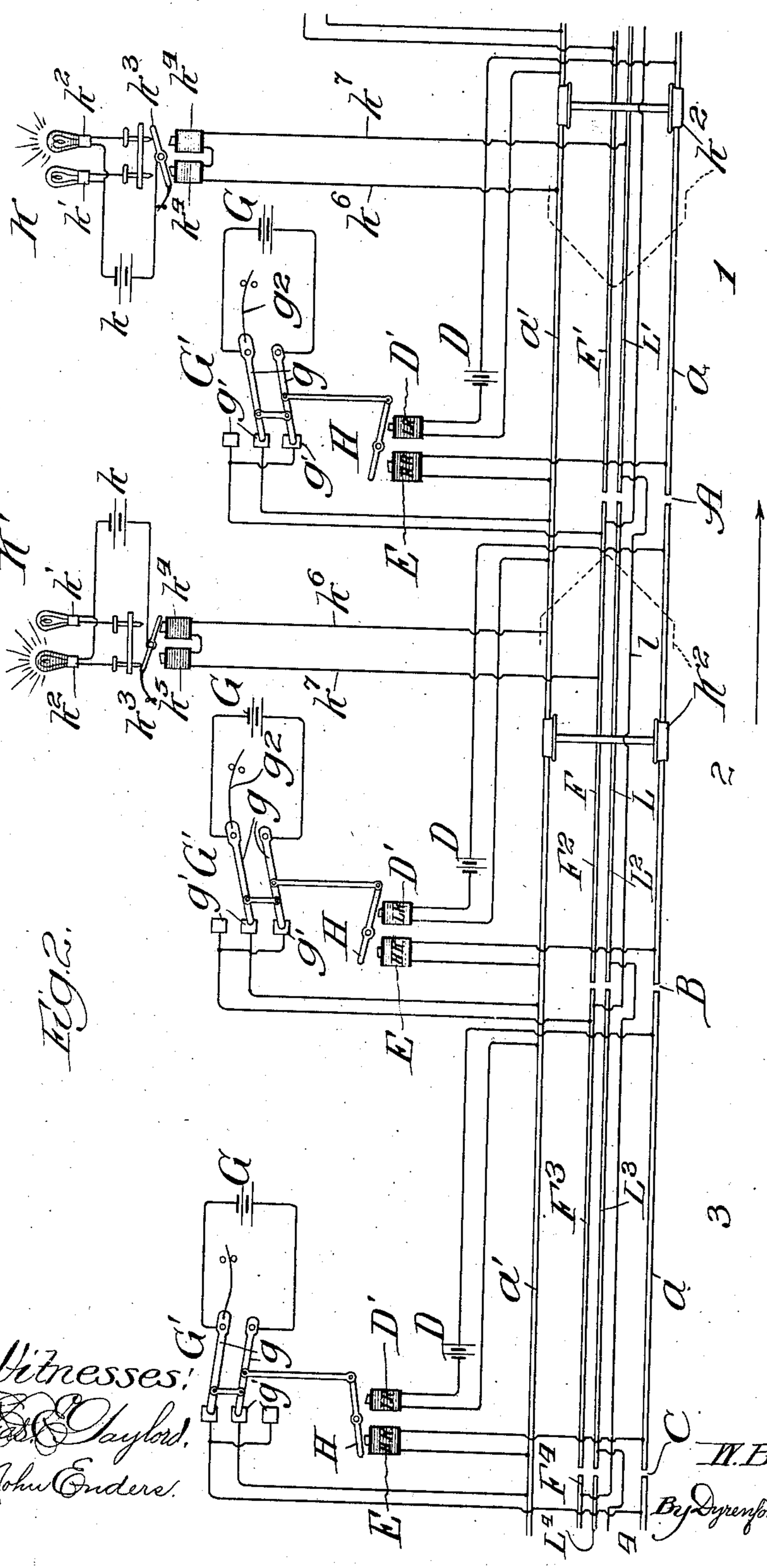

Fig. 2.

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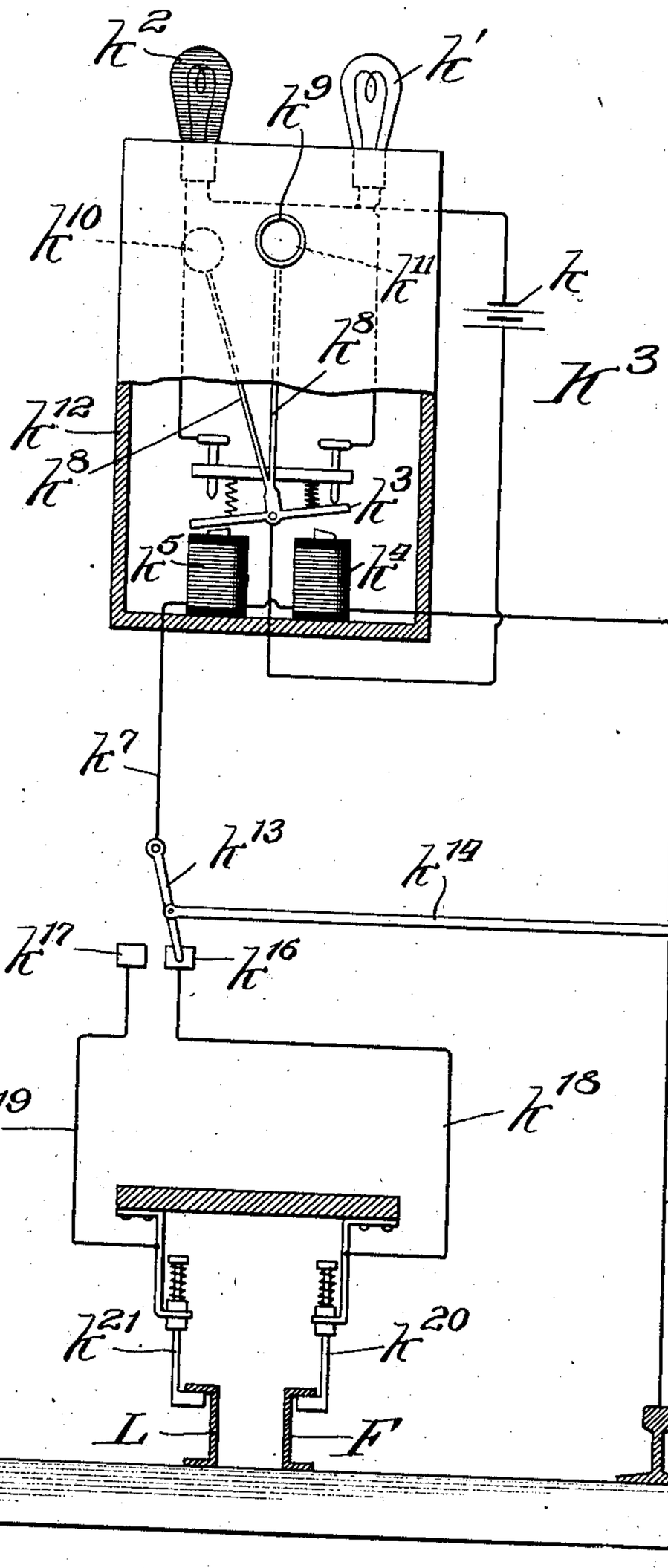
3 SHEETS—SHEET 3.

Fig. 3.



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SIGNAL APPARATUS.

No. 840,135. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed July 25, 1906. Serial No. 327,637.

To all whom it may concern:

Be it known that I, W BRITTON LANE, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a new and useful Signal Apparatus, of which the following is a specification.

My invention relates particularly to block-signaling apparatus adapted to operate train-carried signals.

My primary object is to provide improved apparatus of the character indicated possessing great certainty of action and calculated to give to the engineer in charge of a train accurate knowledge as to the condition of the track.

The invention is illustrated in its preferred embodiment in the accompanying drawings, in which—

Figure 1 represents diagrammatically my improved apparatus as applied to a track designed for train movement in one direction only. Fig. 2 represents diagrammatically my improved apparatus as applied to a track designed for train movement in both directions, and Fig. 3 is a transverse sectional view showing details of the apparatus as arranged in Fig. 2.

Referring to Fig. 1, a a' represent track-rails, the former of which is electrically divided into sections, the block-junctions being marked A B C. Four blocks are shown, numbered 1, 2, 3, and 4. The direction of train movement is indicated by the arrow. Connected with the track-rails near the advance end of each block is a battery D, in whose circuit is a low-resistance electromagnet D′. Connected with the track-rails near the rear end of each block is a high-resistance electromagnet E. Located between the track-rails is a rail composed of electrically-insulated sections F′ F² F³ F⁴, corresponding in location with the sections of the track-rail a. Connected with the continuous track-rail a' and the block-rail F, near the advance end of each block, is a local train-controlling battery G, whose circuit is equipped with a pole-changer G′. The pole-changer of each block is controlled by an armature H, which is controlled by the high-resistance and low-resistance electromagnets E and D′ of the advance block. Each battery G and its conductors and the rails connected therewith constitute a local partial circuit adapted to be closed by a train-carried partial circuit controlling the signals mounted on the train, preferably on the locomotive. K K′ represent train-carried signal mechanisms mounted on locomotives K². Each train-carried mechanism comprises a battery k, having a circuit connected with clear and danger lights k' k^2, a polarized armature k^3 controlling the circuit of the battery k and electromagnets k^4 k^5, connected by conductors k^6 k^7 with the track-rail a' and the block-rail F. Each pole-changer G′ is provided with swinging contact members g, coacting with stationary contact members g', connected with the circuit of the battery G. The contact members g' are so spaced that the swinging contact members g may assume a neutral position between them, owing to the action of a spring g^2, when both the high-resistance and low-resistance electromagnets controlling the armature H are deënergized. The armatures k^3 are also spring-controlled, so that they will assume a neutral position when the electromagnets k^4 k^5 are deënergized.

Fig. 1 shows the condition when a train is in block 2 and another train is in block 3 and block 1 is clear. Under such circumstances the high-resistance magnet E, connected with the block 1, controls the pole-changer G′ of the block 2, and current from the battery G passes to the rails a' and F of the block 2 and thence through the conductors k^6 k^7 in a direction to influence the polarized armature k^3 of the mechanism K, so as to give a clear signal through the medium of the light k'. It should be understood that the battery D of block 1 energizes both the electromagnet D′ and the electromagnet E of the same block, but that the high-resistance magnet prevails. In block 2, however, a short circuit across the track-rails is established by the train, practically deënergizing the high-resistance magnet of block 2 and allowing the low-resistance magnet of block 2 to operate the pole-changer G′ of block 3. The result is that the current from battery G of block 3 passes in such direction to the track-rail a' and the block-rail F as to change the polarity of the magnets k^4 k^5 of the mechanism K′, thereby causing the armature k^3 of said mechanism to move and close the circuit of the danger-signal k^2 of said mechanism. The position of the pole-changer of block 4 is the same as the position of the pole-changer of block 3, so that were a train to approach block 3 from the rear thereof a danger-signal would be received through its train-carried

signal mechanism. Were a track-battery D to fail, the result would be to deënergize the track-magnets of the same block, thereby allowing the swinging contact members *g* of the corresponding pole-changer G′ to assume the neutral position under the action of the spring with which the pole-changer is provided, so that the local partial circuit would not be energized. Consequently a train entering the succeeding block would fail to receive a positive signal, inasmuch as the armature k^3 of its mechanism would assume the neutral position, owing to the failure of a supply of current through the magnets k^4 k^5. The same result would follow in the event of the failure of a battery G or its connections. In any event the engineer would understand that there was no train ahead and would, under the rules, proceed cautiously. If upon entering a block farther in advance the signals were reëstablished, it would be known that the track equipment for one block had failed.

In the construction illustrated in Fig. 2 certain of the parts are duplicates of the parts already described and are indicated by the same reference characters. To provide, however, for the giving of the signal to the train regardless of the direction of movement of the train, an additional block-rail L is provided adjacent to the block-rail F, and the rail L is electrically divided into sections L′ L^2 L^3 L^4, corresponding with the sections of the rail F. One end of each section of the rail L is joined by a conductor *l* to the other end of the next section but one of the rail F—that is, different ends of alternate sections of the rails L and F are joined together. Assuming now that trains are approaching each other in blocks 1 and 2, as shown in Fig. 2, the magnet E of block 1 will be short-circuited by the train in block 1, thereby setting the pole-changer G′ of block 1 in position to give a danger-signal to the approaching train in block 2. The magnet E of block 2 will be cut out by the train in said block, and the battery G of block 3 will be so connected with the rails a' and F as to give a danger-signal to any train mechanism receiving the current. As the rail a' is continuous and the section of the rail F which receives the current from the battery G of block 3 is connected with the section of the rail L in block 1, the train in block 1 will receive the danger-signal. At the same time were a train to enter block 3 it would receive a danger-signal.

In Fig. 3 is illustrated a slightly-modified form of train signal mechanism K^3, and the relation thereof to the track and track equipment shown in Fig. 2 is illustrated. The parts of the train mechanism K^3 corresponding with the parts of the train mechanism K are similarly lettered. In this construction the armature k^3 is equipped with rods k^8, which carry danger and clear signal targets or semaphores k^9 k^{10}, adapted to register with an opening k^{11} in a casing k^{12}, it being understood that the clear semaphore is exhibited when the safety signal-lamp k' is lighted. To enable the conductors of the magnets k^4 k^5 to be changed when the train reverses its direction, the conductor k^7 is provided with a switch k^{13}, which is connected by a rod k^{14} with the reversing-lever k^{15} of the locomotive. The contact member k^{13} is adapted to be brought into contact with either one of a pair of contact members k^{16} k^{17}, which are connected, respectively, by conductors k^{18} k^{19} with shoes or brushes k^{20} k^{21}, contacting with the rails F and L. From Fig. 2 it will be understood that when a train is moving in the direction opposite the direction of the arrow it is necessary that the conductor k^7 be connected with the rail L. This is accomplished when a train backs up by the shifting of the switch k^{13} through the medium of the reversing-lever of the locomotive.

For clearness of understanding the batteries D are designated "track-batteries," and the function of each track-battery is to energize a high-resistance magnet and a low-resistance magnet, and the batteries G are designated "signal-controlling" batteries, whose pole-changers are controlled by the magnets E and D′. As has been indicated, each signal-controlling battery is connected with the rails and forms therewith a local partial circuit through whose medium the signals on the train are operated.

It is noted that the rails F and L are symmetrically arranged with reference to the track, so that upon turning a locomotive about the conductors thereof have their shoes shifted from one rail to the other.

What I regard as new, and desire to secure by Letters Patent, is—

1. The combination with rails electrically divided into blocks, of a high-resistance electromagnet and a low-resistance electromagnet connected with one block, a track-battery normally energizing said magnets, a local signal-controlling battery connected with an adjacent block and forming therewith a local partial circuit, a pole-changer controlling the circuit of said signal-controlling battery and controlled by both of said electromagnets, and train-carried signal mechanism having a partial circuit adapted to complete the local partial circuit as the train passes over the same.

2. The combination with rails electrically divided into blocks, of a high-resistance electromagnet and a low-resistance electromagnet located adjacent to each other and connected with opposite ends of one block, a track-battery normally energizing said magnets, a local signal-controlling battery connected with an adjacent block and forming therewith a local partial circuit, a pole-changer controlling the

circuit of said signal-controlling battery, an armature controlled by both of said electromagnets and connected with said pole-changer, and train-carried signal mechanism having a partial circuit adapted to complete the local partial circuit as a train passes over the same.

3. The combination with rails electrically divided into blocks, of a high-resistance electromagnet and a low-resistance electromagnet connected with one block near opposite ends of the same, a track-battery normally energizing said magnets, a local signal-controlling battery connected with an adjacent block and forming therewith a local partial circuit, a pole-changer controlling the circuit of said signal-controlling battery and controlled by both said electromagnets, means for throwing said pole-changer to a neutral position in the event of deënergization of both said magnets, and train-carried signal mechanism having a partial circuit adapted to complete the local partial circuit as the train passes over the same, said train-carried signal mechanism having a circuit-controlling member adapted to assume a neutral position in the event of the failure of current from the local signal-controlling battery.

4. The combination with rails electrically divided into blocks, of a high-resistance electromagnet and a low-resistance electromagnet connected with one block, a track-battery normally energizing said magnets, a local signal-controlling battery connected with an adjacent block and forming therewith a local partial circuit, a pole-changer controlling the circuit of said signal-controlling battery and controlled by both of said electromagnets, means for moving the pole-changer to a neutral position in the event of deënergization of both of said electromagnets, and train-carried signal mechanism comprising clear and danger signals having circuits, a polarized armature controlling said circuits, means for moving said armature to a neutral position, and electromagnets controlling said polarized armature and having a partial circuit adapted to complete the local partial circuit as the train passes over the same.

5. The combination with a pair of track-rails, one of which is electrically continuous and the other electrically divided into blocks, of a high-resistance electromagnet connected with both track-rails in one block, a low-resistance electromagnet connected with both track-rails in the same block, a track-battery normally energizing said electromagnets, a third rail electrically divided into blocks, a local signal-controlling battery connected with said continuous rail and with said third rail in an adjacent block and forming therewith a local partial circuit, a pole-changer controlling said local partial circuit and controlled by both of said electromagnets, and train-carried signal mechanism having a partial circuit adapted to complete said local partial circuit as the train passes over the same.

6. The combination with a pair of track-rails, one of which is electrically continuous and the other electrically divided into blocks, of a third and fourth rail both electrically divided into blocks, a high-resistance electromagnet and a low-resistance electromagnet connected with the track-rails near opposite ends of one block, a track-battery normally energizing said electromagnets, a signal-controlling battery connected with the continuous rail and with the third rail of an adjacent block and forming therewith a local partial circuit, a pole-changer controlling said local partial circuit and controlled by both of said electromagnets, conductors joining one set of ends of the sections of the third rail with the other set of ends of alternate sections of the fourth rail, and train-carried signal mechanism having a partial circuit adapted to be completed through said local partial circuit as the train passes over the same.

7. The combination with a pair of track-rails, one of which is electrically continuous and the other electrically divided into blocks, of a third and fourth rail both electrically divided into blocks, a high-resistance electromagnet and a low-resistance electromagnet connected with the track-rails near opposite ends of one block, a track-battery normally energizing said electromagnets, a signal-controlling battery connected with the continuous rail and with the third rail of an adjacent block and forming therewith a local partial circuit, a pole-changer controlling said local partial circuit and controlled by both of said electromagnets, conductors joining one set of ends of the sections of the third rail with the other set of ends of alternate sections of the fourth rail, and train-carried signal mechanism comprising clear and danger signals, circuits for the same, electromagnets controlling said last-named circuits and having rail-engaging conductors, one of said conductors being equipped with a switch and with two terminals engaging said third and fourth rails.

8. Train-carried signal mechanism of the character described, comprising clear and danger lights provided with electric circuits, an armature controlling said circuits, a plate provided with a sight-opening, clear and danger semaphores mounted on said armature and adapted to be presented at said sight-opening, and electromagnets controlling said armature and having a partial circuit adapted to be completed through a local partial circuit.

W BRITTON LANE.

In presence of—
L. HEISLAR,
J. H. LANDES.