F. J. MILLER.

AUTOMATIC SIGNAL AND STOPPING DEVICE FOR RAILROAD TRAINS.

APPLICATION FILED JULY 10, 1908.

929,458. Patented July 27, 1909.

3 SHEETS—SHEET 1.

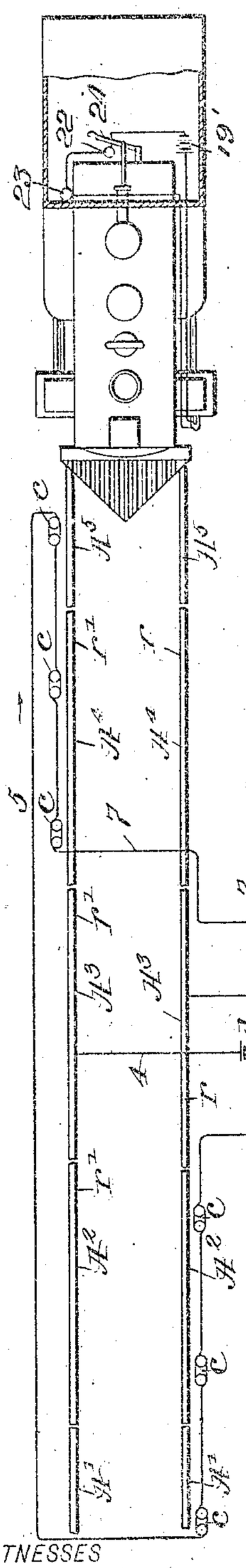

Fig. 1.

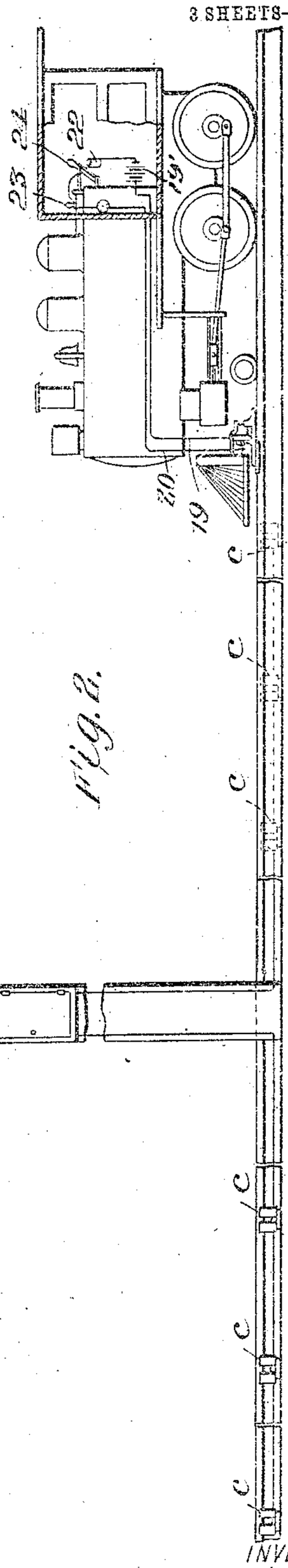

Fig. 2.

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Fig. 3.

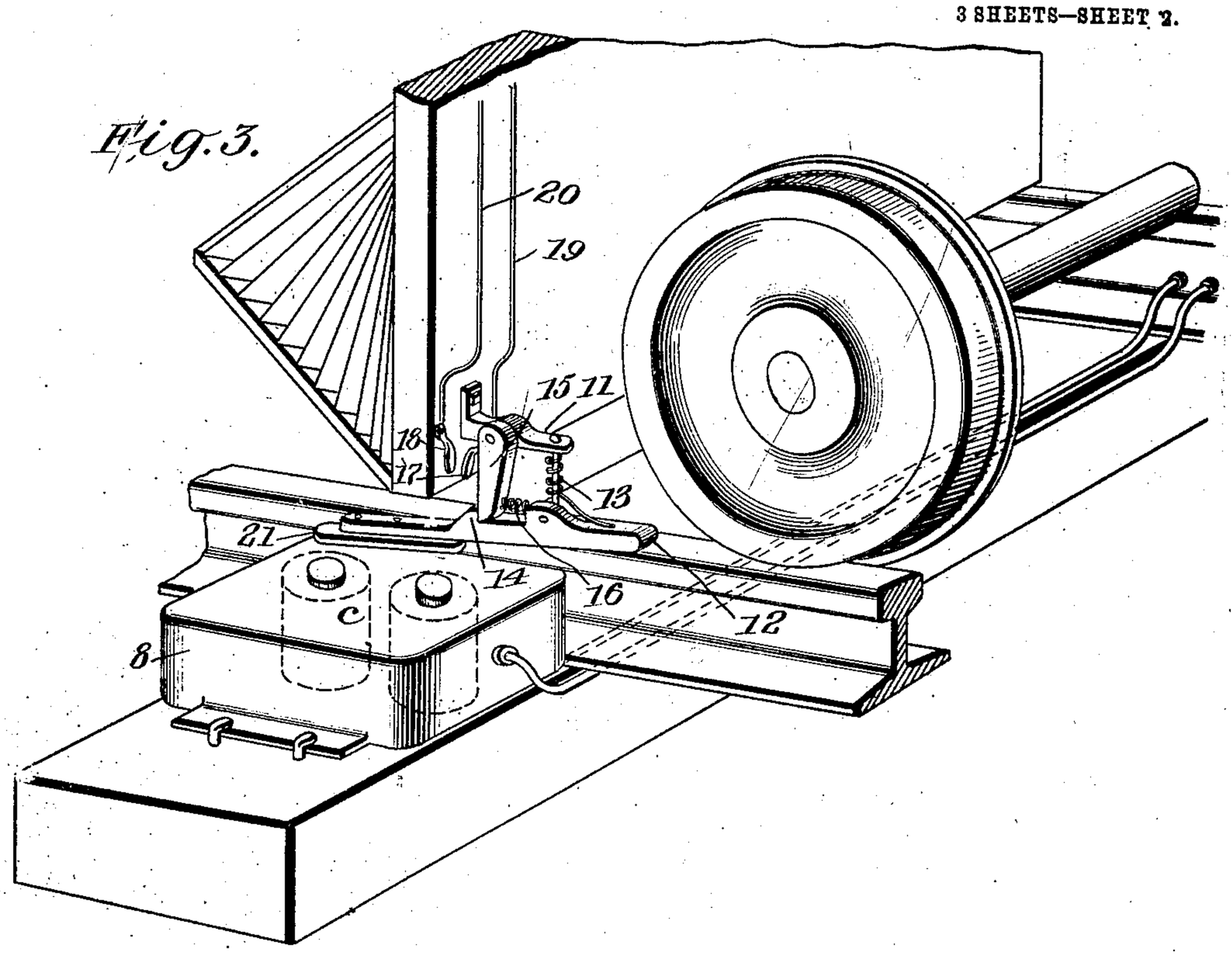


Fig. 6.

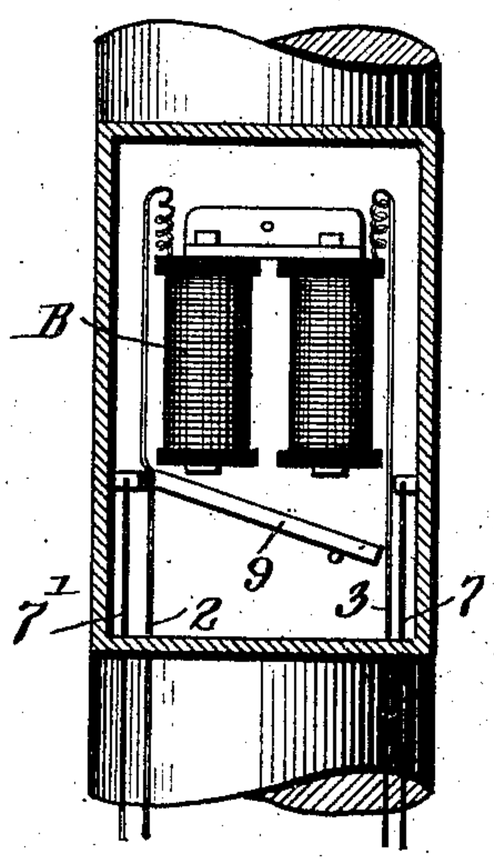
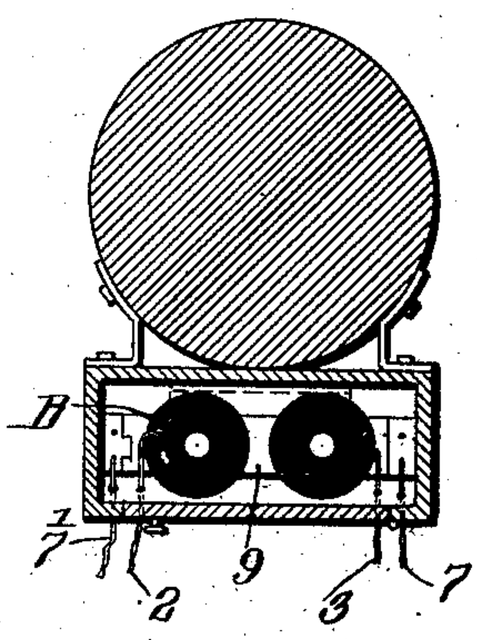


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 3.

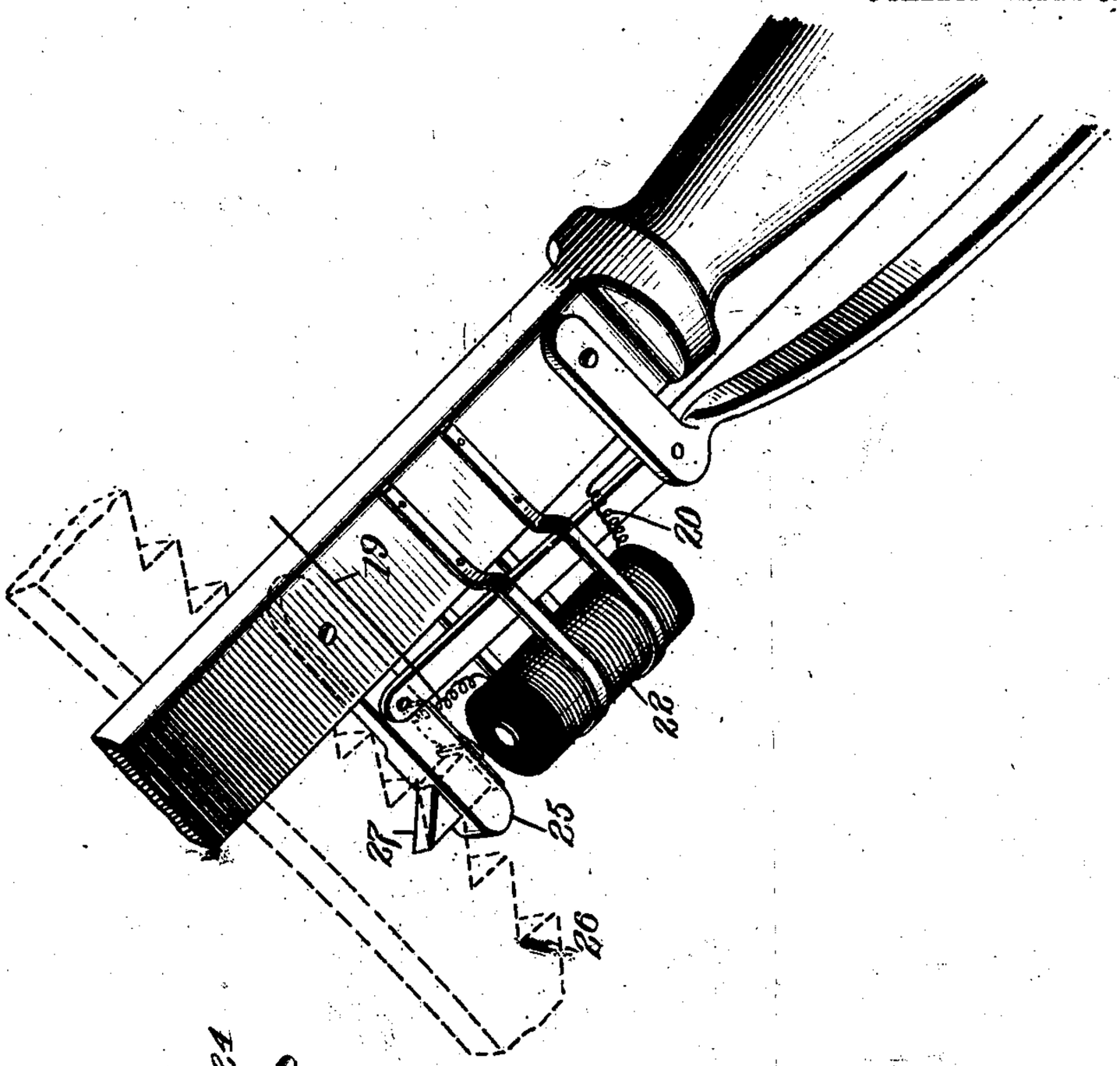
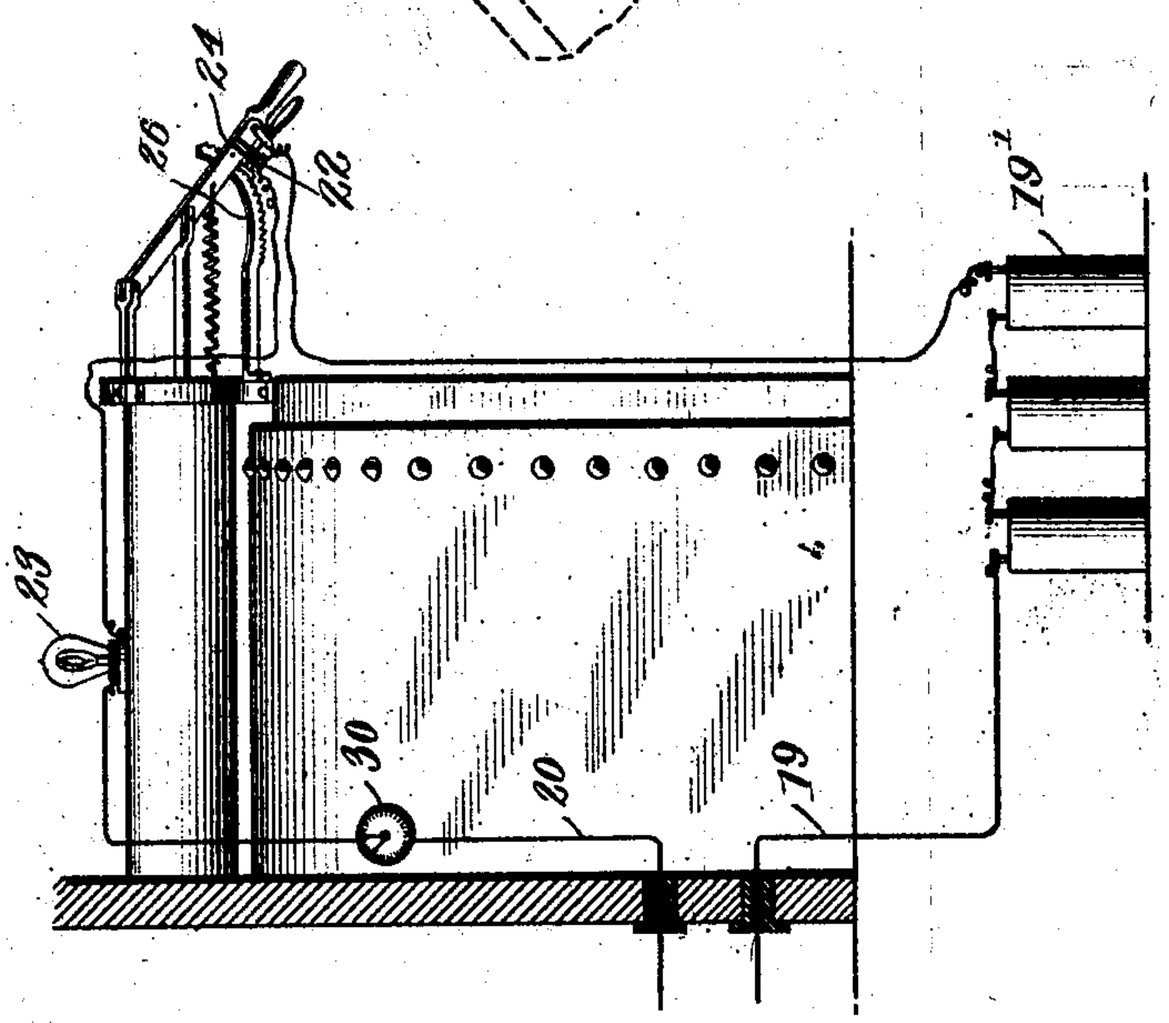


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC SIGNAL AND STOPPING DEVICE FOR RAILROAD-TRAINS.

No. 929,458. Specification of Letters Patent. Patented July 27, 1909.

Application filed July 10, 1908. Serial No. 442,827.

To all whom it may concern:

Be it known that I, FRANK J. MILLER, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have made certain new and useful Improvements in Automatic Signal and Stopping Devices for Railroad-Trains, of which the following is a specification.

My invention relates to that class of devices employed on railroads for the purpose of avoiding collisions and which comprehend the electro-magnetic devices in the roadbed, acting in connection with electro-magnetic devices on the engine or car, whereby the entry of a train upon a section of track already occupied, will actuate in said on-coming train a signal alarm and will also cause automatic devices to be set into action, by which the throttle valve is closed and the train is automatically brought to a standstill.

My invention consists in the novel construction and arrangement of the devices in the roadbed and the circuits connecting the same, in combination with the devices of the engine as will be hereinafter more fully described with reference to the drawings, in which—

Figure 1 is a plan view of the section of track comprehending five units of my system; Fig. 2 is an elevational view of the track sections shown in Fig. 1; Fig. 3 is an enlarged detail view, in perspective, of the parts of the device carried by the locomotive which act in connection with devices in the roadbed for giving the alarm and closing the throttle valve; Fig. 4 is a view of the signal device and throttle valve operating mechanism; Fig. 5 is an enlarged detail view of the throttle valve operating mechanism; Fig. 6 is a side view, in detail, of a circuit closing device; and Fig. 7 is a plan view of the circuit closing device shown in Fig. 6.

Referring now to Fig. 1, A^1, A^2, A^3, A^4 and A^5, represent five units or sections of a railroad track, each section of which is suitably insulated from the adjacent section. It will be understood that in the following description the electro-magnetic devices shown in connection with the section A^3, are so shown for purposes of illustration and that they are in practice associated with each track section, as will fully appear hereinafter. Considering then the section A^3, an inspection of the drawing will show that this section has associated with it a circuit closing device B, a detail view of which is shown in Fig. 6. This circuit closing device is arranged to be actuated by means of the battery 1, when an electrical connection between the two rails of the section is completed. To this end, one terminal of the electro-magnet B is connected to the battery by the wire 2, the other terminal is connected to one of the rails r by the conductor 3, while the other rail r' is connected with the battery by the conductor 4.

The function of the circuit closer B is to establish a closed circuit through the electro-magnets c. The arrangement and disposition of the latter magnets forms one of the main features of my invention. These magnets are in a circuit including the contacts of the circuit closer B, and the circuit is completed by means of an auxiliary conductor 5, which, as is shown in the figure, extends from the magnets c on the left of the figure to the magnet c on the opposite side of the track at the right of the figure. Upon the actuation of the circuit closer B, the circuit may be traced from the battery 6, through the magnets c at the left of the figure, across the track to the conductor 5, thence through the magnet c at the right of the figure, and by means of the conductor 7, back through the circuit closer to the battery. It will be also noted, that there are no magnets c adjacent to the rails r' of the section A^3, which are controlled by the circuit closer B of the section A^3, although as pointed out before, there are certain of these magnets along the rails of the section A^3 which are controlled by circuit closers of other sections.

The circuit closer B is preferably located at one side of the track upon a post or other supports as shown in Fig. 6. The magnets c on the other hand, are located adjacent to the rails and are housed in suitable casings 8, as shown in Fig. 3. It will be seen from an inspection of Fig. 1, that the closure of the circuit by the relay B places an actuating current on the magnets of the section A^2 and part of A^1 that is ahead of A^3 and whose magnets are on one side of the track, and it also actuates the magnets c of the section A^4 and part of the section A^5 behind the section A^3, these latter magnets being on the opposite side of the track. While I have shown these magnets as extending over an adjacent section and part of still another section it is obvious that in practice these magnets c

would be so distributed as to meet the requirements of the system in which they are to be used. Thus, it may be convenient to extend these magnets merely into the sections ahead and the section behind the section containing the circuit closer, and more or fewer of the magnets *c* could be used, depending upon the length of the sections to be guarded.

The main principle of the invention consists in the automatic closing of the actuating circuit of the relay B, when a train enters upon the section A^3 associated with the circuit closer. When a train is upon section A^3 the rails are electrically connected together through the wheels and axles of the train. The actuating circuit of the relay B is closed, and when the relay pulls up, its armature 9, engages contact 10, see Fig. 6, thereby closing the circuit from the wire 7 to the wire 7′ leading to the battery 6.

The electro-magnetic devices arranged to coöperate with the magnets *c* on the roadbed are shown in Fig. 3. These consist of a supporting member 11 attached at some point near the front of the engine, shown in Fig. 3 as attached on the rear of the cow-catcher, and bearing a pivoted lever 12. The lever 12 is fulcrumed at one end and is normally drawn up by a spring 13. This lever is provided with an upwardly projecting lug 14 which is adapted to catch and hold the lower end of a trigger 15 which is pivoted on the supporting member 11, and which is forced by means of a compression spring 16 against the lug 14. The trigger 15 is provided with a contact 17, adapted to coöperate with another contact 18, these two contacts forming the terminals of the conductors 19 and 20, respectively. Attached to the forward end of the lever 12 is an armature 21 which is carried immediately over the tops of the magnets *c* along the track and which is adapted to be attracted toward said magnets when the latter are actuated and to release the trigger 15 which is then moved by the spring 16, thereby closing the contacts 17 and 18 and completing an electric circuit through the wires 19 and 20. In Fig. 3 the circuit closing mechanism is shown as attached to the left side of the moving train. A similar device is attached to the right side of the train and is arranged to be actuated by the magnet *c* in the manner hereinafter described.

Referring now to Figs. 2 and 4, the two wires 19 and 20 extend to the cab, where they terminate in the winding of an electro-magnet 22. In the circuit of the wire 20 is arranged a danger signal lamp 23, shown in Fig. 4. The conductor 19 is attached to a local battery 19′ from which the actuating current of the magnet 22 is derived. The magnet 22, acts upon the throttle mechanism through the medium of a pin and the movement of the latter causes the release of the throttle lever 24, and the consequent shutting off of the steam. The magnet 22, as will be seen from Figs. 4 and 5 is carried upon the throttle lever itself and in the ordinary use of the throttle lever the engineer will move the same backward and forward, and the lever will be retained in its position by means of the pivoted pawl 25 which engages the teeth of the rack member 26. The pawl 25, comprises a spring actuated pin 27, which is movably carried in a slot or opening in the pivoted member. The magnet 22 is in close proximity to the movable pin 27, and when the magnet is actuated the pin is drawn outwardly against the tension of the spring and the throttle lever which, of course, is also under tension immediately returns to its normal position thereby closing the throttle and shutting off the steam.

Having thus described in detail the operating mechanism I will show the operation of the various devices, and the manner in which a unit of the system may be automatically protected and collisions may be avoided. Referring now to Fig. 1, we will assume that a train has entered the section A^3, thereby completing an electrical connection between the two rails. The circuit closer B will be actuated in the manner already described and will close a circuit through the magnets *c*, in the section immediately forward of the section A^3 and in the section immediately behind the scetion A^3. If now a train should approach from the rear, that is from the direction indicated in Fig. 1, the armature 21 of its right-hand circuit closing device will be attracted by the magnet *c*. The local circuit through the magnet 22 which controls the throttle will be completed and the throttle will be closed, thereby bringing the train to a standstill. At the same time, the red danger lamp 23 will glow thereby apprising the engineer of the fact that there is a train in the block or section immediately ahead. If a train should approach from the left, that is come head-on toward the train in section A^3, the magnets *c* on the lefthand side of the track being actuated would cause the oncoming train to stop in the same manner. Now when the train in the section A^3 moves on to the section A^2, the circuit closer B of the section A^3 is deënergized, the magnets *c* controlled by it are also deënergized, while the circuit closer of the section A^2 is energized and completes a circuit through a series of magnets arranged along the track on the left and right hand of the forward and rear adjacent sections respectively, in the same relative positions as those controlled by the circuit closer B of the section A^3 which the train has just left. The apparatus on the right side of the engine may also be applied for putting on the brake of the train as well as to shut off the steam.

The apparatus on the lefthand side of the engine may be used as an indicator. Thus a series of magnets *c* may be arranged along the lefthand rail of the section in which the train is located and may be controlled by the circuit closer of the section itself. With this arrangement I extend the wires 19 and 20 to an electric lamp and not to the throttle controlling mechanism. The lamp will be preferably of a green color and when the circuit closing device on the engine passes one of the magnets *c* controlled by the circuit closer of its section, the green lamp will flash and the flashing of the lamp will indicate that the circuit is in working condition. If, however, the green lamp failed to flash the engineer would be immediately apprised of danger ahead of him from the interruption of the circuit, which might be occasioned by a broken rail, a wash-out, a bridge down or any other cause which might render the circuit inoperative. I also propose to use a bell on the same system as the green lamp. In case the engineer does not see the lamp he can hear the bell and thus be apprised of the proper operative condition of the system. Although I show each section of track operated by a signal-battery 1, in practice I propose to use a battery at each magnet connected to act in series with the battery of the central section so that all the magnets would be energetically charged.

In order to record the exact time at which one train was stopped by another train, I may use an electrically controlled stop clock which I have indicated in Fig. 4, at 30, and which may be conveniently placed in series with the local throttle-controlling circuit.

From the above description it will be seen that I have provided a system in which the various sections or blocks of track are amply protected from collisions and the trains are automatically stopped before they enter upon a section already occupied. I have also provided means for indicating the condition of the track ahead of the moving train.

I am aware that various modifications may be made embodying the ideas herein disclosed, but I desire to claim as my own all such modifications as fairly fall within the spirit and scope of the invention.

Having now described my invention what I claim and desire to secure by Letters Patent of the United States is:—

1. In a signaling and train stopping device, a track comprising a series of insulated sections each provided with an electrical relay, a series of magnets arranged along adjacent sections of track and adapted to be actuated by said relay, those magnets associated with the forward adjacent section being on one side of the track and those of the rear adjacent section being on the other side of the track, a train provided with an armature adapted to be attracted by said magnets and to operate a circuit closing device, throttle lever, and an electro magnet carried by said lever and arranged to be actuated by said circuit closer for restoring said lever and thereby closing the throttle.

2. In a train signaling and stopping device, the combination with an electro-magnet in the road bed, of an armature carried by a car and adapted to be attracted by said magnet, a spring-actuated trigger provided with a contact arranged to be released on the movement of the armature, a second contact adapted to be engaged by the first-named contact for closing an electric circuit, a throttle valve lever and an electro-magnetic locking and releasing device arranged in said electric circuit and adapted to be operated upon the closure of said contacts.

3. In a train signaling and stopping device, the combination with an electro-magnet in the roadbed, of an armature with trip devices carried on the car and controlling two terminal contacts, a throttle-valve lever provided with a pivoted retaining pawl having a movable pin arranged to engage a rack member for locking said throttle lever, an electro-magnet also carried by said lever and arranged when actuated by the closure of said terminals to withdraw said pin and to release the throttle lever.

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Witnesses:
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VICTOR WM. HERTWIG.