915,238.

H. W. SOUDER.

ELECTRIC ROAD CROSSING SIGNAL.

APPLICATION FILED JUNE 29, 1907.

Patented Mar. 16, 1909.

2 SHEETS—SHEET 1.

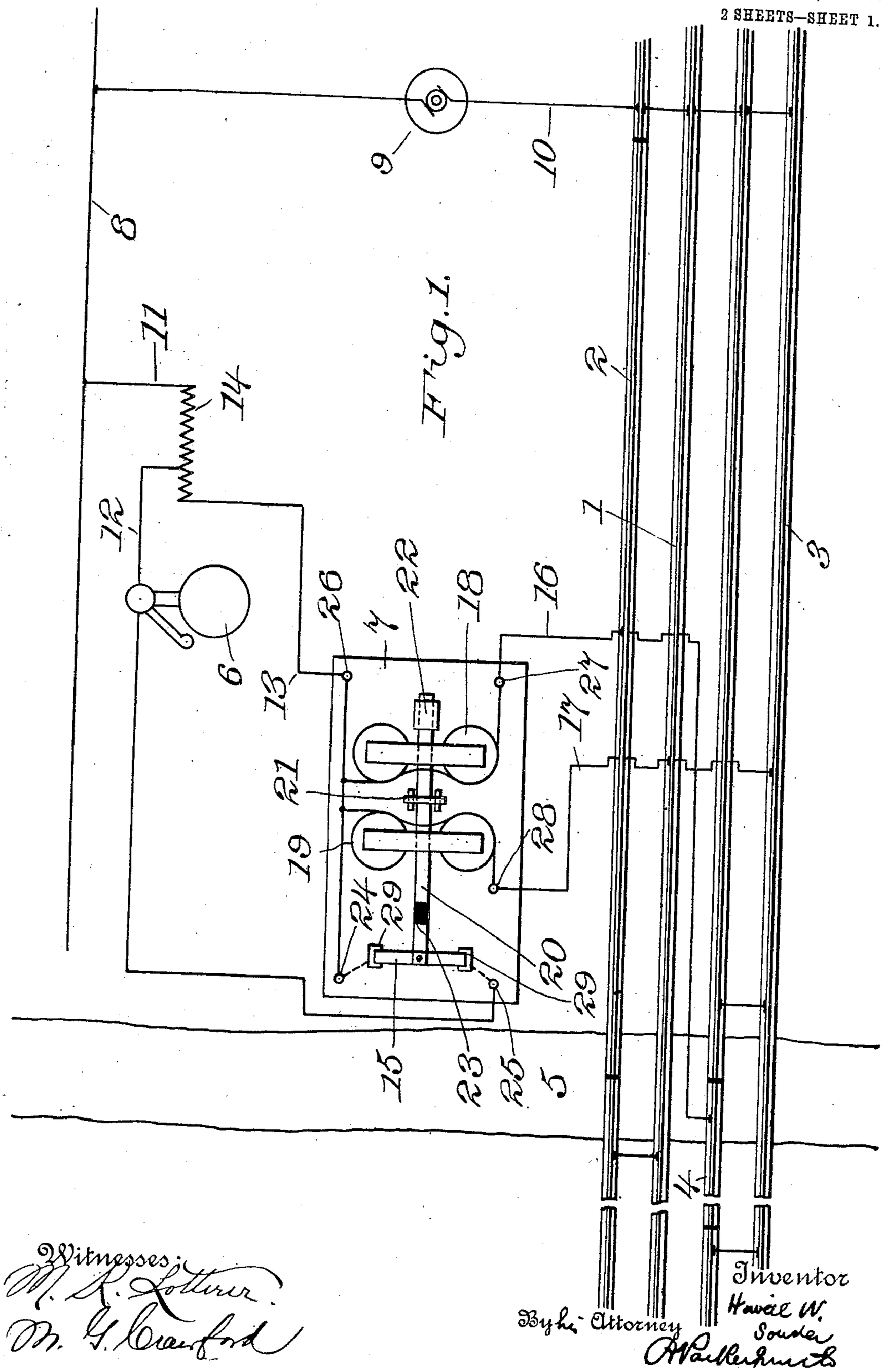

Fig. 1.

THE NORRIS PETERS CO., WASHINGTON, D. C.

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2 SHEETS—SHEET 2.

Fig. 2.

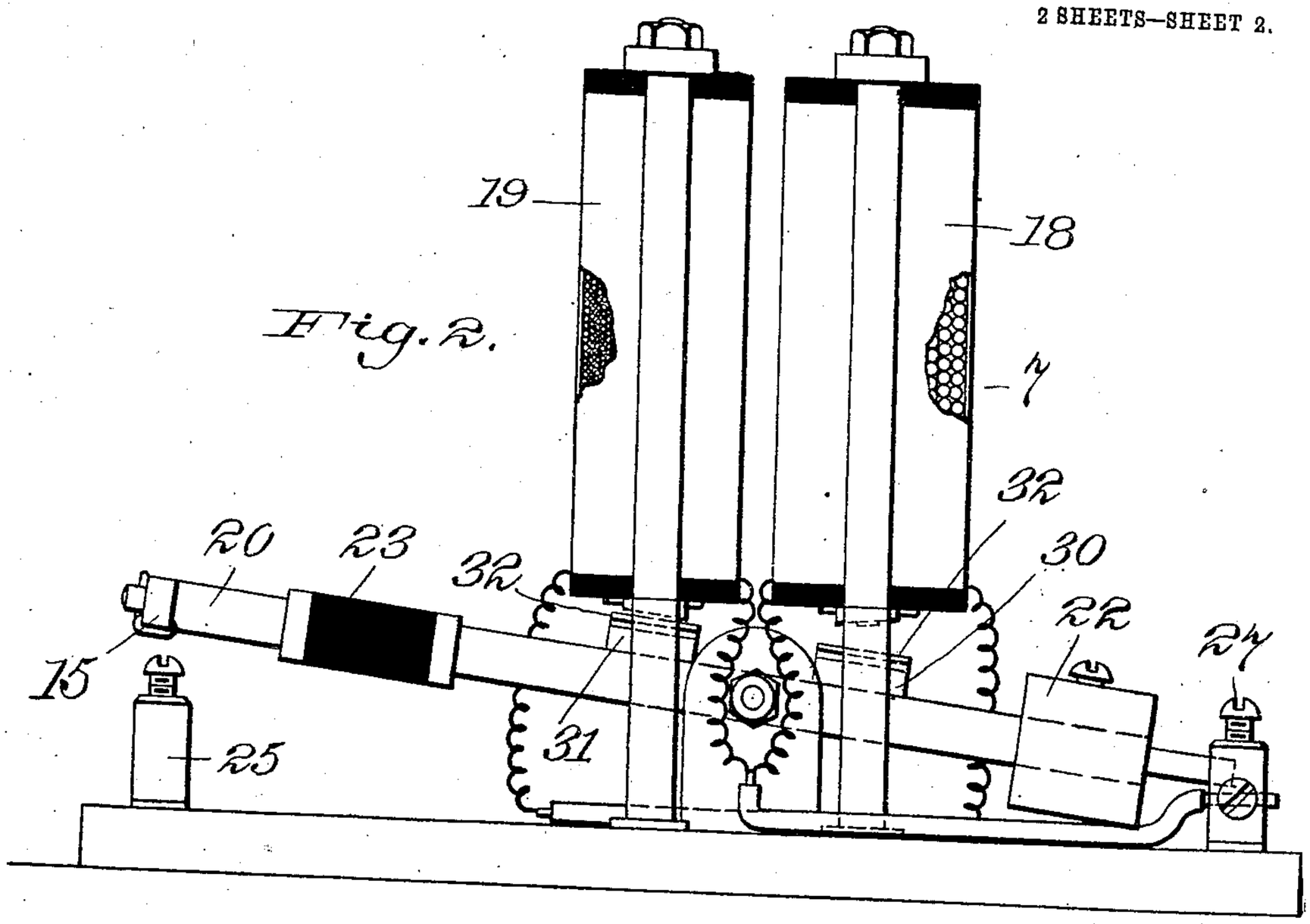
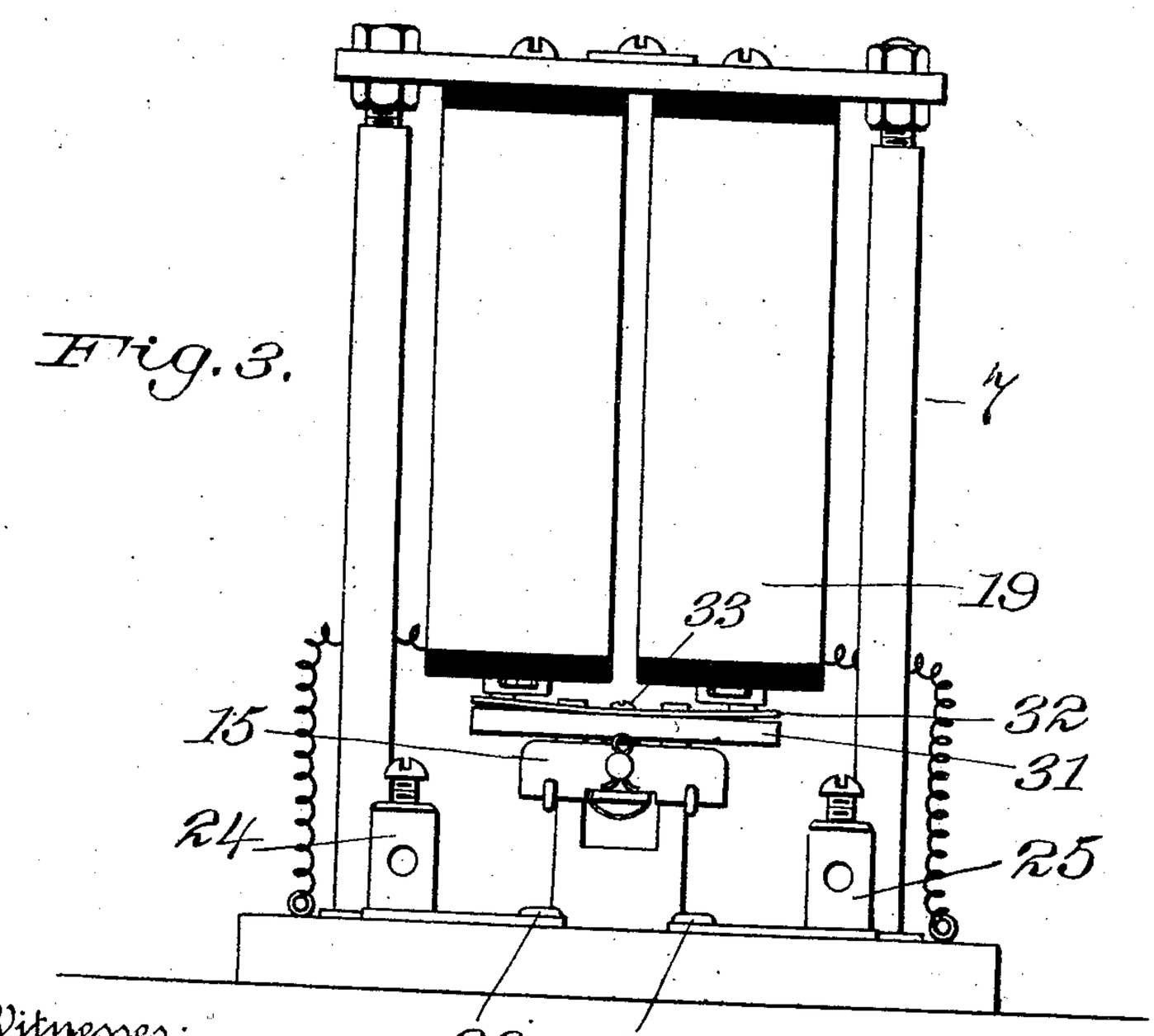


Fig. 3.



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UNITED STATES PATENT OFFICE.

HOWELL W. SOUDER, OF TAMAQUA, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO ELLEN ZEHNER BREED, OF CLEVELAND, OHIO, AND ONE-FOURTH TO MARIE ZEHNER BRADSHAW, OF CONSHOHOCKEN, PENNSYLVANIA.

ELECTRIC ROAD-CROSSING SIGNAL.

No. 915,238. Specification of Letters Patent. Patented March 16, 1909.

Application filed June 29, 1907. Serial No. 381,393.

To all whom it may concern:

Be it known that I, HOWELL W. SOUDER, a citizen of the United States of America, and a resident of Tamaqua, Schuylkill county, State of Pennsylvania, have invented certain new and useful Improvements in Electric Road-Crossing Signals, of which the following is a specification.

My invention relates to electric signaling systems for trolley roads and more specifically comprises an improved apparatus for ringing a bell located at a highway crossing to warn the public that a train or car is approaching on the railroad.

The best form of apparatus at present known to me embodying my invention is illustrated in the accompanying two sheets of drawing, in which:

Figure 1 is a diagrammatic view of the railroad and crossing highway and electric circuits. Fig. 2 is a side elevation with parts of the circuit controller broken away, and Fig. 3 is an end view of the same.

Throughout the drawings, like reference figures indicate like parts.

As shown in Fig. 1, there is a double track railroad in which the west bound track has a bonded rail 1, and an insulated section 2 in the other rail, while the east bound track has a bonded rail 3 and an insulated section 4 in the other rail. 5 represents the crossing highway. 6 is an electrically operated bell of any desired construction. This bell is automatically operated by electric current controlled by the circuits and apparatus illustrated in the drawing in which 7 represents an automatic circuit controller, 8 the trolley wire or other main feed wire, 9 a generator of electric current from which said trolley wire is charged, 10 a return connection from the bonded rails of the track to one pole of the generator, the other pole being of course connected to the trolley wire. 11 is a branch feed wire extending from the trolley or main feed wire through the resistance 14 to the bell circuit 12 and a second shunt circuit 13. As shown, the bell or signal circuit is connected at an intermediate point of the resistance 14 so that there is less resistance in circuit with the signal than with the second circuit 13. In the signal circuit is a normally open gap controlled by the circuit closer 15. 16 is a connection to the insulated rail sections 2 and 4 from the binding post 26 to which both the circuit 12 and 13 are connected. 17 is a connection from the said binding post to the two bonded rails 1 and 3. 18 is an electro-magnet whose coils are included in circuit 16, and 19 is an electro-magnet whose coils are included in the circuit 17. 20 is a circuit closer lever carrying the circuit closer 15 and pivoted at 21 having the adjustable counterweight 22. 23 is a section of insulation in said lever. 24 and 25 are binding posts which are connected to the contact pieces 29, 29, coöperating with the circuit closer 15 and to which binding posts the wires of the circuit 12 are connected. 27 is the binding post to which the insulated rail section circuit is connected and 28 is a similar binding post to which the bonded rail circuit is connected.

The circuit closer lever 20 carries two armatures 30 and 31, the first of which cooperates with the magnet 18 and the other with magnet 19. 32, 32 represent spring faces for said armatures attached to the latter at the middle by means of the rivets or screws 33, or equivalent device, the spring face plates being bent slightly up at an acute angle to the faces of the magnet cores, as shown in Fig. 3.

The magnet 18 is made of considerably lower resistance but of stronger magnetic field than the magnet 19, as indicated in Fig. 2, by the different sizes of wire with which the cores are wound.

Such being the construction, the operation of my invention is as follows: Normally, a weak current flows from the generator through the trolley or feed wire and the branch 11, through the resistance 14, wire 13, binding post 26, high resistance magnet 19 and bonded rail connection 17, back through the bonded rail return 10 to the generator. This attracts the armature 31 and lifts the circuit closer in the position shown in Figs. 2 and 3 so as to leave a normally open gap in the signal circuit 12 with the result that the bell does not ring. When a car approaches from the west on the east bound track, or from the east on the west bound track, it runs on to one of the insulated sections of rail 2 or 4, and bridging the gap between the insulated and bonded rail establishes a circuit from the binding post 26 through the magnet 18 and connection 16 to the bonded rail. This sending of current

through the low resistance magnet 18 creates a powerful field which attracts the armature 30 and swings the circuit closer lever 20 so as to drop the circuit closer and bridge the gap between the contacts 29, 29, in the signal or bell circuit, the high resistance magnet 19 being overpowered. The signal circuit 12 being of lower resistance than the second circuit 13 looped around it, the principal portion of the current flows through the bell and sets the same ringing. The bell continues to ring as long as a car is on one of the insulated rail sections. When the car runs off the insulated rail section, the circuit 16 is open and the magnet 18 becomes dead. The magnet 19 then regains its power and opens the circuit closer, cutting out the bell and re-establishing the circuits as originally described.

As the continuance of flow of current through the magnets might so charge the same that sufficient residual magnetism would be left after the current was shut off to hold the armature, I provide each of the armatures 30 and 31 with a spring face plate 32 of much less mass than the armature proper. These face plates tend normally to extend in a line at an acute angle to the face of the magnet cores and to the armature proper. The result is that when the current is cut off from the magnet and its power reduced, the face plate tends to spring the armature away from the face of the core piece and break the magnetic connection. The armature proper being removed a slight distance by such spring action, the residual magnetism is not strong enough to hold the armature 30 against the pull of the counterweight 22 and the high resistance magnet 19 and the action of the circuit closer is therefore made certain and the "freezing" of the armature to the magnet is prevented.

The action of residual magnetism in "freezing" the armature to the magnet and so preventing the operation of the circuit controller is particularly apt to occur when the magnet has been subjected to a considerable flow of current for a period of time of some length, as would be the case in a bell ringing circuit such as is here described, it being necessary to have the insulated rail section of considerable length so that the bell will ring for some time before the car reaches the road crossing.

One great advantage of my improved system is the avoidance of arcing at the bell contacts. It is practically impossible to operate a bell or other electrically vibrated signal on a high voltage circuit under ordinary conditions because the excessive arcing at the contacts promptly destroys the same. If the usual trolley road propulsion current be sent through a single circuit and bell, though enough resistance be included in the circuit to cut down the flow of current sufficiently for best operation of the bell, the rapid opening and closing of the entire circuit by the bell vibrator would produce a constant succession of heavy arcs at the contacts which would soon destroy them. With my system a portion of the current flows continuously through the closed circuit 13, whether the circuit 12 is closed at the bell vibrator or not, so that not only is the inductive action of the resistance coils greatly reduced but the circuit 13 being always closed for flow of currents, both original and induced, there is no tendency for the same to jump across the air gaps formed by the bell vibrator and produce arcs at that point.

Another advantage arises from the great reduction of effective voltage in the bell circuit and in the insulated rail circuit. In practice with a 550 volt power current, I connect the bell circuit 12 to the resistance 14 of about 1100 ohms, at a point which shunts about 55 ohms of the resistance around a bell of six ohms resistance, and I find that this will produce an effective ringing of the bell even when the line voltage drops 50 per cent. as it sometimes does in practice under varying conditions of load. The current passing through the bell under these conditions will not give an unpleasant shock even at full force. In the same way, the difference of resistance between magnets 18 and 19 is so small that no appreciable shock can be obtained from contact with the insulated rail section, while if there were no permanently closed circuit to the bonded rails, the insulated rail sections would be a continual source of danger to animals which happened to furnish a good ground connection to such section, by accidental contact therewith, and under certain conditions, such as a moist or wet roadbed from rain or marshy ground, old sills with surface covered with small particles of metal and rust from the rails, as well as ice and snow, might cause enough current to flow from the insulated to the bonded rail sections to energize sufficiently the magnets operating to shut the circuit closer, if a low potential between the bonded and insulated rail sections were not maintained. By the arrangement of circuits to the bonded and insulated rails, as explained, the same difference of potential may be had between them as in the low voltage rail circuits which good practice has found best adapted for the operation of steam railroad block signals.

Having, therefore, described my invention, I claim:

1. In an electric signal system for railroad crossings, the combination of a normally open circuit, a generator of current therefor, an electrically operated signal in said circuit, a second circuit from the same generator of current also normally open, means operated by a passing car to close said second circuit,

and means operated by the flow of current in the second circuit to close the signal circuit, said first mentioned means comprising an insulated section of rail to which the second circuit is connected and a bonded rail connected to that pole of the current generator which has no direct connection with the other circuits.

2. In an electric signal system for railroad crossings, the combination of a normally open circuit, a generator of current therefor, an electrically operated signal in said circuit, a second circuit from the same generator of current also normally open, means operated by a passing car to close said second circuit, and means operated by the flow of current in the second circuit to close the signal circuit, the second circuit being of higher resistance than the signal circuit.

3. In an electric signal system for railroad crossings, the combination of a normally open circuit, a generator of current therefor, an electrically operated signal in said circuit, a second circuit from the generator of current also normally open, means operated by a passing car to close said second circuit, and means operated by the flow of current in the second circuit to close the signal circuit, said last mentioned means comprising a circuit closer, a magnet whose coils are included in the second circuit, and an armature for said magnet connected to the circuit closer, the second circuit being of higher resistance than the signal circuit.

4. In an electric signal system for railroad crossings, the combination of a normally open circuit, a generator of current therefor, an electrically operated signal in said circuit, a second circuit from the generator of current also normally open, means operated by a passing car to close said second circuit, and means operated by the flow of current in the second circuit to close the signal circuit, said last mentioned means comprising a circuit closer in the signal circuit, a magnet in series with both the second circuit and signal circuits, and an armature for said magnet connected to the circuit closer.

5. In an electric signal system for railroads, the combination of an electric generator, a bonded rail connected to one pole of the generator, an insulated section of rails, a connection from the other pole of the generator to the insulated section of rails, a normally open shunt loop to this last mentioned connection, an electrically operated signal in this shunt, and means operated by the flow of current in the insulated rail connection which closes the signal shunt.

6. In an electric signal system for railroads, the combination of an electric generator, a bonded rail connected to one pole of the generator, an insulated section of rails, a connection from the other pole of the generator to the insulated section of rails, a normally open shunt loop to this last mentioned connection, an electrically operated signal in this shunt, and means operated by the flow of current in the insulated rail connection which closes the signal shunt, said means comprising an electro-magnet included in the insulated rail connection and also in series with the shunt loop, a circuit closer for the loop and an armature for the magnet connected to the circuit closer.

7. In an electric signal system for railroads, the combination of an electric generator, a bonded rail connected to one pole of the generator, an insulated section of rails, a connection from the other pole of the generator to the insulated section of rails, a normally open shunt loop to this last mentioned connection, an electrically operated signal in this shunt, and means operated by the flow of current in the insulated rail connection which closes the signal shunt, said means comprising an electro-magnet included in the insulated rail connection and also in series with the shunt loop, a circuit closer for the loop and an armature for the magnet connected to the circuit closer, the shunt loop being of lower resistance than the portion of the insulated rail conection about which it is looped.

8. In an electric signal system for railroads, the combination of a closed circuit and source of current therefor, a shunt loop thereto, an electrically operated signal in said loop, a magnet of weak power in the closed circuit, a circuit controller for the shunt loop held normally open by said magnet, a normally open branch circuit, a magnet of lower resistance and greater power in said branch circuit which when energized overpowers the weaker magnet and closes the shunt loop, and means operated by a passing car for closing the branch circuit.

9. In an electric signal system for railroads, the combination of a closed circuit and source of current therefor, a shunt loop thereto, an electrically operated signal in said loop, a magnet of weak power in the closed circuit, a circuit controller for the shunt loop held normally open by said magnet, a normally open branch circuit, a magnet of lower resistance and greater power in said branch circuit which when energized overpowers the weaker magnet and closes the shunt loop, and means operated by a passing car for closing the branch circuit, said means comprising a bonded rail to which one pole of the source of current is connected while one end of the branch circuit is connected to the other pole, and an insulated section of rail to which the other end of the branch circuit is connected.

10. The combination with a normally closed circuit and source of current supply therefor, of two normally open shunt loops to said circuit, a circuit closer in the first

shunt loop, a magnet with a weak field included in that portion of the main circuit in parallel with the second shunt loop, a magnet of lower resistance with a strong field included in the second shunt loop, a common armature system oppositely influenced by said magnets and connected to the circuit closer so as to close same when the stronger magnet is energized, and means for closing the second shunt loop.

11. In an electric signal system, the combination with a signal circuit adapted to be closed by the action of a car passing over an insulated rail, of an electro-magnet in said circuit, a movable armature therefor, and a spring face plate for said armature.

12. The combination with an electric vibrating apparatus of a circuit including the same, a generator of electric current included in said circuit, and a closed shunt around the vibrating apparatus, the resistance of which shunt circuit is slightly higher than that of the vibrating apparatus.

13. The combination with an electric vibrating apparatus of a circuit including the same, a generator of electric current included in said circuit, and a closed shunt around the vibrating apparatus, the resistance of which shunt circuit is slightly higher than that of the vibrating apparatus, together with a resistance in the main circuit in series with both the shunt and the vibrating apparatus.

Signed at New York, N. Y. this 17 day of June, 1907.

HOWELL W. SOUDER.

Witnesses:
M. K. LOTTERER,
M. G. CRAWFORD.