No. 620,806. Patented Mar. 7, 1899.

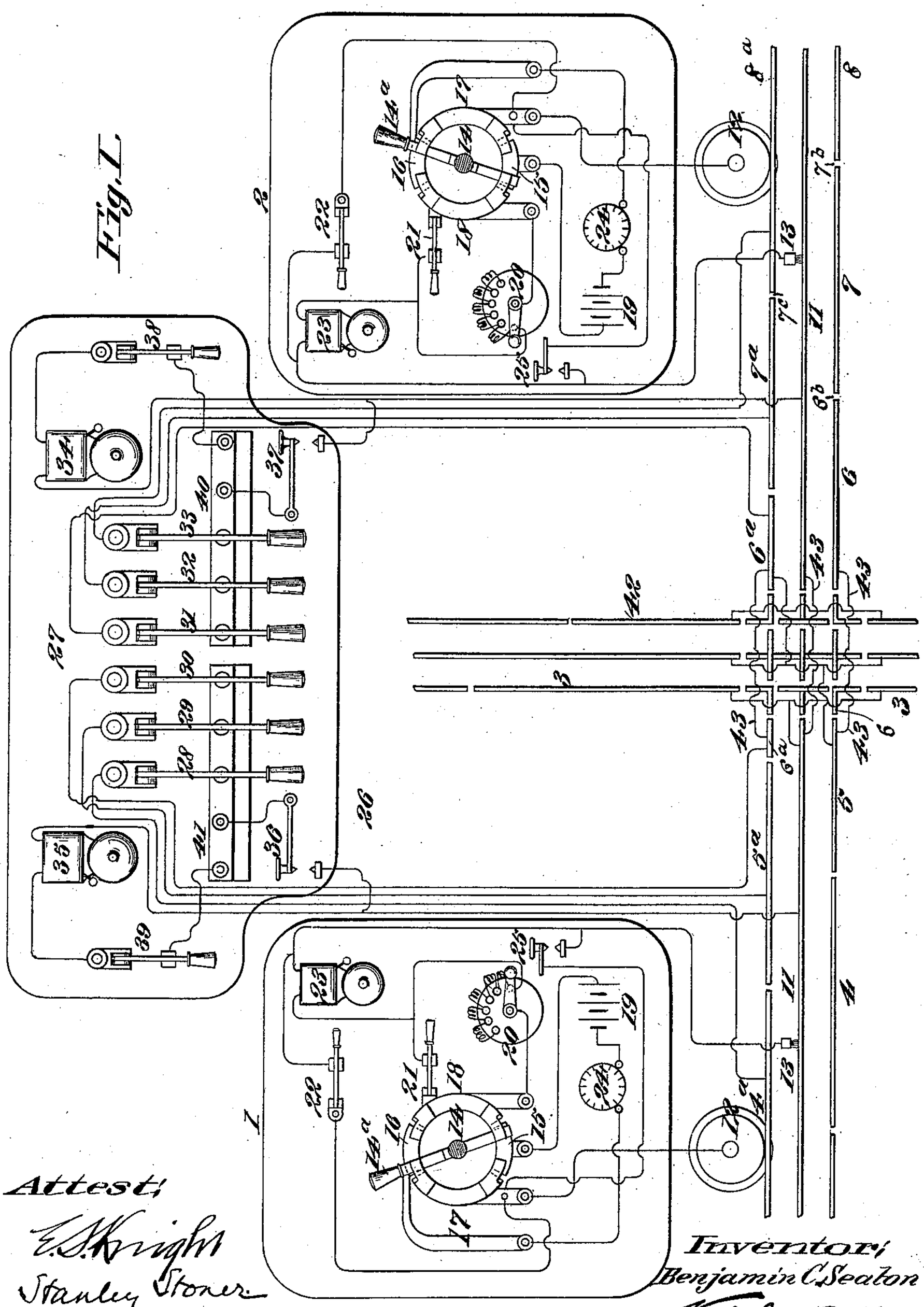
B. C. SEATON.

ELECTRIC TRAIN SIGNALING SYSTEM.

(Application filed Feb. 28, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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Stanley Stoner.

Inventor:
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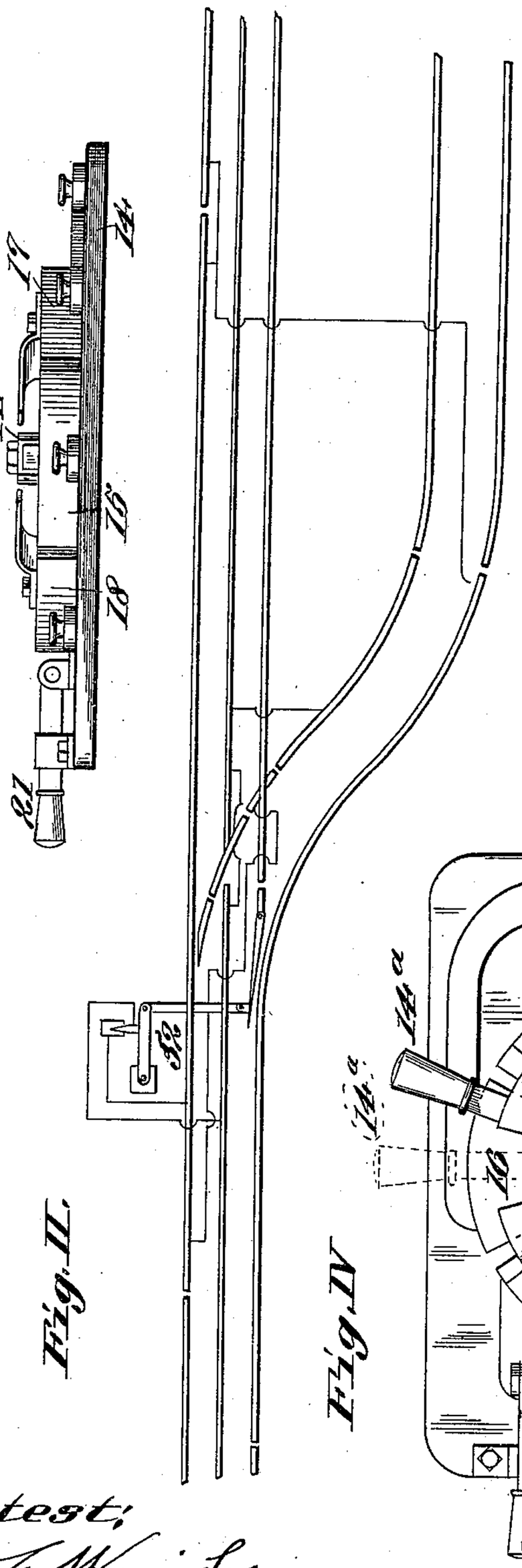

Fig. II.

Fig. I.

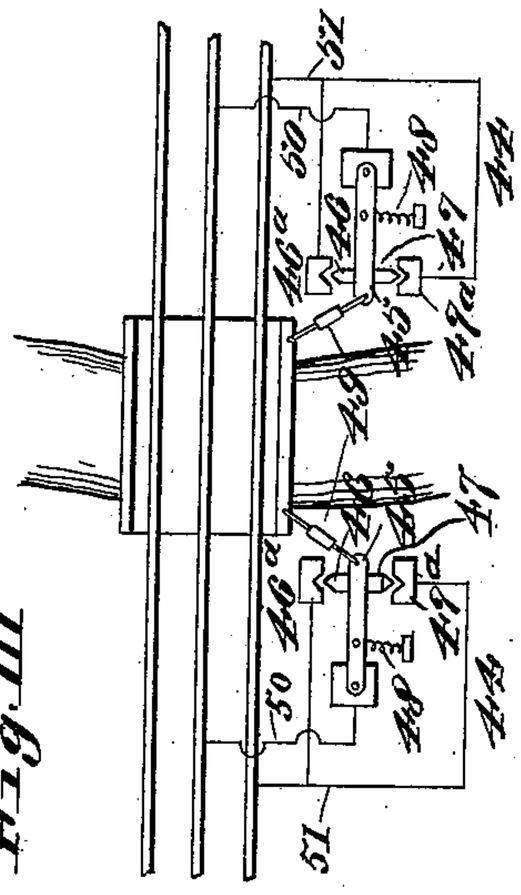

Fig. III.

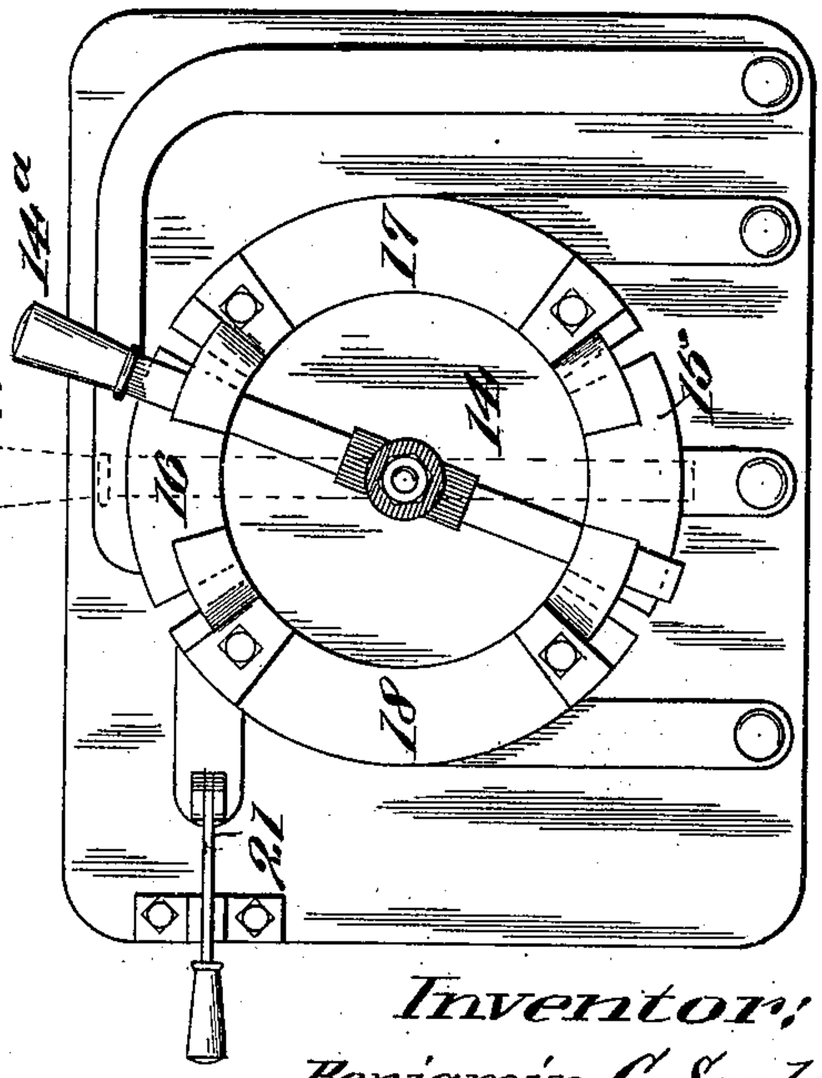

Fig. IV.

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UNITED STATES PATENT OFFICE.

BENJAMIN C. SEATON, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE ELECTRIC THIRD RAIL AND SIGNAL COMPANY, OF SAME PLACE.

ELECTRIC TRAIN-SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 620,806, dated March 7, 1899.

Application filed February 28, 1898. Serial No. 671,907. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN C. SEATON, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Electric Train-Signaling Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an electrically-operated signaling system for railways, and is an improvement on the invention forming the subject-matter of my Patent No. 503,100, dated August 8, 1893, which was an improvement on the invention forming the subject-matter of my Patent No. 484,614, dated October 18, 1892, to which patents reference may be had for a detailed description of the general features and fundamental principles of such a system.

My present invention may be applied to either ordinary steam-railways or to "third-rail" or other electric railways, it being necessary that there should be an electrically-continuous auxiliary rail or conductor.

The objects of my present invention are, first, to secure greater efficiency of operation; second, to provide a system of wider scope and adaptability; third, to provide a system operative and reliable under all conditions, however adverse, and, fourth, one that will be inexpensive to install and maintain. I attain these objects by the mechanism and arrangement of circuits illustrated in the accompanying drawings, of which there are two sheets, and in which—

Figure I is a general diagrammatic illustration of the system, showing a section of track including several blocks and a crossing, two motor or locomotive pilot-houses supposed to be approaching each other upon the same track, with the electrical apparatus contained thereon, and the switchboard at a signal-station, with its apparatus and circuits. Fig. II is a plan of a section of track including a track-switch and the electrical apparatus and circuits connected therewith, shown diagrammatically. Fig. III is a plan of a section of track including a bridge and the apparatus and circuits connected therewith, shown diagrammatically. Fig. IV is an enlarged detail plan view of the pole-changing switch forming part of the apparatus in each motor-car or locomotive pilot-house. Fig. V is a side elevation of said pole-changing switch.

The same reference-numerals refer to corresponding parts throughout the several views.

1 and 2 indicate portions of two trains supposed to be moving in opposite directions and approaching each other upon either side of a crossing 3; but they are not both upon the same block, however. Several insulated sections of track are shown in the sketch of the road illustrated in this figure by the numerals 4, 5, 6, 7, and 8, which represent insulated sections of one rail of the ordinary single track upon which the trains run. The other rail of said track is similarly divided into insulated sections, (represented by 4^a, 5^a, 6^a, 7^a, and 8^a,) and it will be observed that these two sets of insulated sections of rail overlap each other in the same way that broken joints are made upon a railroad, except that these joints are insulated—*i. e.*, one stretch of rail composing a section is insulated from its adjoining sections; but the two rails are not broken electrically at opposite points, the insulated joint at one point on one rail being made somewhere between the ends of an insulated section of its fellow rail. For instance, the insulated joint 7^c occurs about the middle of the insulated section 7 of its fellow rail, and the insulated joint 6^b occurs about the middle of the insulated section 7^a of its fellow rail. This arrangement I call "broken insulated joints," and the result is what I call "overlapping insulated sections."

The space between an insulated joint in one rail and an insulated joint in its fellow rail—as, for example, the distance between the joint 7^c and the joint 6^b—constitutes a safety-block, within which distance it is impossible under my system for two cars or trains to approach without signaling each other. They may sometimes signal each other when separated the distance of any one insulated section, as between 6^b and 7^b; but it is impossible for them to ever come nearer together than the distance

from 7^c to 6^b without signaling each other. These blocks may be made of any required length.

Parallel with the two ordinary rails I place an auxiliary circuit-rail or metallic strip 11, which is made electrically continuous throughout its course.

12 represents the ordinary wheels of a car or locomotive; 13, a contact device carried by the car or locomotive, but insulated therefrom, and contacting with the auxiliary rail 11; 14, a pole-changing switch having a lever 14^a; 15, a contact-segment of said pole-changing switch which connects with one pole of a battery 19, carried by the car or locomotive; 16, a similar contact-segment connecting with the other pole of said battery; 17, a contact-segment of said pole-changing switch which connects with the framework, axles, or wheels of the car or locomotive; 18, a similar contact-segment connecting with the contact device 13; 20, a rheostat arranged to be thrown into or out of circuit through the agency of the switch 21; 22, a switch with which to cut in or out the bell or annunciator 23; 24, an electrical time-indicator of any well-known construction for recording the time when any alarm or signal impulse is conveyed; 25, a circuit-closing key for communicating between approaching trains or with the signal-stations through the agency of a prearranged code of signals.

26 represents a signal-station, of which there may be any desired number located at suitable distances along the road; 27, a switch-board for such station; 28, 29, 30, 31, 32, and 33, circuit-closing switches for the several blocks upon either side of such station; 34 and 35, the bell or annunciator of such station; 36 and 37, circuit-closing keys for communicating signals from such station to the trains; 38 and 39, switches for throwing in or out of circuit the bells 34 and 35; 40, a connecting-bar common to and by means of which all of the switches 31, 32, and 33, representing the different blocks 6^a, 7^a, and 8^a upon one side of the station, are connected to the bell 34, and 41 a similar connecting-bar for the corresponding switches 28, 29, and 30, connecting with the blocks 4^a, 5^a, and 6^a upon the other side of said station.

At a crossing all the rails leading thereto from both tracks are insulated from each other and from the crossing proper upon both sides of the said crossing; but the auxiliary rail or conductor 11 is electrically connected with one of the ordinary rails, as 42, of the crossing-track upon both sides of said crossing, while both the ordinary rails of the main track are electrically connected to the auxiliary rail or conductor of the crossing-track upon both sides of the crossing, and all the rails or conductors are each made electrically continuous at the crossing by having their terminals at the crossing electrically connected to special connecting-wires, as 43; but the conductors upon both sides of the electric circuit for the main track may be in any other suitable manner connected with an insulated section or block of track forming a crossing so long as the arrangement is such that the entrance of a locomotive or car upon said insulated section of crossing-track will connect the two sides of the electric circuit running parallel to the main track.

At a bridge, as shown in Fig. III, I introduce two combined mechanical and thermostatic switches 44, one at each end of the bridge, designed to effect a short circuit or a cross connection between the two sides of the circuit in case a train approaches too close to a bridge which has been either washed away, broken down, or crippled by fire. This is accomplished by means of the lever 45, carrying suitable contacts 46 and 47, normally held out of contact with their contacting points 46^a and 47^a by means of a spring 48 and a fusible wire 49. If the bridge should move from its anchorings, the wire 49 pulls the contact 40 against the contact 46^a, where it is held until the wire 49 is broken by a further movement of the bridge, when the spring 48 will pull the contact 47 against the contact 47^a. On the other hand, if the bridge should catch fire and become sufficiently destroyed to disable it the heat thus generated would melt the fusible wire 49 and allow the spring 48 to pull the contact 47 against the contact 47^a. The contacts 46^a and 47^a are connected to one of the contact rails or conductors for the road by a wire 51, and the contacts 46 and 47 are similarly connected to the other side of the rail-circuit by a wire 50. The operation is obvious. A short circuit for an approaching car or train is established whenever the contacts 46 and 46^a or 47 and 47^a come together, which results in an alarm. This apparatus is duplicated at each bridge, one such switch being located at each end of the bridge and connected with the track upon its side of the bridge in order that the track upon both sides of the bridge may be equally protected.

At a switch, as illustrated in Fig. II, I provide a contact device 52, which establishes a short circuit for an approaching car or train whenever the railroad-switch is open, the operation being obvious from the illustration without further description. I also cross-connect the rails of the switch with those of the main track, as shown, so that a car standing or moving upon the siding within any desired distance of the main track will short-circuit the circuits of the main track, and thus alarm a car approaching upon the main track.

Having thus described the various parts of my system in detail, I will now give a general description of its operation.

Suppose two trains, as 1 and 2, to be approaching each other upon the main track. The levers 14^a of the switches 14 in each are so placed that the electromotive forces from the batteries in both will coöperate with each other and conjointly act to ring the bells in both trains whenever and so soon as both the

latter enter upon a block common to both or the same block, which may be of any arbitrary distance, regulated by the length of the insulated sections of track, such as 4, 5, 6, and 7. By previous arrangement we will assume it to be the duty of the person in charge of car 2 to proceed to determine the cause of the alarm. He therefore reverses the lever 14^a the moment the alarm is made by moving said lever to the left, when his bell will cease ringing or will ring very feebly, since the electromotive forces of the batteries in the two cars will now be working in opposition to each other. He next moves the lever 14^a to the neutral position indicated by the dotted lines in Fig. IV and opens the switch 22, which removes his own bell from the circuit, and proceeds by means of the key 25 to send any signal he may desire according to the established code to car No. 1. Immediately he has finished his signaling he returns the lever 14^a to its original position (shown in the illustration) and changes the switch 22 (which latter may be made so as to be operated by the movement of the lever 14^a, if desired) and awaits a return signal, which the person in charge of car No. 1 proceeds to give by duplicating the procedure adopted in car No. 2 when sending his signal. In this way No. 2 learns whether the approaching train is in front or behind him or on a crossing or a siding, how far away it is, and what must be done to avoid it. On the other hand, if an alarm occurs in No. 2 and on reversing the lever 14^a the alarm continues, and continues with unabating strength, the person in charge knows that it is caused by an open switch, by a defective bridge, or by a train upon a crossing or switch, either of which would simply act as a short circuit or to close the circuit and cause an alarm irrespective of the position of the lever 14^a of the pole-switch 14. In a similar way if a train were standing or approaching on the main track and a train were standing or approaching on the tracks of the crossing road shown in Fig. I, or on the siding shown in Fig. II, an alarm will occur in the train upon the main track just as in the first illustration given above.

The rheostat 20 is designed to be used only in wet weather, as I have found by experiment that in such weather it is necessary to introduce into the circuit more or less additional resistance in order to make the bell ring properly, the amount of resistance depending upon the amount of dampness.

When the rheostat is to be used, the switch 21 is opened and the lever of the rheostat moves to the proper position to introduce the necessary amount of resistance. Whenever an alarm impulse comes in over the circuits, it operates the well-known form of watchman's time-indicator illustrated at 24, and thus makes a permanent record of the alarm, showing the time it occurred, from which may be determined the part of the road on which the signal was made.

26 represents one of any number of stations which may be established along the road, from which to communicate with the various trains upon the line, in which any desired number of blocks may be connected with the station upon both sides of the same. Their operation is as follows: Normally the switches 28 to 33 are open; but whenever it is desired to establish communication between any such station and a train approaching the section of track connected with such station one of the switches above mentioned is closed, connecting with the block upon which it is desired to stop or communicate with such train when it enters such block, whereupon the moment such train enters such block the bell in the car or locomotive will ring, as will the bell 34 or 35 in the said station. The operator in the station may then open the switch 38, thus cutting out his own bell, and then by means of the key 36 or 37 send the desired signal to the train. To establish the alarm from the fixed station 26 to the moving train 2, the switch 33 is closed, which action places in electrical communication, through the medium of the rail-section marked 8^a, the train 2. By tracing this circuit it will be seen that the current is enabled to pass through the bell 34, the switch 38 being closed, and also that by means of the key 37 a prearranged signal may be communicated to the bell 23 of the moving train 2.

I claim as my invention—

An electric train-signaling system comprising the single-track rails having overlapping insulated sections and broken insulated joints, an auxiliary circuit-rail and a signal-station having for each side of the signal-station a switchboard provided with circuit-closing switches for the several sections, a bell or annunciator, a circuit-closing key, for communicating a signal from the signal-station to a train, a switch for throwing the bell or annunciator in or out of circuit, and a connecting-bar common to all the circuit-closing switches, whereby the latter are connected with the bell or annunciator; substantially as described.

BENJAMIN C. SEATON.

In presence of—
E. S. KNIGHT,
N. V. ALEXANDER.