J. F. McELROY.

SIGNALING ON TRAINS.

APPLICATION FILED APR. 30, 1908.

907,269.

Patented Dec. 22, 1908.

3 SHEETS—SHEET 1.

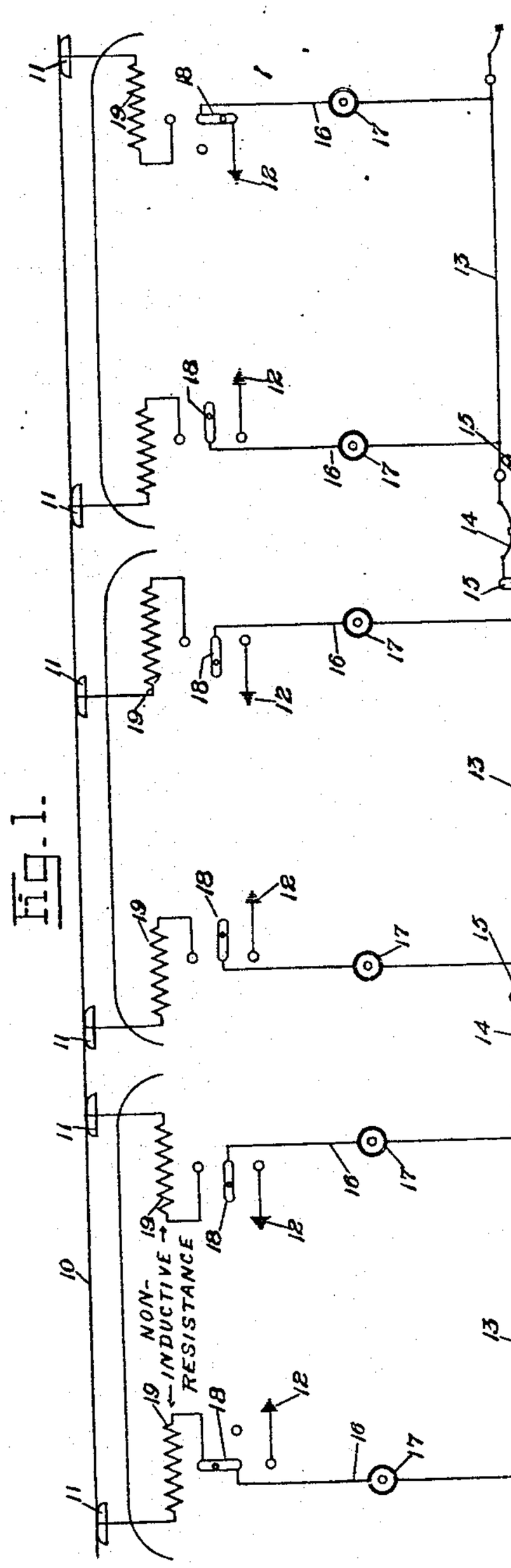

Fig. 1.

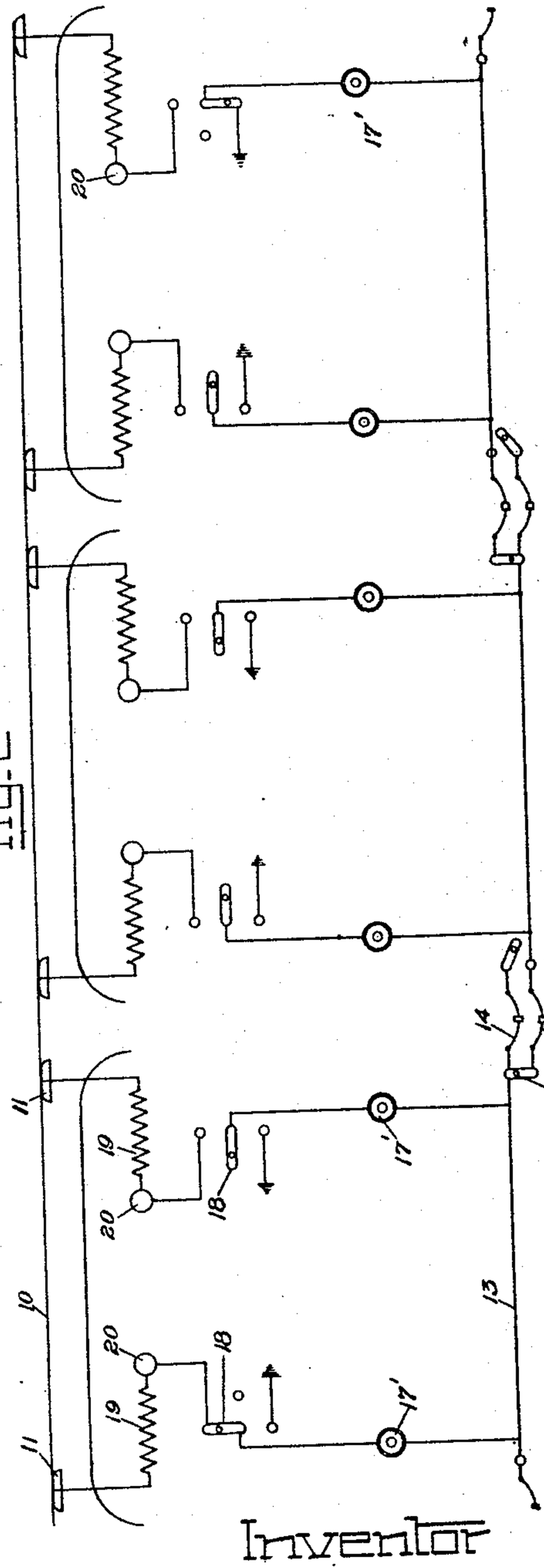

Fig. 2.

Witnesses

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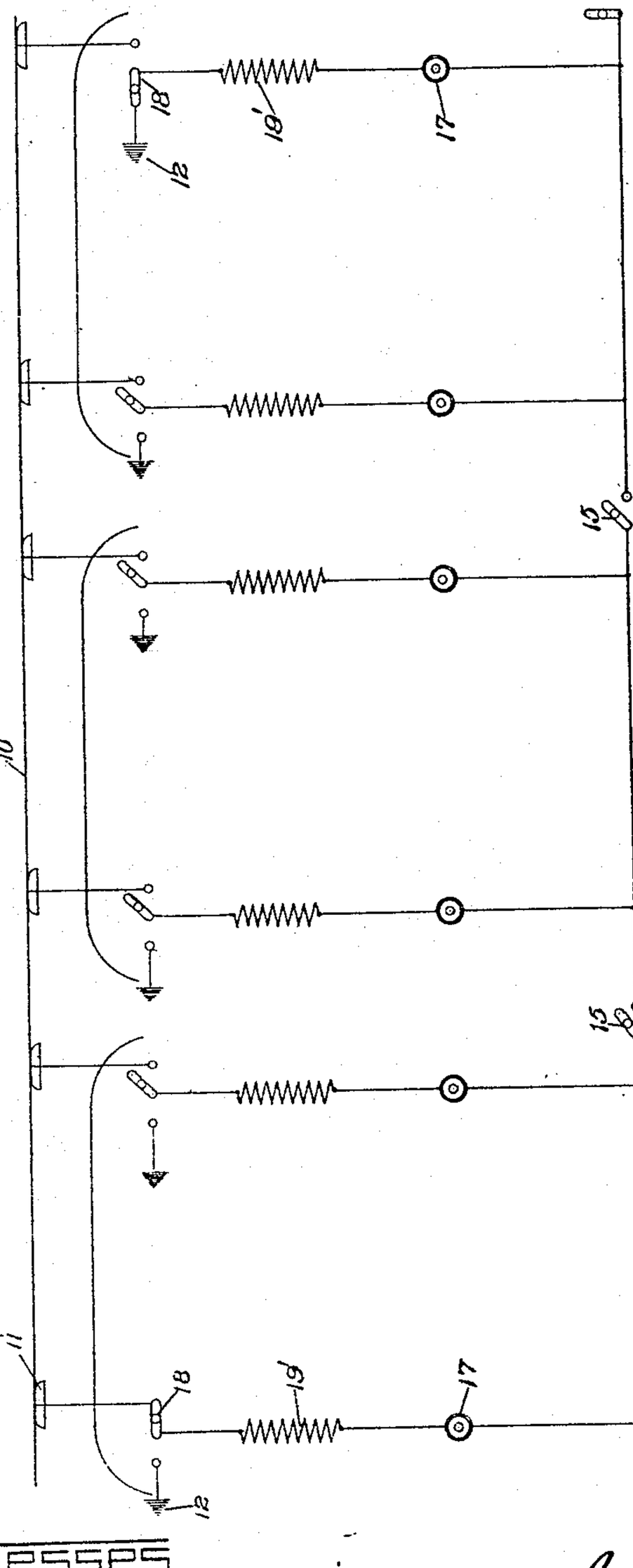

Fig. 3.

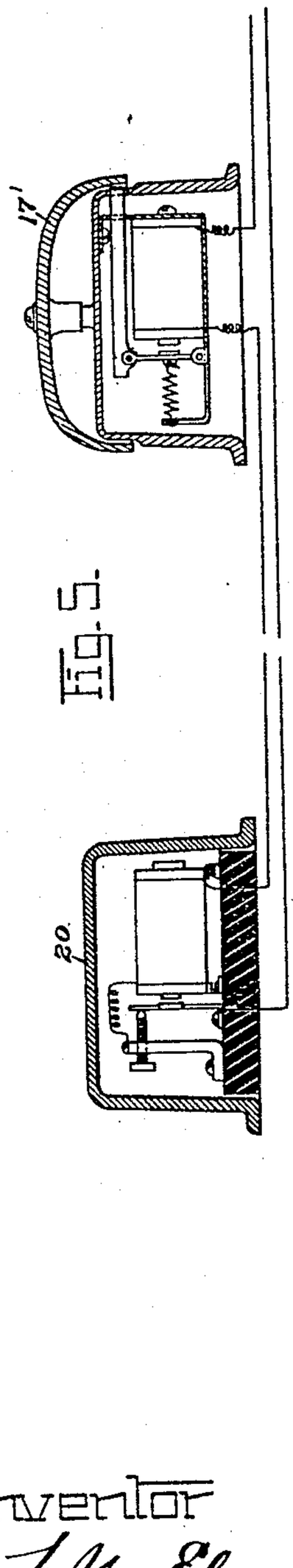

Fig. 5.

Witnesses

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3 SHEETS—SHEET 3.

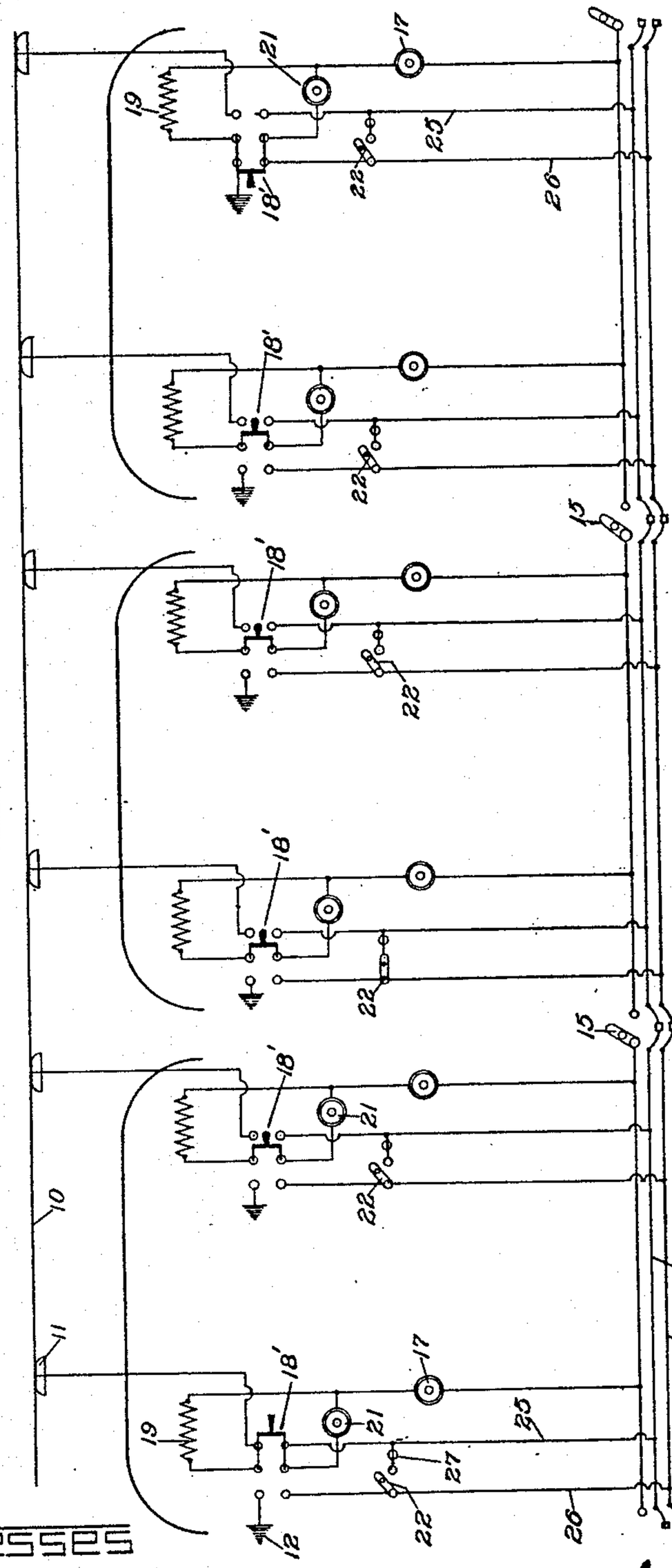

Fig. 4.

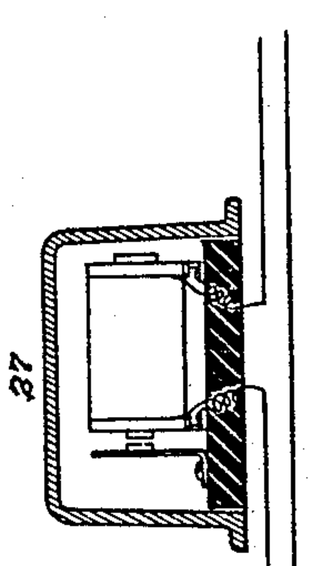

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

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SIGNALING ON TRAINS.

No. 907,269. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed April 30, 1908. Serial No. 430,085.

To all whom it may concern:

Be it known that I, JAMES F. McELROY, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Signaling on Trains, of which the following is a specification.

This invention relates to electric circuit devices on trains, whereby a signal is given to the driver at the forward end of the train when a series circuit extending through the train has been completed at all the conductors' or guards' positions between cars. Systems of this kind, of which an example is found in Gilliland Patent No. 318,102, are readily adaptable to multiple-unit electrically-driven trains, using the propelling current through resistances to operate the signals, and employing suitable branch-connections and double-throw switches at each end of each motor car to connect the signaling circuit to trolley at one end of the train and to ground at the other end on any cars which happen to be at those ends, the intermediate switches being opened. An arrangement of this character requires a signal at each end of each motor car, since any motor car may become the one at the head of the train in the multiple-unit system, and one of the objects of my invention is to avoid actuating the intermediate signals, the latter being cut out of circuit by the operation of opening the intermediate double-throw switches. Hence only the signals at the front and rear of the train are actuated when the signaling circuit is closed and no switches need be thrown when the train changes direction and the driver changes ends. The driver is informed by the signal at his end when the guards have closed the circuit at all of the open points and it is time for him to start the train. A further effect of putting the signals, which have high-resistance magnets, in the branch connections, and cutting out the intermediate signals when cars are coupled up to form a train system, is that the resistance of the entire train-line is not materially varied by cutting cars in and out of the train, for the resistance-unit which controls the circuit at one or both ends of the train is of large value compared to the low resistance of the intermediate portion of the train-line, which by my invention, need not contain the intermediate signal-magnets of comparatively high resistance.

A further improvement consists in arranging a single signaling circuit of the aforesaid character in series-parallel between adjacent car-ends, in combination with two guards' or conductors' switches, one on each car-end, the closing of either of which will invariably complete the circuit for that position regardless of which of the two switches at some other guard's position has been closed.

My invention also includes certain novel expedients in the manner of arranging resistances in the signaling circuit to cut down the trolley current and protect the circuit devices as well as the persons using them; and it includes an auxiliary signaling system which may be combined with the principal signal circuit and is calculated to allow individual guards or conductors to give a signal to the driver independently of other guards. Arrangement may be made whereby the giving of this signal is made evident to the particular guard who transmits it.

Lastly my invention includes an improvement in separate signals and interrupters for systems of the general character herein mentioned.

Of the accompanying drawings, Figure 1 represents a diagrammatic view of a train-starting signal system embodying my invention. Fig. 2 represents a similar view showing a modification. Fig. 3 represents a similar view showing a second modification. Fig. 4 represents a similar view showing my improved starting signal system combined with an auxiliary system for independent signaling by any guard. Fig. 5 represents a sectional view of a signal bell and separate interrupter which may be employed. Fig. 6 represents a view of a signal bell in connection with a buzzer for each guard's position to inform him of the transmission of the independent signal.

In Fig. 1, three car units are shown assembled in a train signaling system in which 10 is the trolley line or third rail conductor, 11 are the traveling shoes or trolleys, and 12 are the ground points which may be the car wheels running on the conductive rails. 13 is a wire on each car connected by flexible conductors 14 between cars, and 15 are the

guards' or conductors' switches located on or about the vestibules or car platforms for closing the circuit and giving the signal. These switches may be variously arranged but I prefer to employ two switches at each guard's position, one on each car end and on opposite sides of the vestibules, together with overlapping or parallel conductors including two flexible couplings 14 between each pair of cars, either switch 15 being adapted to close the circuit. Thus there is or may be only one series wire extending from end to end of a car, but between cars the conductors are in parallel and either switch will invariably close the circuit for that guard's position regardless of which of the two switches at some other guard's position has been actuated. This arrangement enables the guard to close the circuit conveniently from either side, as where entrance and exit are made from station platforms sometimes on one side and sometimes on the other side of the train.

The guards' switches are shown conventionally and I may operate them by means of the car-platform gates in a well-known manner, but prefer to use an independent manual switch, which might be a simple push-button.

At the two ends of each car are cross or branch conductors 16 containing bells 17 or other signaling devices, whose magnets are wound with a large number of ampere-turns of fine wire and consequently have a high resistance as described in a patent hereinafter mentioned, granted to me. These branch conductors extend to the double-throw switches 18 each of which has one point connected with the trolley and the other with the ground, while the switch arm is connected with the branch wire from the longitudinal conductor 13. The branch-conductors 16 also contain resistances 19 for cutting down the trolley current to a safe point for operating the bells 17.

In the operation of this system the double-throw switch 18 at one end of the train, which may be considered the forward end, is put to trolley and the corresponding switch 18 at the opposite end of the train is put to ground, while all the intermediate switches 18 are open or neutral. Then when the switches 15 at all the guards' positions have been closed a circuit will be complete from the trolley conductor 10 through the resistance 19, switch 18 and bell 17 at the forward end of the train, and thence through the wires 13, switches 15 and couplings 14 to the rear end of the train, and through the bell 17 and switch 18 at that end to the ground connection 12. The bells 17 at the front and rear ends of the train will therefore ring and the motorman will receive his signal by hearing the forward bell. One of the pair of switches 15 is closed and held closed by each guard as soon as the passengers are aboard through his doors and the doors closed, and the signal is instantly given by the last guard who closes his switch. As soon as the train starts the guards may open their switches 15 and the signal will cease to operate. I am aware of devices which could be used in connection with my invention whereby the motorman has control over the guards' switches but I prefer the simpler plan herein described.

It will be noted that the open-circuiting of the intermediate switches 18 also effects that of the intermediate signals 17 without requiring the use of auxiliary devices, since the signals are in the branch-conductors 16, and therefore the intermediate signals are not actuated but only the two signals at the two ends of the train. When the motorman changes ends to run the trains in an opposite direction, no switches have to be thrown.

The addition or subtraction of cars does not appreciably vary the amount of resistance in circuit, since the intermediate bells are cut out and the resistances 19 are of very large value in comparison to the resistance of the rest of the active circuit. In the arrangement shown in Figs. 1 and 4 there is only one resistance 19, located between the trolley and the rest of the signaling circuit, in circuit at any time, and the potential of the bells, switches and other exposed parts in the active portion of the circuit is therefore practically the potential of the ground, whereby I avoid shock to persons accidentally coming in contact with these parts when there is any leakage of current. A non-inductive resistance suitable for use in this connection to cut down the heavy trolley current of 600 volts or thereabouts is described in my Patent No. 874,023. For the signals, while I may use various kinds, and other than audible signals, a bell or buzzer is preferred and such bell may be of the specially-wound and insulated construction described in my Patent No. 874,024.

Instead of a bell containing its own interrupter, an interrupter operated by a separate magnet may be employed and Fig. 5 shows such an interrupter 20 in series with a bell 17′ having no interrupter. The latter may be used alone for alternating currents. In Fig. 2 the interrupters 20 are shown between the switches 18 and the resistances 19 so that one interrupter operates the two bells at opposite ends of the train.

Fig. 3 shows an arrangement similar in principle to Fig. 1 except that resistances 19′ are located between the switches 18 and the bells 17 and the amount of each resistance is only half that of the resistance 19 in Fig. 1. The current passes through one of these resistances 19′ at each end of the train so that the total resistance is the same as in Fig. 1

but this arrangement, while feasible, is not so desirable as the arrangement in Fig. 1 where the resistance is located between the switch 18 and the trolley 11 because in Fig. 3 the potential of the forward switch 18 is the potential of the trolley, and the potential of those parts of the circuit between the two active resistances 19′ is intermediate between the potential of the trolley and that of the ground, making it more difficult to guard against shocks.

Fig. 4 illustrates substantially the same system of signal bells 17 and other circuit arrangements as is shown in Fig. 1, but with the starting signal system I have here combined devices whereby an independent signal may be given to the motorman from any position on the train, as for an emergency. At each end of each car an additional bell 21 is mounted in parallel with the bell 17 and the guard has an additional switch 22. In place of the switches 18 I have shown double-pole, double-throw switches 18′. Two additional conductors 23, 24 are employed, running through the length of the train, and branch-wires 25, 26 running from these to the lower points of the switches 18′, the switches 22 being in circuit across the wires 25, 26. The switch 18′ at the forward end of the train is put to trolley and the one at the rear end is put to ground as shown, while all the intermediate switches 18′ are left open or neutral. Then to give a signal with the bells 21 any guard closes his switch 22 and the current goes from the trolley conductor 10 through the upper bar of the forward switch 18′ and through the forward resistance 19, bell 21, lower bar of switch 18′ and wire 25 to the longitudinal wire 23, then to the rear of the train by way of the particular switch 22 which has been closed and the wire 24 and at the rear end by way of wire 26, lower bar of switch 18′, bell 21 and resistance 19 to the ground 12. In series with each of the switches 22 I may use a signal 27 such as a buzzer so that the guard may know that his signal has been transmitted to the motorman, and these buzzers are preferably without circuit interrupters and operated by the bells 21 as indicated in Fig. 6, said bells being interrupter bells, or by a separate interrupter as in Fig. 5.

I claim:—

1. A guards-signal system for multiple-unit trains comprising in combination with the external conductors a number of like car-units adapted to be assembled in a series train circuit and including a longitudinal conductor section on each unit, branch connections from said longitudinal conductor section on each unit having means for connecting the circuit to the external conductors and for opening the intermediate branches while the circuit remains so connected at its ends, and signals in said branch connections.

2. A guards-signal system for multiple-unit trains comprising in combination with the trolley and ground conductors a number of like car-units adapted to be assembled in a series train-circuit, branch connections on each car having double-throw switches adapted to make either the trolley-connection or the ground connection, signals in said branch connections open-circuited by the opening of said switches, and guards' switches in series adapted to collectively close the circuit.

3. A car-unit for combination with others in a multiple-unit train, comprising in combination with the trolley and ground conductors a longitudinal conductor having couplings at each end, guards' switches in series at each end, a branch conductor at each end having a double-throw switch adapted to make either the trolley connection or the ground connection, and a signal in each branch conductor between the double-throw switch and the longitudinal conductor.

4. A guards-signal system for multiple-unit trains comprising a number of car-units having longitudinal conductors forming a series train circuit and overlapped at the guards' positions between adjacent car-ends, and a pair of switches in parallel between the overlapped conductors at each guard's position, either of which closes the same circuit at that position.

5. A guards-signal system for multiple-unit trains comprising a number of car-units adapted to form a series train circuit, guards' switches adapted to collectively close said circuit, branch connections on each unit containing electro-magnetic signals and having means for forming either the trolley connection or the ground connection, and protective resistances on each unit adapted to be open-circuited by said means.

6. A car unit adapted to be assembled with others to form a series train-signal system and comprising a longitudinal conductor, a trolley, a ground connection, a branch conductor containing a signal and having a double-throw switch adapted to make either the trolley connection or the ground connection, a protective resistance between said switch and trolley, and guards' switches in the longitudinal conductor.

7. A guards-signal system for multiple-unit trains comprising a number of car-units forming a series train-circuit, signals and protective resistances adapted to be included in said circuit, guards' switches in series adapted to collectively close said circuit, and an auxiliary signaling train circuit employing the same resistances and having guards' switches in parallel for individually closing it.

8. A guards-signal system for multiple-unit trains comprising a number of car-units forming a series train-circuit, guards'

switches in series adapted to collectively close said circuit, signals adapted to be included in said circuit, an auxiliary series train-circuit containing guards' switches in parallel and signals, and double throw double-pole switches on each unit adapted to make either the trolley connection or the ground connection for both of said circuits.

9. A guards-signal system for multiple-unit trains comprising a number of car-units forming a series train-circuit, a trolley and a ground connection on each unit, branch connections on each unit containing electro-magnetic vibrator signals, switches in said branch connections adapted to make either the trolley connection or the ground connection and to open-circuit the intermediate signals when open, and magnetic interrupters between the trolley and switch on each car whereby one interrupter operates the signals at both ends of the train.

10. A signaling system for multiple-unit trains, comprising a number of car-units capable of being connected into a continuous train line and having series circuit-closing switches, a branch from said train line on each car in which is placed a signal and a non-inductive resistance, and a three-point switch by which the branch is connected to the trolley or to the ground, or open-circuited.

11. A signaling circuit for multiple-unit trains comprising on each car a train line section of low resistance, with connecting devices between cars, a branch from said train line including a resistance unit of high resistance and an electro-magnetic signal of high resistance, and a switch for connecting said branch to the trolley, or to the ground, or open-circuiting it, so as to maintain a practically uniform resistance of the circuit regardless of the number of cars in the train.

12. A signaling circuit for multiple-unit trains comprising at one end of the train a three-point switch connected to the trolley, a resisting unit of high resistance, a high resistance bell and low resistance train line made up of sections, switching devices arranged in pairs in multiple so that by closing one of each pair of switches said sections may be made into one continuous train line, and at the opposite end of the train a branch circuit containing a high resistance bell and a three-point switch connecting to ground.

13. In an individual call system for electrically propelled trains, a circuit including a resistance element of high resistance whereby signals may be operated from the propelling circuit, one or more signals distant from the guard's position between the ends of the train, and a switch with a vibrator in series with it at the guard's position whereby an audible indication is given to the person sending the signal.

14. In a train-signaling system, the combination with the external conductors, of a train line, a plurality of electro-magnetic vibrating signals in said line adapted to be operated by an intermittent current, a plurality of separate electro-magnetic interrupters operating in series with said signals, and means for connecting the train-line to the external conductors and for connecting any of said interrupters with more than one of the signals.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses, the 23rd day of April 1908.

JAMES F. McELROY.

Witnesses:
BEULAH CARLE,
ERNEST D. JANSEN.