No. 702,656. Patented June 17, 1902.

P. O. KEILHOLTZ.

BLOCK SIGNAL SYSTEM.

(Application filed Mar. 6, 1902.)

(No Model.)

Fig. 1.

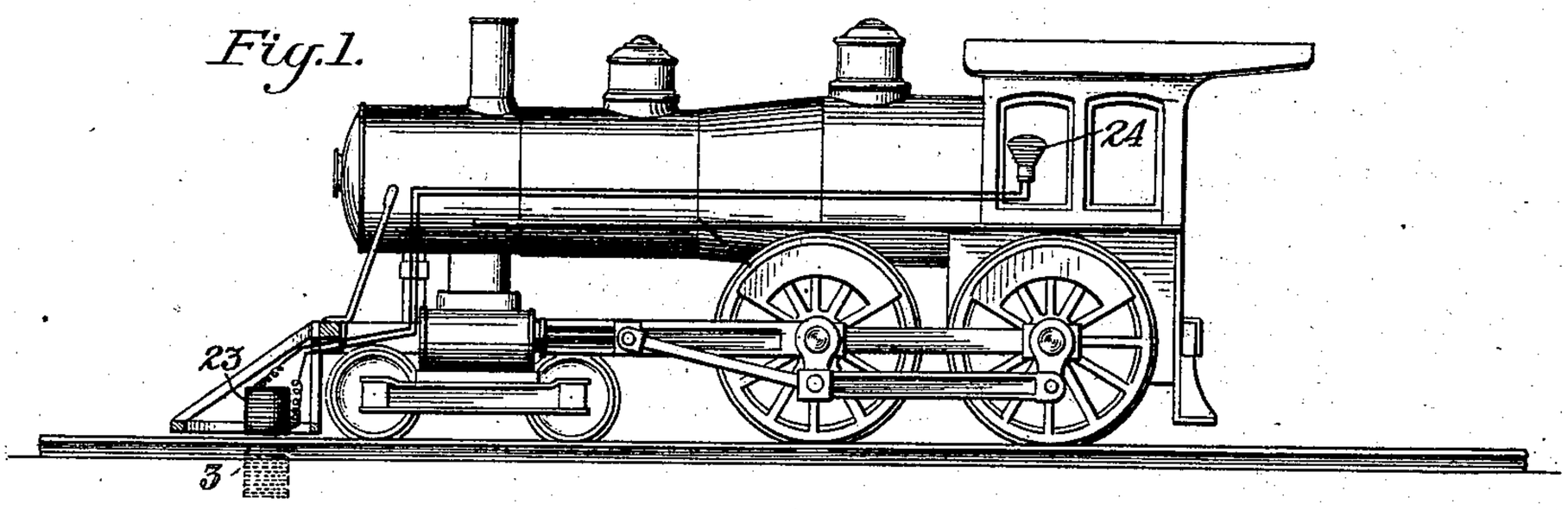


Fig. 2.

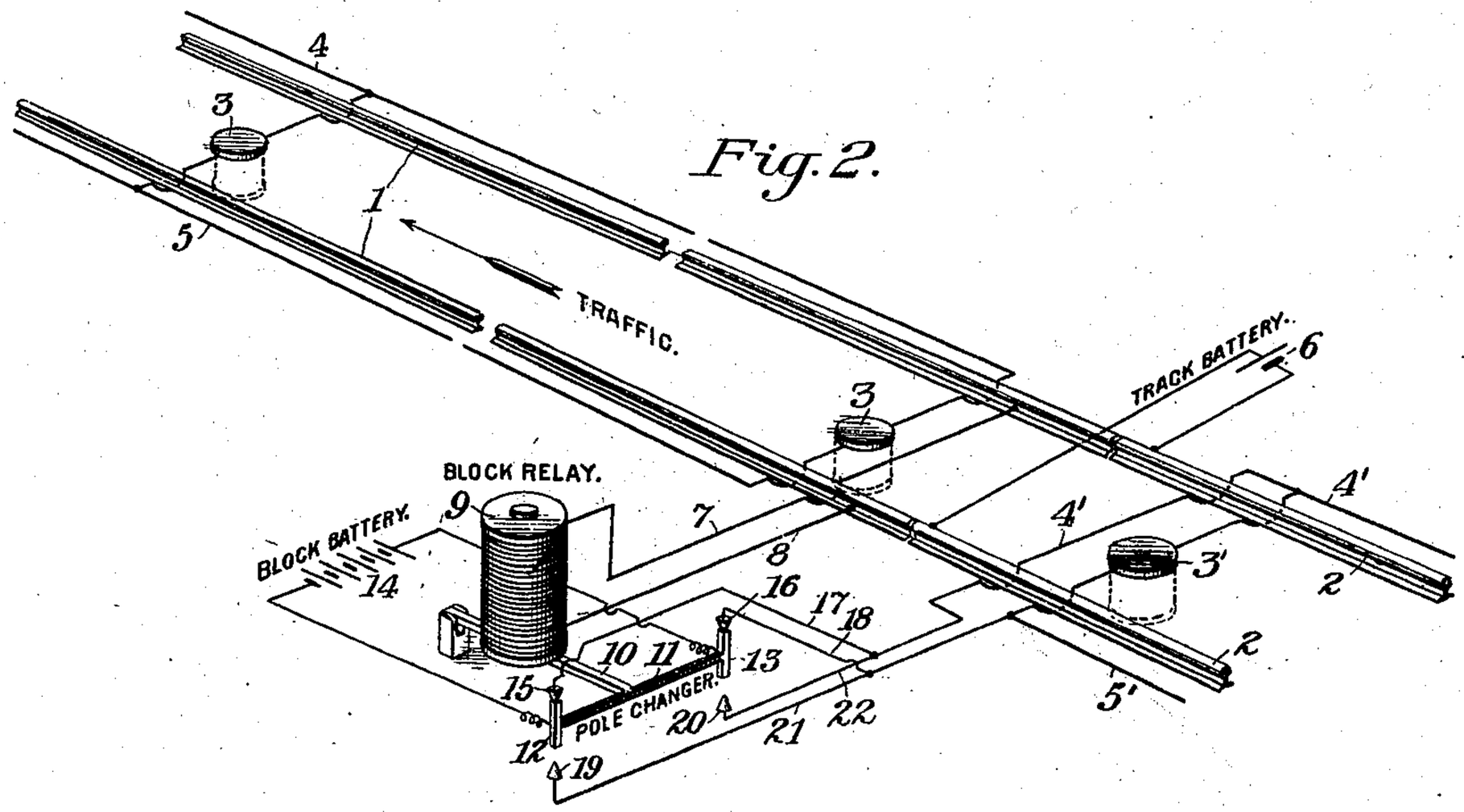
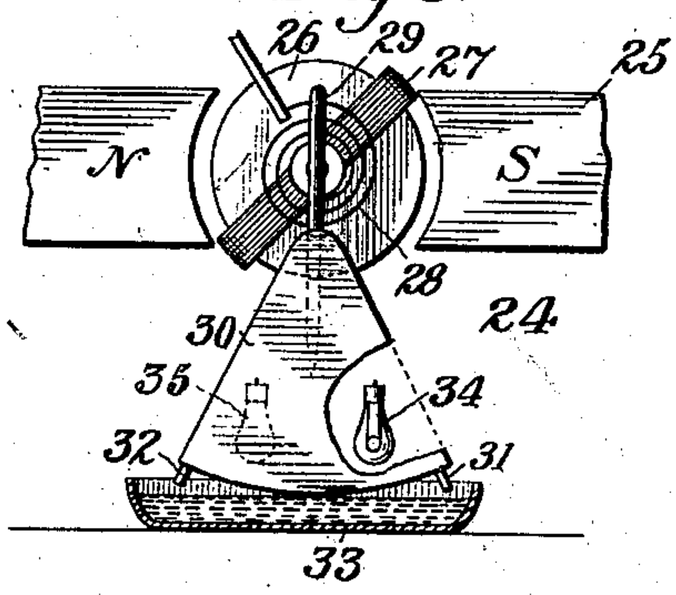


Fig. 3.



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UNITED STATES PATENT OFFICE.

PIERRE O. KEILHOLTZ, OF BALTIMORE, MARYLAND.

BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 702,656, dated June 17, 1902.

Application filed March 6, 1902. Serial No. 96,975. (No model.)

To all whom it may concern:

Be it known that I, PIERRE O. KEILHOLTZ, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Block-Signal Systems, of which the following is a specification.

This invention contemplates the use of a series of electromagnets or coils arranged at suitable intervals in the bed of a railway, the tracks of which are divided into successive insulated sections or blocks, and the provision on the locomotive or other part of the train of a coil placed in position to be acted upon inductively by the track-coils as it moves over them. The tracks of each block are coupled to a battery or other source of electric current, and pole-changers are provided for the track-coils of each block by which the presence of a train in the preceding block will reverse the direction of the current through the track-coils. The induced currents set up in the train-coil are utilized to actuate a signal device in the cab of the locomotive, and the engineer is thereby enabled to determine the condition of the block ahead of him.

Referring to the accompanying drawings, Figure 1 is a side elevation of a locomotive with signaling devices, the fender being broken out to show the train-coil. Fig. 2 is a perspective diagrammatic view of a portion of the railway provided with track-coils and block-relay, and Fig. 3 is a detail view of the preferred form of cab signaling device.

Referring to Fig. 2, 1 indicates a portion of the rails of one block, the portion intermediate between two successive track-coils being broken out. 2 indicates the rails of the following block, which are insulated from those of the first block. The track magnets or coils are buried in the road-bed with their upper ends projecting in such position that the train-coil passes over and in close proximity to them. If the track is divided into blocks of one mile in length, each block may be provided with five track-coils spaced at equal distances apart. The track-coils of each block are connected in parallel across feed-wires which extend along the track. The track-coils of the first block are marked 3 and their feed-wires 4 5. The corresponding track-coil and feed-wires of the second block are marked 3′ 4′ 5′. The rails at one end of each block, here shown as the second, are connected to the opposite terminals of a track-battery 6, which may be a large gravity-cell. The rails at the other end of the same block, here shown as the first, are connected by wires 7 8 to the fine-wire winding of the electromagnet 9 of a block-relay. The armature 10 of this relay carries a cross-piece 11, of insulating material, at each end of which are vertical double contact-pieces 12 13, each connected to one terminal of a block-battery 14. Fixed contact-points 15 16 are placed above pieces 12 13, respectively, and are connected by wires 17 18 with the feed-wires of the track-coils of the next succeeding block, here shown as the second. Fixed contact-points 19 20 are placed below contact-pieces 12 13, respectively, and are also connected with the same feed-wires by wires 21 22. The connections, however, as will be seen, are such that when armature 10 is held up by a current through electromagnet 9, thereby making contact with pieces 15 16, the current from the block-battery 14 will flow through the track-coils in the opposite direction from that which it will take when armature 10 falls and pieces 12 13 come in contact with pieces 19 20. Failure of current in the relay at the end of one block thereby reverses the polarity of the track-currents in the following block.

Referring to Fig. 1, the locomotive is shown provided beneath the fender with a train-coil 23, which is connected to a signaling device 24 in the cab.

The preferred form of signaling device is shown in Fig. 3 and comprises a permanent magnet 25, between the poles of which is fixed a cylindrical piece 26, of soft iron. A rectangular coil 27, of fine wire, having suitable electrical connections to train-coil 23—for example, through a hair-spring 28 at each end of the coil—is pivotally supported in position to swing in the air-gap between the poles of the magnet and piece 26. Coil 27 carries an arm 29, upon which is secured a thin light sector 30, preferably of aluminium. At the lower corners of this sector are short projections 31 32. Beneath the sector is a shallow trough 33, containing oil. Behind the sector, at the right and left, respectively, are two small incandescent electric lamps

34 35 of different color, such as red and white. A momentary current through the coil 27 of this signaling device, such as is caused by the movement of the train-coil 23 over one of the track-coils, causes sector 30 to uncover one of the lamps, its motion being then arrested by one of the pieces 31 32 dipping in the oil in trough 33. An electrical impulse in the opposite direction through swinging coil 27 causes the other lamp to be uncovered.

It will now be seen that when the track-battery of any block is in proper order, the rails and rail-joints of that block unbroken, and no train is in the block a current will continuously pass through the electromagnet of the block-relay, thereby maintaining a current of definite direction through the track-coils of the following block. The presence of a train, however, in the first block will at once short-circuit the track-battery of this block and cut off the current in the relay, whereupon its armature will drop and reverse the current passing through the track-coils of the following block. It is also evident that the same result would be occasioned by a rail or telegraph-wire falling across the track of the first block or by the failure of the track-battery or any lack of electrical continuity in the rails, rail-joints, or electrical connections of that block. The engineer of the train in any block is thereby informed by the signaling device in his cab as he passes over each track-coil as to the precise condition of the block in front of him. For example, if the batteries, rails, or electrical devices are in proper working order and a red light is exhibited as he passes the first track-coil of a block he is thereby informed of the presence of a train in the block in front of him and must slow down his train until the exhibition of a white light shows that the train in front of him has passed out of its block. If, however, the signaling device continues to show a red light as he passes, say, the fourth and fifth coils of his block, his train must be stopped.

The lower contact-points 19 20 may in some cases be omitted. Failure of current in the block-relay thereby cuts off the current from the track-coils. The signaling device in the cab is then employed merely to uncover a white light, failure to show this light indicating danger ahead.

I claim—

1. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the opposite rails of each block, and means whereby the electrical condition of the rail-circuit of one block controls the current to the track-coils of the following block, as set forth.

2. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the rails near the end of each block, an electromagnet connected to the rails near the other end of each block, an armature in position to be actuated by said electromagnet, and contacts carried by said armature and arranged to control the current to the track-coils of each successive block, as set forth.

3. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the rails near the end of each block, an electromagnet connected to the rails near the other end of each block, an armature in position to be actuated by said electromagnet, and sets of contacts carried by said armature, so arranged that the movement of said armature in either direction reverses the current through the track-coils of each successive block, as set forth.

4. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the opposite rails of each block, means whereby the electrical condition of the rail-circuit of one block controls the current to the track-coils of the following block, a train-coil in such position that movement over a track-coil generates an induced current therein, and a signaling device on the train and in circuit with said train-coil, as set forth.

5. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the rails near the end of each block, an electromagnet connected to the rails near the other end of each block, an armature in position to be actuated by said electromagnet, contacts carried by said armature and arranged to control the current to the track-coils of each successive block, a train-coil in such position that movement over a track-coil generates an induced current therein, and a signaling device on the train and in circuit with said train-coil, as set forth.

6. A railway signal system, comprising a track divided into a series of sections or blocks, one or more track-coils in each block, a source of electric current for the track-coils of each block, a source of electric current connected to the rails near the end of each block, an electromagnet connected to the rails near the other end of each block, an armature in position to be actuated by said electromagnet, sets of contacts carried by said armature, so arranged that the movement of said armature in either direction reverses the current

through the track-coils of each successive block, a train-coil in such position that movement over a track-coil generates an induced current therein, and a signaling device on the train and in circuit with said train-coil, as set forth.

7. A train having a coil in proximity to the track, and a signaling device in circuit with said coil and comprising a movable member and electromagnetic mechanism constructed to move said member in either direction, according to the direction of flow of current through said coil, as set forth.

8. A train having a coil in proximity to the track, and a signaling device in circuit with said coil and comprising a movable screen, separate indicators behind said screen, and electromagnetic mechanism for shifting said screen and uncovering either indicator according to the direction of flow of current through said coil, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

PIERRE O. KEILHOLTZ.

Witnesses:
JOHN L. HEBB,
BENJ. F. HARRIS.