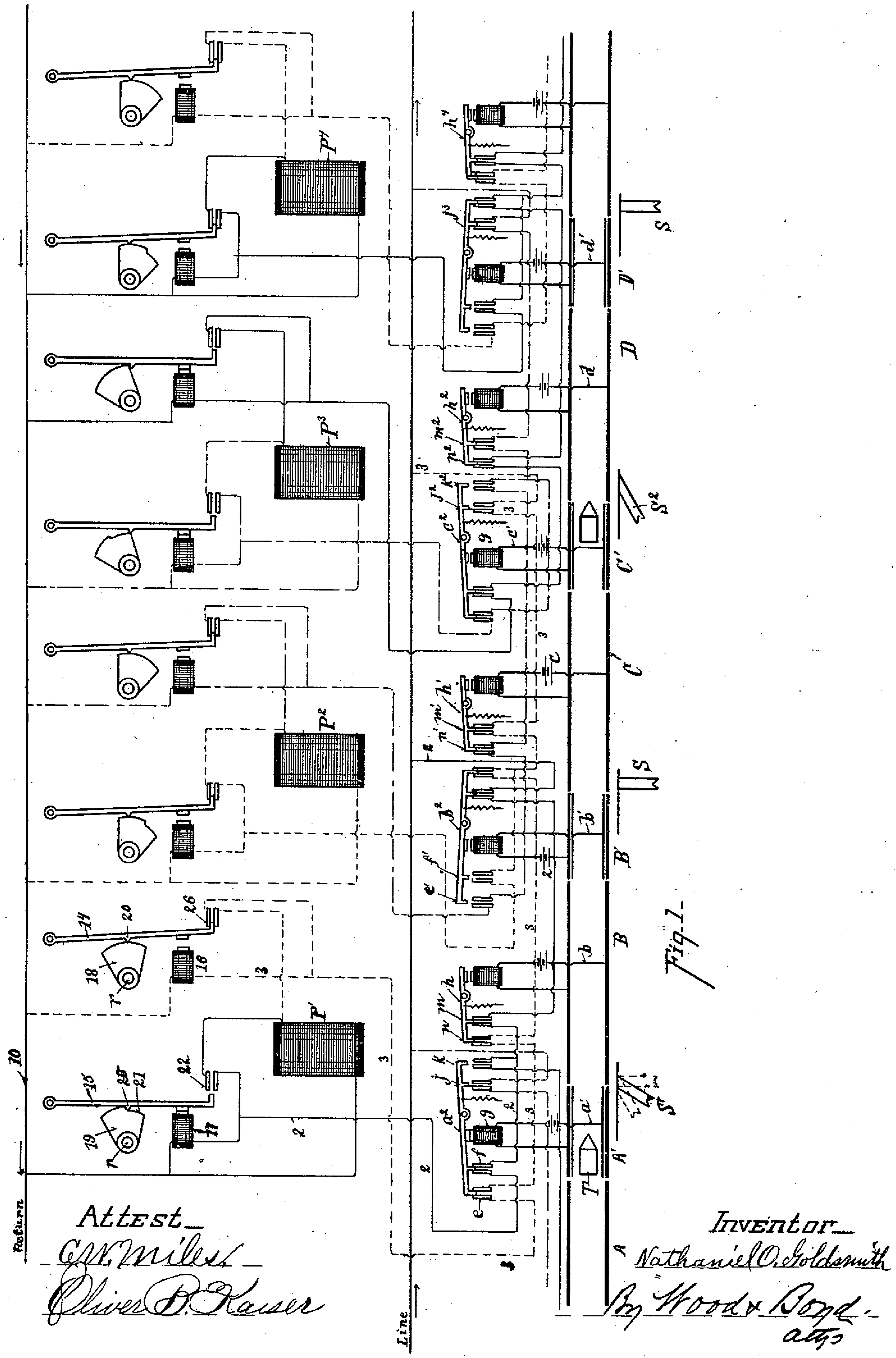
(No Model.)

2 Sheets—Sheet 1.

N. O. GOLDSMITH.

ELECTRIC BLOCK SIGNAL.

No. 536,872. Patented Apr. 2, 1895.



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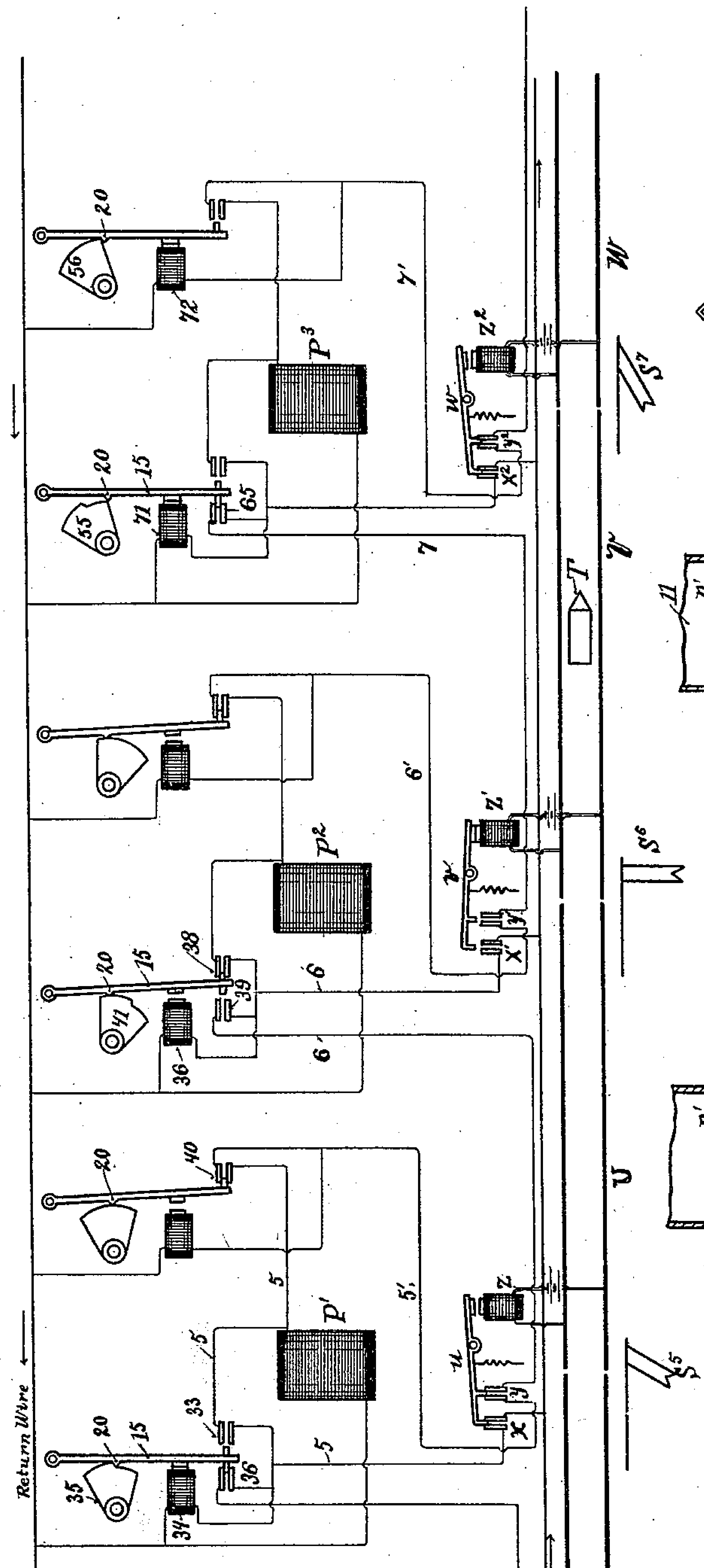

Fig. 2.

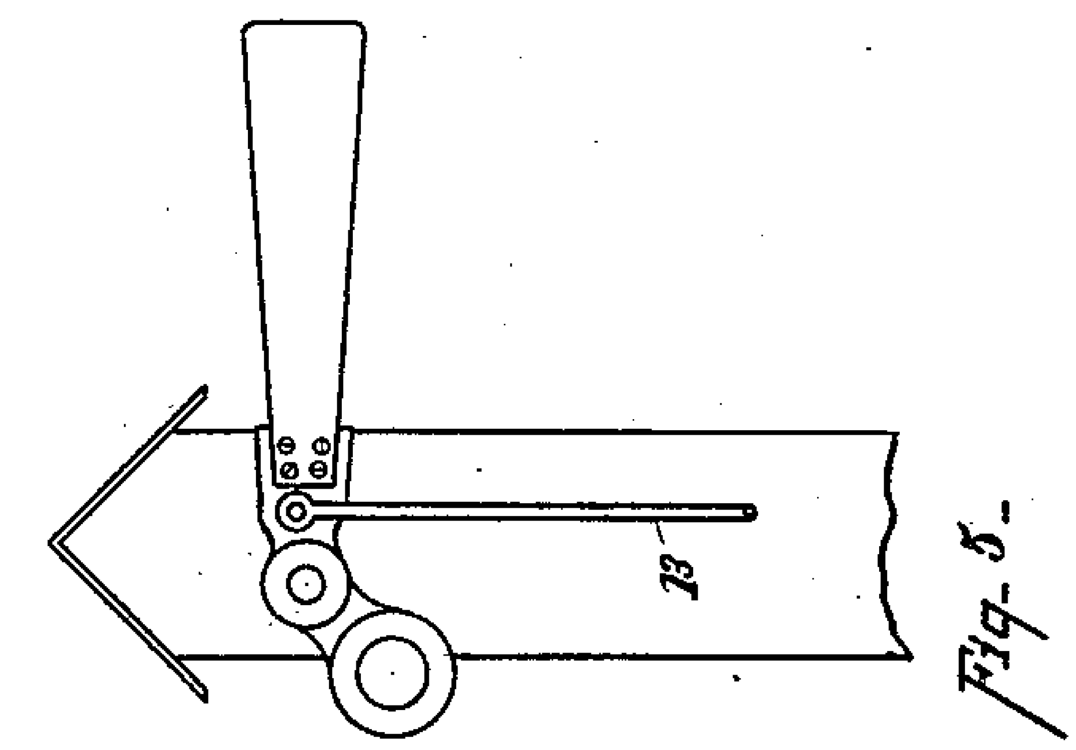

Fig. 5.

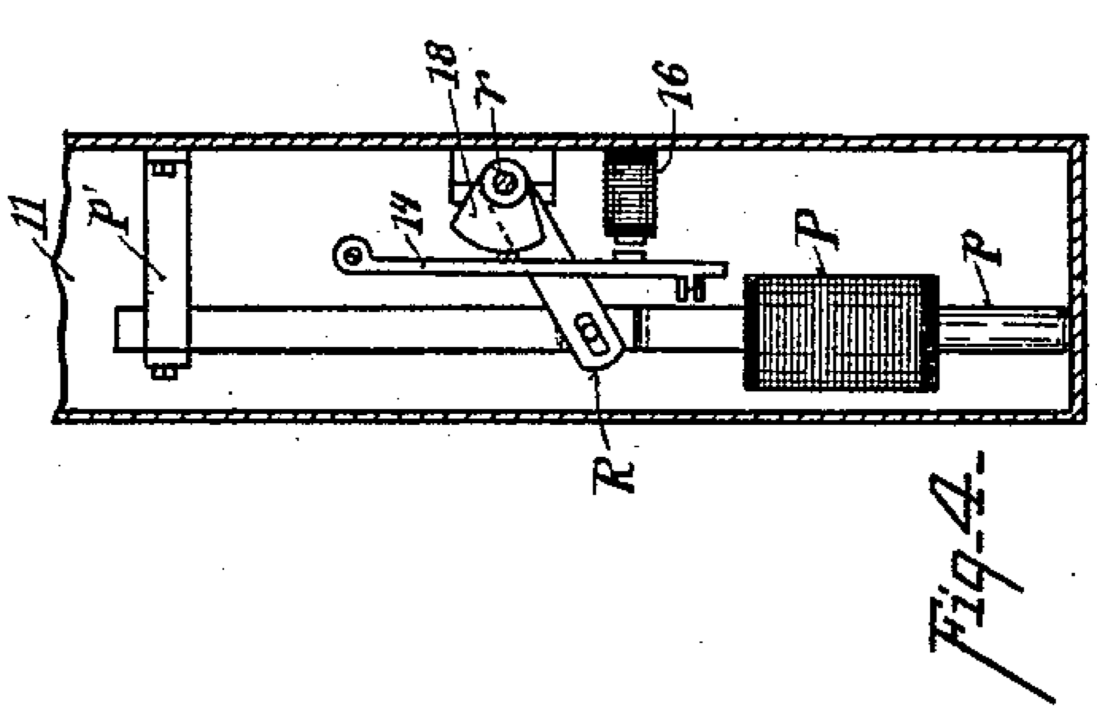

Fig. 4.

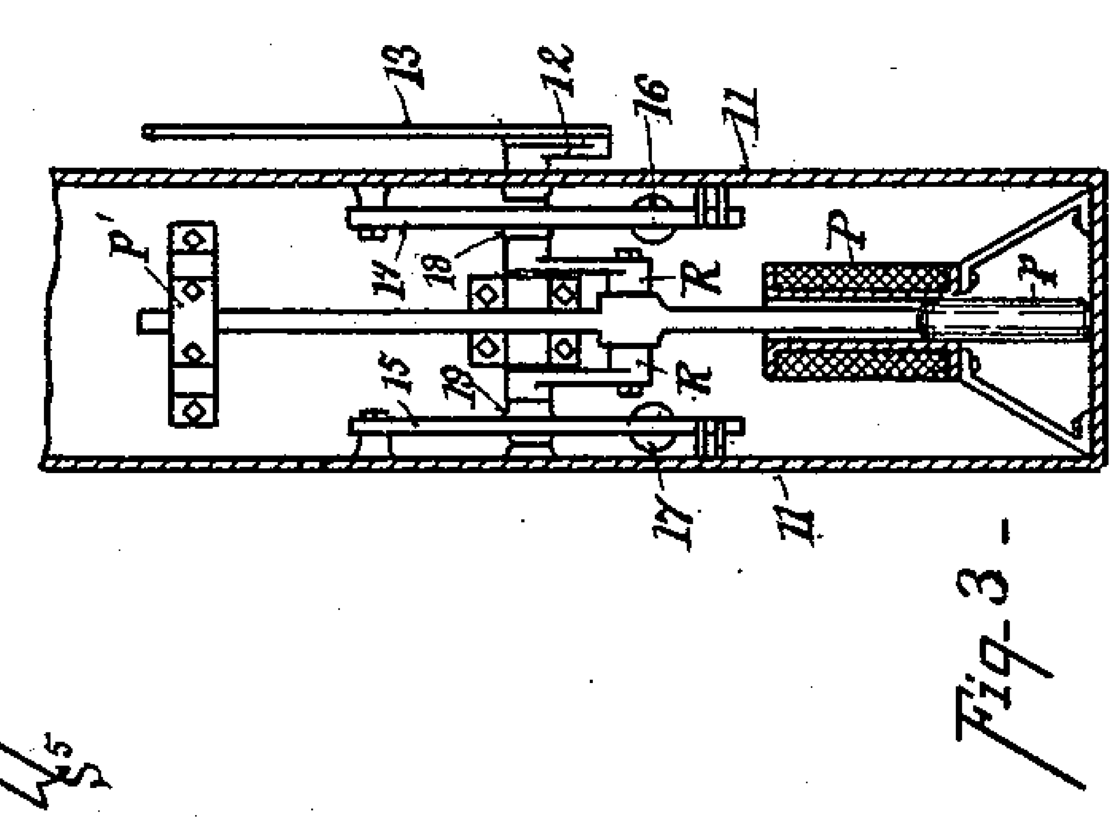

Fig. 3.

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UNITED STATES PATENT OFFICE.

NATHANIEL O. GOLDSMITH, OF CINCINNATI, OHIO.

ELECTRIC BLOCK-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 536,872, dated April 2, 1895.

Application filed March 24, 1894. Serial No. 504,950. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL O. GOLDSMITH, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric Block-Signals, of which the following is a specification.

My invention relates to a system of signals operated by electricity through the opening and closing of local track circuits by a train, thus indicating the condition of the track in two or more contiguous blocks. In the preferred form of construction the positions of trains in two or more sections of the block are indicated; the position of the trains being indicated by the position of the signals. I have shown two forms of operating the signals, one with the signals normally in safety, and the other with the signals normally at danger.

The various features of my invention are fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a diagram of my invention with the signals, circuits and apparatus adapted to be operated on the normal danger system. Fig. 2 is a similar diagram of the circuits and signal device operated at normal safety. Fig. 3 is a sectional elevation of the signal moving device. Fig. 4 is a transverse sectional elevation of Fig. 3. Fig. 5 is a side elevation of the signal box with a weighted signal blade and pitman connection.

In the accompanying drawings A A′ represent a block of two sections; B B′, C C′, D D′ similar blocks.

S represents a semaphore signal blade. When the signal S is in the horizontal position it indicates danger. When in the position shown at S′ it indicates caution. When it is dropped into position shown at S^2 it indicates safety.

T represents a train.

1 represents a main line wire, and 10 the return line wire leading from the signal box.

P′ P^2 P^3 P^4 represent solenoids which is the preferred form of electrical power transmitter. An electrical motor, of course, could be used in lieu thereof.

In Figs. 3 and 4 I have shown the signal moving mechanism. *p* represents the core of the solenoid, the stem of which is swiveled upon a crank arm R; said crank arm being mounted upon a crank shaft *r*. *p′* represents a guide for the stem of the solenoid. The crank shaft *r* is journaled in the sides of the casing 11. 12 represents a crank arm outside of the casing of crank shaft *r*. 13 represents a pitman hinged to the signal blade and to the crank shaft. 14, 15, represent locking arms pivoted to the side of the casing carrying circuit breakers on their free ends. 16, 17, represent magnets for holding said arms in the rearward position to lock the signal in a caution or a safety position. 18 represents cams carried on the crank shaft *r*. 20 represents lugs on the arms 14, 15, adapted to engage with the under face of the cams to hold the signal in its safety position. 19 represents similar cams on the opposite side of the crank shaft and provided with a notch 21 in the face of the cams with which the lug 20 engages to hold the signal in the cautionary position.

I employ a series of primary track circuits *a′* *b*, *b′*, *c*, *c′*, *d*, *d′*, (operated by local batteries) connected to the insulated rails and closed by the train wheels in the ordinary manner. The primary track circuits *a′*, *b′*, *c′* *d′*, operate through magnets *g*, circuit breaking armatures a^2, b^2, c^2, d^2, respectively. Each of these armatures is provided with two sets of terminals on each end closed by the lugs on the armature. These armatures are normally held away from the magnets *g*, by springs. The primary track circuits *b*, *c*, *d*, operate through magnet armatures *h*, *h′*, h^2, h^3, respectively, which make signal circuits by opening or closing two terminals each.

The track circuits are shown as open circuits, but closed track circuits may be substituted and not affect the working of the signal circuits.

The mode of operation of the normal danger plan shown in Fig. 1, is as follows: When a train enters upon the section A′ it closes the local track circuit *a′*, bringing the armature a^2 in contact with the terminals *e*, *f*. If there be no train upon the sections B or B′ of the preceding block a signal circuit is established for operating the solenoid P′ as follows: by wire 2 through terminal *j′*, by wire 2 through terminal *m*, thence by wire 2 through terminal f, and thence by wire 2 through terminal 22 to solenoid P′, which instantly moves the core p, Figs. 3 and 4, moving the crank shaft r, and with it the cam 19 to the position shown in the drawings, Fig. 1; but the magnet cannot attract the armature 15 at the start of the operation as the lug 20 resting on the face of the cam 19 prevents this movement until the lug 20 has passed into the notch 21. Then the energized magnet 17 attracts the armature 15 and breaks the solenoid circuit at the terminal 12. This aforementioned movement of the solenoid core p pulls the signal blade S into the first position shown at S′.

If there be no train in section C or C′, then the solenoid is cut into circuit to move the signal to the full safety position as follows: The signal circuit 3 is brought in by the operation of armature a^2 because the intermediate track armatures are in proper position for this purpose, and the circuit 3 is established as follows: Armature c^2 being in normal position terminals j^2 are closed thence by wire 3 through terminal m', by wire 3′, terminal k' wire 3 through terminal n, terminal e, by wire 3 to magnet 16, and by branch through contact 26 to the solenoid P′, which moves the cam 18 upward allowing the lug 20 to drop under the face of said cam, and allowing the energized magnet 16 to break the circuit 3 by attracting the armature 14. This movement of the cam 18 of course brings the signal from the cautionary position S′ to the positive safety position S^2.

In order that a train in preceding blocks B, B′, C, C′, may prevent the signal circuits 2 and 3 from being operated by the train on section A′, I employ the following instrumentalities: Suppose a train is in section C′. Then the armature c^2 is attracted, by closing local track circuit c', as shown in Fig. 1, and the signal circuit 3 is broken at the terminal j^2; but if a train be in either block B or B′, circuit 2 will be broken by the armatures h, and b^2, respectively; so that the closing of the local track circuit a' will not close either signal circuits 2 or 3. Hence, the entering of a train upon block A′ will not move the signal S which is still locked at danger. It is obvious that each of the signal circuits of the preceding blocks is operated in a similar manner.

In the diagram shown in Fig. 2 it is designed to protect the track with the signal at normal safety, and in this case the blocks are laid off in single sections. The signal moving apparatus is the same as that already described; but a different track closing armature is required. A primary track circuit and magnet operated by a local battery is employed in the ordinary manner. When the train is upon track U the armature u is attracted, breaking the signal circuit at terminals x, y. If the train is ready to enter upon track U, and there be a train upon track V the signal S^5 will stand at "Caution." Assuming that there are no trains upon tracks V and W, and the signal S^5 in a safety position, then when the train enters track U it closes the primary track circuit z, attracts the armature u, breaks the circuit at terminals x, y, which demagnetizes magnet 34 and releases the signal locking mechanism, and it goes to danger by gravity of the signal arm. At the same instant the signal of the block in the rear moves from danger to caution. Assume that the train has passed from track U to track V. The signal S^5 for track U is moved from danger to caution in the following manner: The magnet z being de-energized, armature u is pulled by the spring t into position shown in Fig. 2, and the circuit 5 is established through the terminal x. By wire 5 through the terminals 33, the armature 15 being held up by the lug 20, the circuit 5 is connected to the solenoid P′ which immediately pulls the signal S^5 down in a caution position, so that cam 35 comes to the position shown, magnet 34 attracts armature 15, closes the terminal 36, and establishes the signal circuit for the signal in the rear permitting it to come from the caution to the safety position. Signal S^6 is at danger position so long as a train is on block V, and the signal S^5 is in the cautionary position. Signal S^7 is in safety position provided two blocks ahead are clear. When the train passes from track V to track W terminals x' y' are closed by spring t, and x^2, y^2, are opened by the closing of the track circuit through the energizing of magnet z^2. When the magnet z^2 is energized to raise the armature w and break the signal circuits at x^2, y^2, the magnets 71, 72, being de-energized, the weights of the cams 55, 56, pressing on the lugs 20 will force the armatures out and allow the signal S^7 to go to danger.

Signal S^5 is pulled to the safety position in the following manner: Circuit 6 is closed by the spring t' at contact x', bringing in solenoid P^2, energizing magnet 36. The notch 20 of armature 15 passes into the notch of the cam 41 as the signal is pulled, when the solenoid circuit is broken at terminals 38. Terminal 39 is made by the same movement, closing the wire 6, leading therefrom, and the signal circuit passes through contact y, and by line 5′ through terminal 40, bringing the solenoid P′ into circuit and pulling the signal S^5 to safety position because the face of the cam 35 keeps the armature lever 15 from contact with lever 36 until the full movement is completed. It is obvious that the circuits 6′ and 7′ are operated at appropriate times in like manner to operate their respective signals.

In another application of even date herewith, Serial No. 504,949, I have shown a railway block signal system comprising separate home signals and distant signals for each block sub-section overlapping track circuits, overlapping signal circuits, and electric motors for operating either or both signals, from which my present invention differs chiefly in employing only one signal for each block, actuated through step-by-step movements from danger or safety, as the case may be, to cautionary and from cautionary to full position.

Having described my invention, what I claim is—

1. An electric railway block signal system, consisting of a series of insulated sections of rails, an open track circuit for each section adapted to be closed by the train, a magnet and its armature in each track circuit, two or more terminals on said armatures, two independent signal circuits connected through said terminals, and signal moving mechanism operated by said signal circuits and adapted to move the signals one step by the closing of one of said track circuits, substantially as described.

2. In a railway block signal system, a series of track circuits made through the train, a series of duplex signal circuits, and mechanism for operating a signal in step-by-step movements, said signal circuits being controlled by independent terminals on the armatures of magnets in the track circuits and one of said signal circuits being controlled by the next adjacent track circuit, substantially as described.

3. In a railway block signal system, a series of track-circuits made through the train, and duplex signal circuits in parallel connection with the same motor and provided with signal moving mechanism for operating the same signal, each signal circuit having independent terminals on the armatures of the magnets of two or more track circuits, substantially as described.

4. In a railway block signal system, a series of track circuits made through the train, duplex signal circuits in parallel connection with the same motor and provided with signal moving mechanism for operating the same signal, each signal circuit having independent terminals on the armatures of the magnets of two or more track circuits, and locking devices in one of said signal moving mechanisms for holding the signal in a given position, substantially as described.

5. In a railway block signal system, a series of track circuits made through the train, duplex signal circuits in parallel connection with the same motor, and signal moving mechanism operated by each circuit for moving the same signal, the armatures of the track circuit magnets being provided with contacts for making and breaking the signal circuits, substantially as described.

In testimony whereof I have hereunto set my hand.

NATHANIEL O. GOLDSMITH.

Witnesses:

T. SIMMONS,
N. R. WOOD.