No. 840,095. PATENTED JAN. 1, 1907.

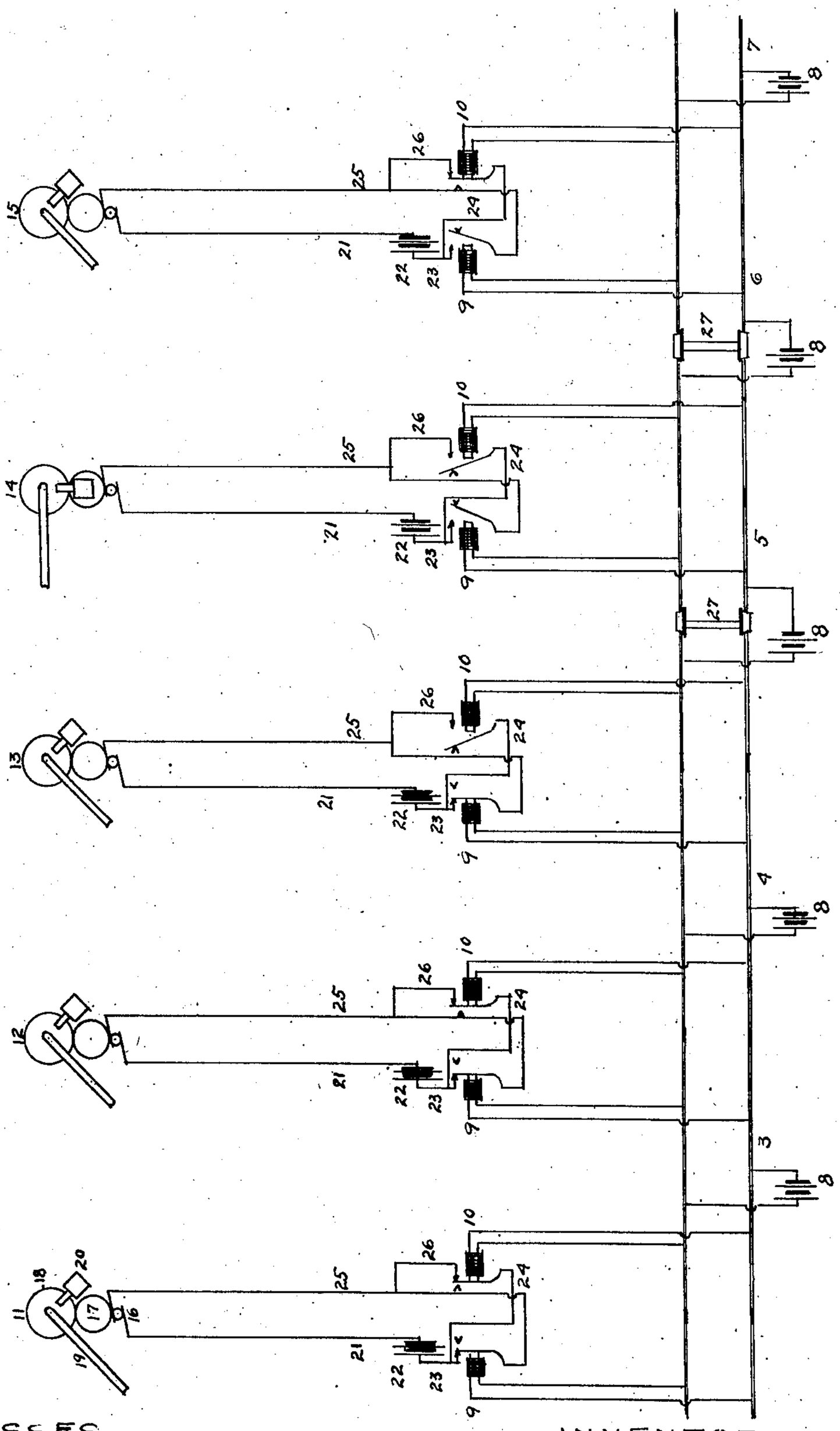
J. SHOECRAFT.

AUTOMATIC SIGNAL.

APPLICATION FILED APR. 20, 1906.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES.

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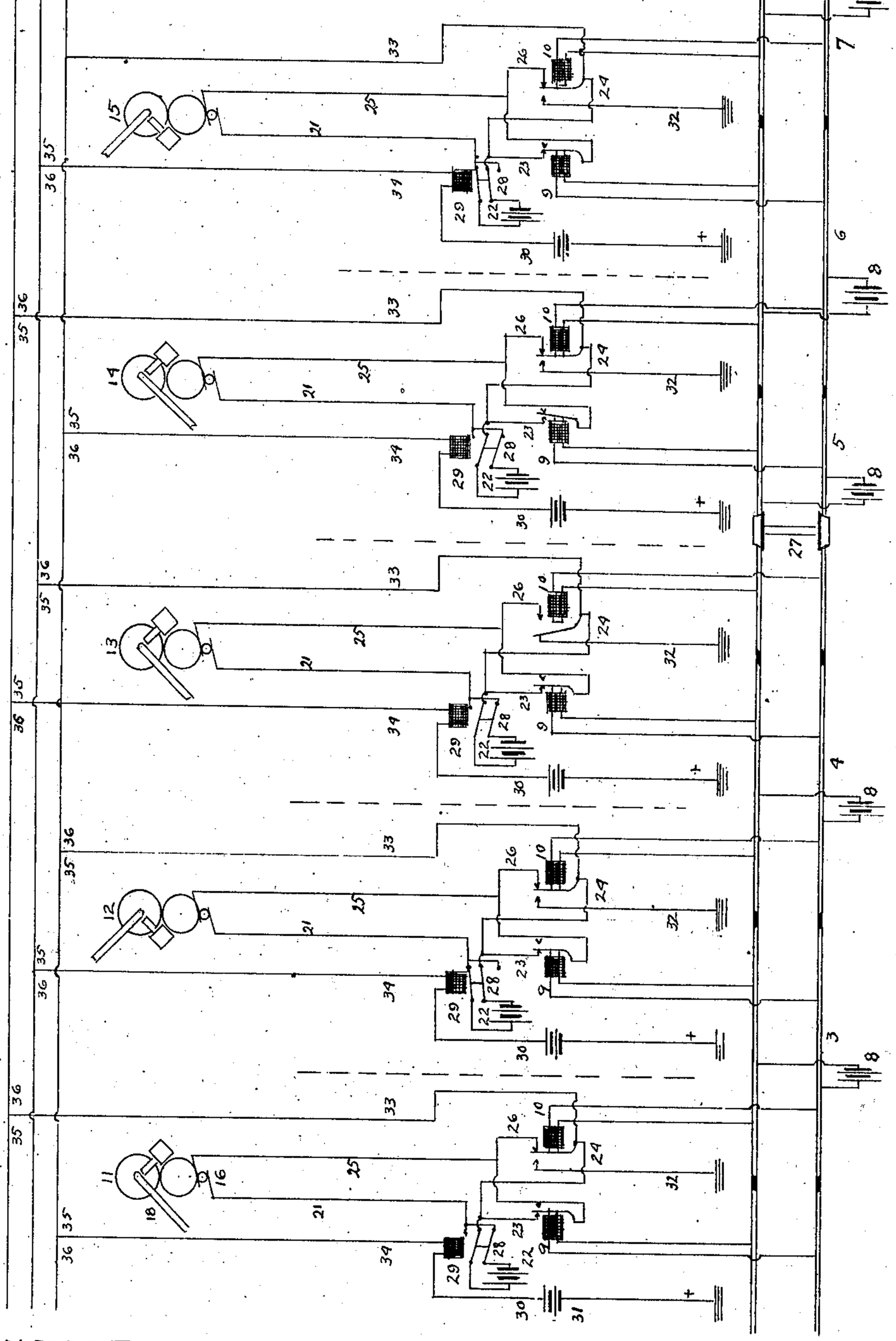
2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

JUDSON SHOECRAFT, OF ESKRIDGE, KANSAS.

AUTOMATIC SIGNAL.

No. 840,095. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed April 20, 1906. Serial No. 312,918.

To all whom it may concern:

Be it known that I, JUDSON SHOECRAFT, a citizen of the United States, residing at Eskridge, in the county of Wabaunsee and State of Kansas, have invented new and useful Improvements in Automatic Signals, of which the following is a specification.

The invention has reference to block-signal systems for railways operated or controlled by electric currents, said currents being adapted automatically to operate or control visual signals and being controlled directly or indirectly by the trains upon the tracks. Signaling devices, as semaphores, are provided at each junction-point to indicate the condition of the adjoining block or blocks.

Objects of my invention are to improve generally upon block-signal systems particularly adapted to a single track on which the trains move in both directions; to provide such a system which is adapted to the three positions of "clear," "caution," and "danger," but which requires only a single signaling device at each station instead of two signaling devices at each station or junction-point; to improve upon the system providing only for the danger and clear signals by simplifying the circuit arrangements and making the operation more reliable and the mechanism less liable to be gotten out of order, and to provide the various parts and improvements hereinafter set forth; and the invention consists of the parts, improvements, and combinations herein set forth and claimed.

Although I have shown the signaling device as the ordinary signal-blade or semaphore, it will be understood that any other devices may be used—such, for instance, as lights of different colors. In the form shown in the drawings the blade in horizontal position indicates "danger"—that is, train in the next adjoining block. In lowered position it indicates a clear track, and in the third or raised position it indicates "caution"—that is, that there is a train in the second block ahead. Normally the signals are in clear position, although they tend naturally to maintain the danger-signal and would go to danger position if the signal-motor circuit were destroyed. They are set in the positions enumerated by the train or trains automatically.

In the drawings accompanying and forming part of this specification and in the description thereof I have illustrated the invention in its preferred form and have shown the best mode of applying the principles thereof; but it is to be understood that the invention itself is not confined to these drawings and the description of the drawings, that it may be applied to other uses, that parts and combinations thereof as herein separately claimed may be used with or without the other devices of similar general nature, and that I contemplate changes in form, proportions, materials, arrangement, the transposition of parts, and the substitution of equivalent members without departing from the spirit of the invention.

Figure 1 illustrates in diagram a line of railway comprising four complete and two incomplete blocks with the complete signaling devices at five junction-points or stations equipped for the danger and clear signals only. Fig. 2 is a similar view of a line, but having in addition the necessary line-wires and equipment for also operating the caution-signals.

Referring first to Fig. 1, the track is divided into a series of blocks 3, 4, 5, 6, and 7. Each block is provided with a track-battery 8. Each block is also provided with two relays, one at each junction-point, as indicated by 9 and 10, respectively. Obviously when the rails are not connected the current from battery 8 flows through the relays 9 and 10, energizing them and holding their armatures against the front contacts, (see blocks 3, 4, and 7;) but when the rails are electrically connected, as by a train passing over them, the current is shunted through the wheels and axles and the relays become demagnetized and the armatures break the front contacts and drop to the back contacts. (See blocks 5 and 6.) At each station or junction-point is a signaling device, as a semaphore, (indicated by the numerals 11, 12, 13, 14, and 15, respectively.) This device may consist of a motor 16, operating a gear-train 17, which in turn operates another gear-wheel 18, on the shaft of which is the signal-blade 19, the weight 20 tending by the force of gravity to hold the signal-blade in danger position. When the current flows through the motor, the blade is driven to clear position and will be held in that position as long

as there is current flowing through the motor or through the motor-circuit or through either branch of the motor-circuit. The preferred form of motor and connections is shown in detail and covered by Patent No. 816,259, granted to me March 27, 1906, for an automatic gearing device, to which reference is hereby made. One side of the motor is connected by wire 21 to the motor-battery 22, and the battery is connected by wire 23 and by a branch 24 to respectively the front contact of relay 9 and the armature of relay 10. The other side of the motor is connected by wire 25 and the branch 26 to respectively the armature of relay 9 and the front contact of armature 10. This affords two passages for the motor-circuit, one through the contacts of relay 9 and the other through the contacts of relay 10. So long as either one or both of these passages are closed the motor-circuit will be closed; but if both passages be broken, as by the demagnetizing of both relays, the motor-circuit will be broken and the signal will go to "danger." Therefore a single train or trains on a single block will not change the signals from their normal clear positions, because the relays are affected at different stations; but if trains be upon immediately-adjoining blocks the relays at the intermediate station will both be demagnetized, with the result of permitting the signal to go to "danger." 27 27 represent trains on adjoining blocks, and the circuits as above set forth may readily be traced by reference to Fig. 1.

Referring now to Fig. 2, the track is divided into blocks, the track-batteries are provided and connected up, and so are the two relays for each station, and the signaling devices and motor-battery, all substantially similar to the arrangement shown in Fig. 1, except that the signal-blade is adapted to the three positions, and the motor is a reversible motor. The blade and motor in Fig. 1 may be of this type if desired, but it may also be of any other suitable type, this feature being immaterial in Fig. 1, but material in Fig. 2. Also one side of the motor-circuit is connected up with a pole-changer 28, which is operated by a relay or motor 29, whereby the direction of flow of the motor-circuit current may be reversed, and thus reverse the direction of rotation of the signal-operating motor. Normally when the circuit is broken through the relay or pole-changer motor 29, as at station 11, the current flows in the direction to set the signal at "clear," but upon energizing the motor 29 the pole-changer will be shifted to reverse the direction of the current, as in station 12, and set the signal at "caution;" but if the motor-circuit be broken, as by demagnetizing both of the relays at that station, the signal will go to "danger." One pole of the pole-changer motor 29 is connected to the ground by wire 30 and through a battery 31, and the other pole is connected by wire 34 to a line-wire. The same poles of all the batteries in the pole-changer motor-circuits are connected to earth, as indicated. The pole-changer motor-circuits are controlled by the back contacts of the relays 10 10. The said back contact is connected to earth, and the armature is connected with a line-wire running both ways therefrom, one branch 36 36 connecting with the pole-changer motor in the signal-station second removed in one direction from the block in which that relay 10 is located, and the other branch 35 35 connecting with the pole-changer motor in the station second removed in the other direction. The pole-changer motor-circuits are normally open, but become closed by a train upon the track. Thus a train upon a given block will set the signals at the second stations in both directions at "caution," but will not affect the signals at stations at the ends of that block, which remain in their normal position of "clear," as in the system shown in Fig. 1. Two trains with an intervening block between them will therefore each receive caution signal; but if two trains come upon adjoining blocks the signal-motor circuit at the intermediate station will be broken, just as in the system shown in Fig. 1, and the signal at that station will be set at "danger." Each train will always set the signals second removed in each direction in the caution position, while the signals at the ends of the block for each particular train will always be at "clear" unless a train be also upon the first or the second block, in which latter cases the train first referred to will receive a danger-signal if the other train be in the next block ahead, or a caution-signal if it be in the second block ahead, although if trains be upon three adjoining blocks only the danger-signals will be set at the intermediate stations, as the motor-circuits at these intermediate stations will be broken. With this arrangement I am able by simple apparatus to provide the signaling devices for the three positions with a single signal device at each station, whereas it has formerly required two devices at each station, one for the trains moving in each direction.

What I claim is—

1. In a block-signal system, the combination with a track divided into blocks, a single signaling device at each station, a reversible motor and a motor-circuit for controlling the signaling device, a pole-changer in the motor-circuit and a pole-changer motor, a relay at each end of each block for each signaling device, the two relays for each signaling-station being connected to control the motor-circuit in multiple, two pole-changer motor-circuits for each pole-changer motor, one of the relays in each block being adapted to control

the circuits for the pole-changer motors for the signaling devices two blocks removed from said relay.

2. In a block-signal system for railways, the combination with a track divided into blocks, a track-battery for each block, two track-relays for each block, said battery and relays being so connected as to be controlled by the train upon the track, a signaling device at each junction-point, a motor and circuit for controlling the signaling device, said motor-circuit being controlled in multiple by the two relays of the adjoining blocks, whereby said circuit will be closed whenever one or neither of the track-relays is actuated by a train upon the block and whereby said motor-circuit will be broken when both of said relays are actuated by trains upon adjoining blocks.

3. In a block-signal system for railways, the combination with a track divided into blocks, a track-battery connected to the opposite rails of each block respectively, a relay at each end of each block connected with the opposite rails respectively, a signaling device at each junction and a motor and a motor-circuit therefor, said motor-circuit being normally closed and when closed holding the signaling device in "clear" position and having branches controlled in multiple by the relays at the said junction-point, so that a train upon one block will not open the circuit for the signal-motor, but trains upon adjoining blocks will open said motor-circuit and set the signal at "danger."

4. In a block-signal system for railways, the combination with a track divided into blocks, a track-battery connected to the respective rails of each block, a relay at each end of each block connected to the rails respectively, a signaling device at each junction and a motor and a normally closed motor-circuit therefor, said signaling device tending naturally to "danger" position but being thrown to and held in "clear" position by the energized motor, said motor-circuit being controlled in multiple by the armatures of the relays at that junction.

5. In a block-signal system for railways, the combination with a track divided into blocks with a signaling device at each junction-point or signaling-station and a reversible motor and a motor-circuit including a pole-changer therein and a pole-changer motor for each signaling device; of a track-battery and a relay at each end for each block; a pole-changer motor-circuit extending in each direction from the pole-changer and controlled by relays at distant blocks, respectively, and said signal-motor circuit being controlled in multiple by the relays of the adjoining blocks.

6. In a block-signal system for railways, the combination with a track divided into blocks and signaling-stations arranged along the track; of a single signaling device at each station, and a reversible motor and a motor-circuit including a pole-changer therefor, a pole-changer motor included in a circuit controlled by a relay in a distant block; a track-battery and two relays for each block, said relays being located at opposite ends of the respective blocks, so that at each signaling-station there is one of the relays from each of the adjoining blocks, said two relays at each station being connected to control in multiple the signal-motor circuit, and one of said relays being the one to control the pole-changer motor-circuits for the pole-changer motors at distant stations in opposite directions.

7. In a block-signal system for railways, the combination of a track divided into blocks, a battery for each block connected to opposite rails thereof, a relay at each end of each block and connected to opposite rails; a single signaling device at each junction or signaling-station tending naturally to "danger" position, a reversible motor for said signaling device so arranged that when the cursent flows in normal direction said signal will be driven to and held in "clear" position and when the current flows in opposite direction said signal will be driven to and held in "caution" position and when said circuit is broken said signal will go to its natural or "danger" position, a pole-changer in said signal-motor circuit and a pole-changer motor therefor; a circuit controlled by one of the relays in each block and extending to and including the pole-changer motor in a distant station and being normally open; said signal-motor circuit being controlled in multiple by the relays at the signaling-station for the adjoining blocks and so arranged that said circuit is normally closed by both relays and so that it will be broken only by the operation of both track-relays at that station.

8. In a block-signal system for railways, the combination of a track divided into blocks, a battery for each block connected to opposite rails thereof, a relay at each end of each block and connected to opposite rails; a single signaling device at each junction or signaling-station tending naturally to "danger" position, a reversible motor for said signaling device so arranged that when the current flows in normal direction said signal will be driven to and held in "clear" position and when the current flows in opposite direction said signal will be driven to and held in "caution" position and when said circuit is broken said signal will go to its natural or "danger" position, a pole-changer in said signal-motor circuit and a pole-changer motor therefor; two circuits controlled by one of the relays in each block and extending in opposite directions to and including the pole-changer motors at distant stations respectively and being normally open; said signal-motor circuit

being controlled in multiple by the track-relays at each respective station and being normally closed and being also closed when either one of said relays is affected by a train upon its block and said circuit being broken when both of said relays are affected by trains upon their respective blocks.

In testimony whereof I have hereunto signed my name in the presence of the subscribing witnesses.

JUDSON SHOECRAFT.

Witnesses:
Z. T. FISHER,
SAM BRISTOW.