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W. LINTERN.

CAR SIGNAL SYSTEM.

APPLICATION FILED NOV. 28, 1904.

Fig. I.

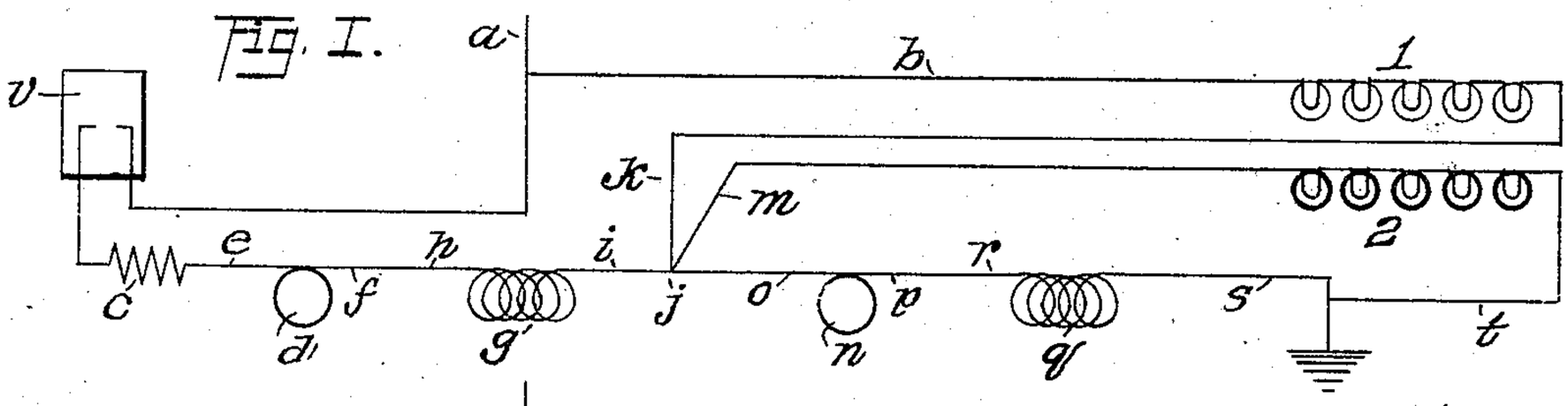


Fig. II.

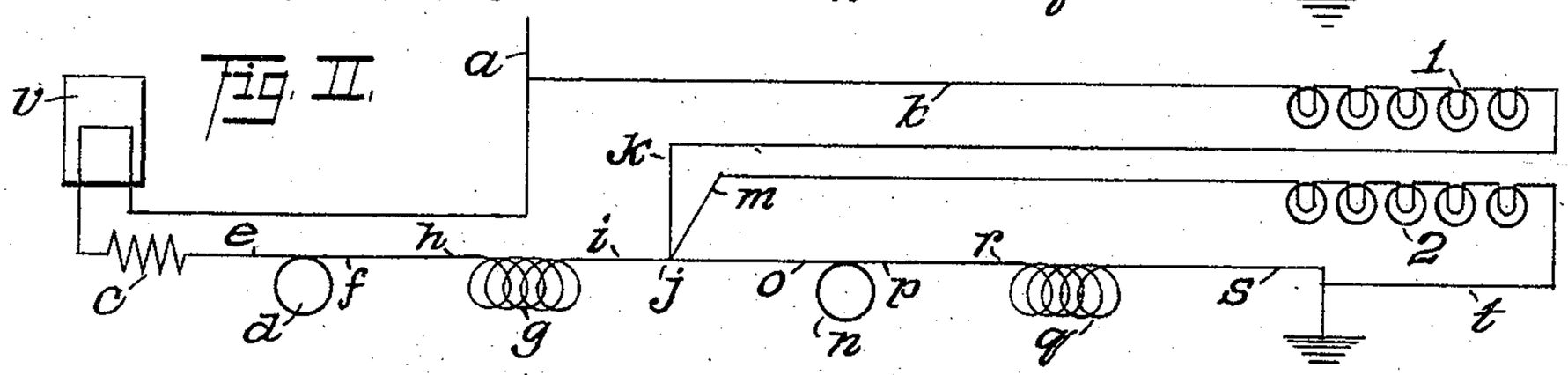


Fig. III.

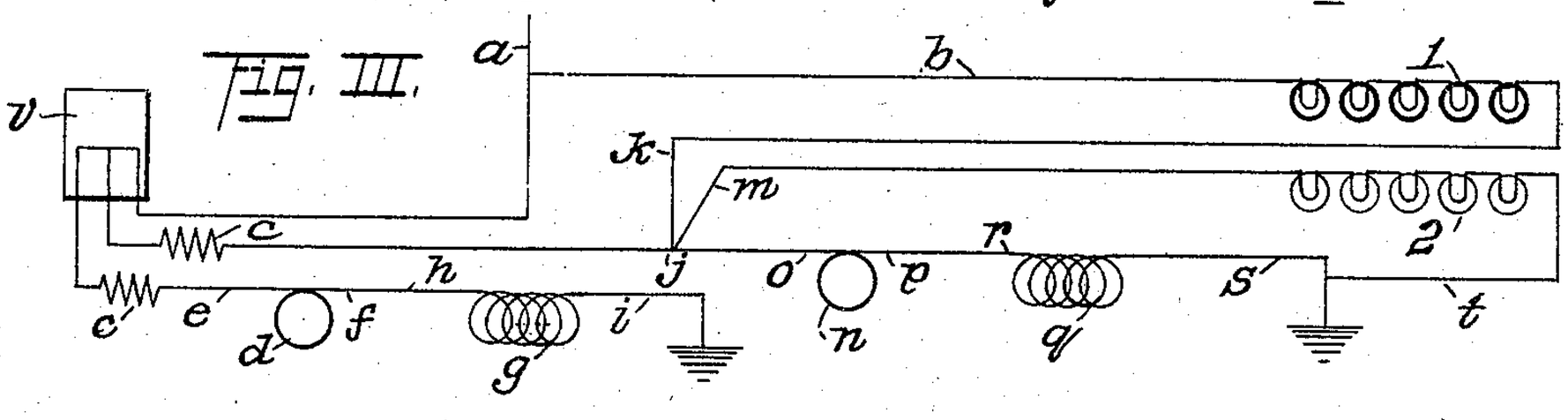


Fig. IV

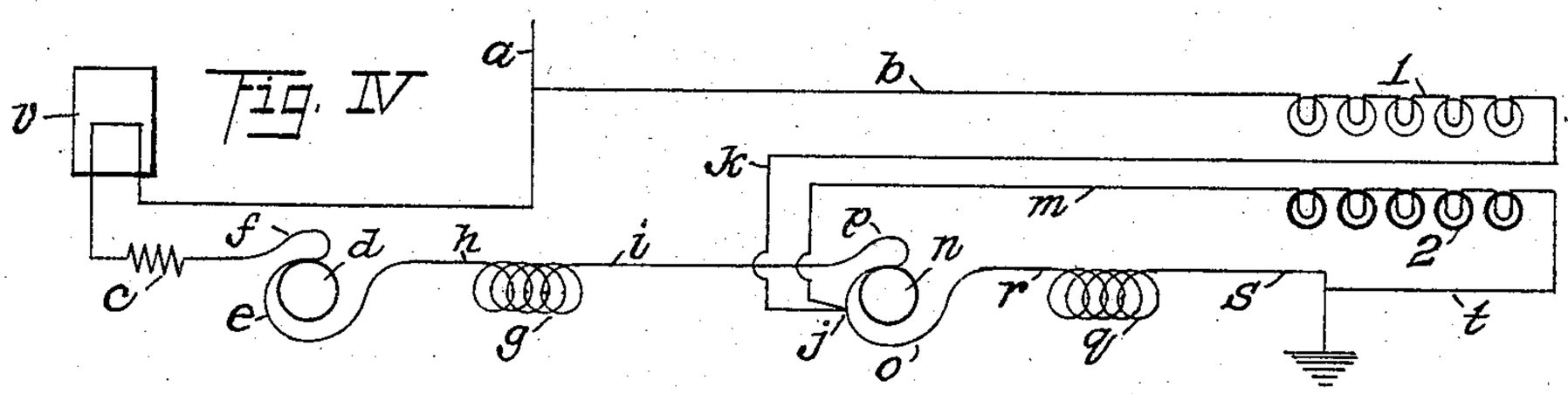
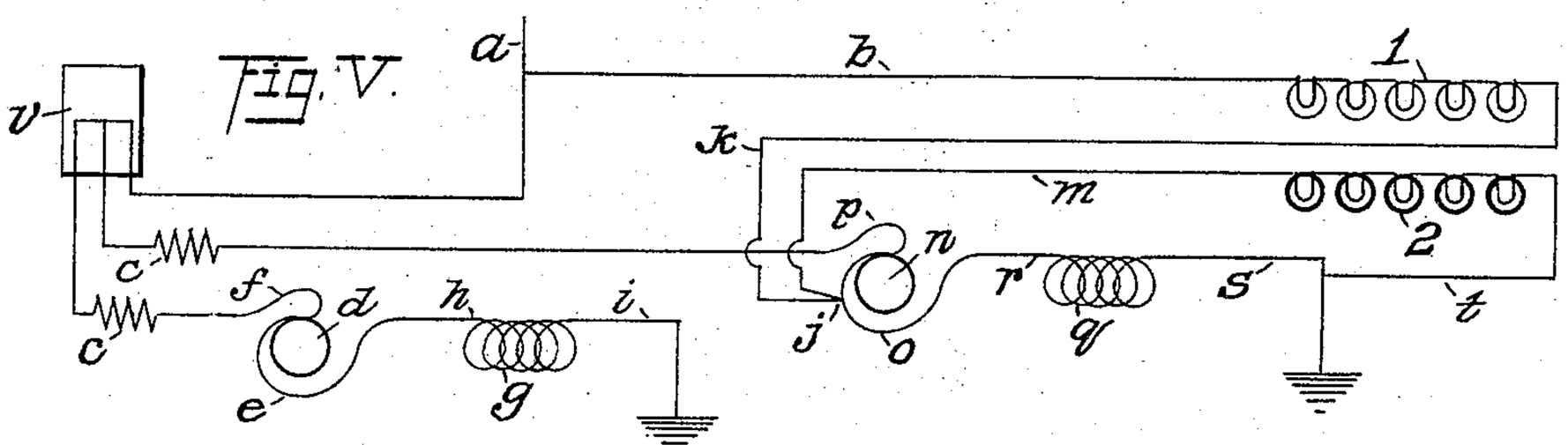


Fig. V.



Witnesses,
Elsie M. Hopper.
Jno. J. Sullivan

Inventor,
William Lintern,
By Luther G. Hopper,
Attorney.

No. 782,455. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM LINTERN, OF WEST PARK, OHIO.

CAR-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 782,455, dated February 14, 1905.

Application filed November 28, 1904. Serial No. 234,475.

To all whom it may concern:

Be it known that I, WILLIAM LINTERN, a citizen of the United States, residing at West Park, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Car-Signal Systems, of which the following is a specification.

This invention relates to signals upon motor-cars and trains indicating to interested parties the conditions governing the movement of such cars or trains.

The object of my present invention is to produce an arrangement of electric circuits for automatically operating signals upon motor cars and vehicles and upon trains, said signals being made, preferably, by differently-colored electric lights and operated by the ordinary electric power-controller without the introduction of additional mechanism.

The invention consists in the introduction, in the motor-circuits of an electric car or train, of permanent connections to electric signals, said connections being made at such points in said motor-circuits as to take advantage of the rises and falls of potential occurring therein, according to the position of the power-controller.

I have illustrated diagrammatically the motor and signal circuits in the different combinations effected by a power-controller in the drawings accompanying this specification, in which—

Figure I represents the motor and signal circuits when the motor-circuits are open, or, in other words, when the electric current is shut off from the motors. Fig. II represents the said circuits when the controller is set to operate the motors in series positions. Fig. III shows the said circuits when the motors are operated in multiple or parallel positions. Fig. IV represents the condition of the said circuits when the direction of movement of the motors is reversed and operated in series. Fig. V represents the said circuits when the motors are reversed and operated in multiple.

In my present system I prefer to employ an electric circuit of approximately five hundred volts, such being the voltage ordinarily supplied to electric-railway cars. It is obvious, however, that the signaling can be accomplished at different voltages by modifying the resistances of the signal-circuits or by introducing suitable transforming apparatus.

The reference-numeral 1 indicates a group of incandescent lamps producing a color effect, which is preferably red, and 2 indicates another group of lamps, which are preferably green. Each of said groups represents a resistance approximating one thousand ohms, and it is therefore apparent that other suitable resistance devices may be substituted in the circuits for some of said lamps in either or both groups when so many lamps as shown are not required.

a is a conducting-wire leading directly from the trolley or line-contact, and *b* is the positive connection therefrom of group 1 of signal-lamps.

v indicates a series-parallel controller of the usual type, the multifarious contacts of which and conductors leading therefrom not being shown, since they are well understood by those skilled in the art. However, the principal changes in the circuits corresponding to the different positions of said controller are indicated in the figures.

c represents the rheostat in the motor-circuits of the car.

d is the armature, and *g* represents the field-coils, of the first or No. 1 motor.

n is the armature, and *q* represents the field-coils, of the second or No. 2 motor of the car.

e is the positive and *f* is the negative connection to the armature *d*.

h is the positive and *i* is the negative connection to the field-coils *g*.

o is the positive and *p* is the negative connection to the armature *n*.

r is the positive connection to the field-coils *q*, and *s* is the negative wire leading to the ground from said coils.

j represents a point or points where both the negative wire *k* from the signal group 1 and the positive wire *m* to the signal group 2 are connected to the positive wire *o* of the armature of motor No. 2.

t represents the negative wire leading from the signal group 2 to the ground-wire *s*.

The voltage at *a* is approximately five hundred at all times during contact with the power-line. When power is shut off from the

motors, as in Fig. I, the point *j* is at ground-potential, and the path of the current will be through signal group 1, wire *k*, and motor No. 2 to the ground-wire *s*, because the resistance of signal group 2 is much greater than that of the windings of motor No. 2. The result is that the red signal-lamps of group 1 glow brightly, while the green signal-lamps of group 2 do not light at all. This indicates to the operator of a following or approaching car or other interested parties that power is shut off from the motors and may be designated a "danger-signal."

When the reverse-switch is at "off" position in the common style of controller, the circuit to ground through motor No. 2 is open at the reverse-switch. Consequently the path of the current is through both signal groups, resulting in the signal-lights showing at one-half of their full lighting power, which can be construed as a danger or caution signal. Upon applying power to the motors the difference of potential decreases between the positive wire *e* of motor No. 1 and the positive wire *o* of motor No. 2, and it is only partly affected by the increase or decrease of current-flow in the motor-circuit, being more directly governed by the counter electromotive force developed by the motors. Thus when the position in the series combination (see Fig. II) is reached where there is no rheostatic resistance in the motor-circuit and the maximum speed is attained the difference of potential between the points *j* and *a* is approximately two hundred and fifty volts, and it is the same between the points *j* and *s*. Then it is obvious that the current-flow through the signal groups 1 and 2 will depend upon their respective or combined resistances. The result will be a partial lighting of the signal-lamps of both groups. That of group 2 will begin almost at the moment of applying the power and increase as the power is increased until the position above mentioned of maximum power and speed is reached, while that of group 1 will decrease in lighting effect

With some methods of control of power to the motors a flicker of the signal-lamps will occur when the controller is shifted from the series to the transition position, but the multiple or parallel position being reached the conditions then existing (see Fig. III) are approximately five hundred volts at *a*, and *j* being connected with *a* through the wire *o* and the controller connections there is no difference of potential between said points. Therefore the current does not flow through signal group 1; but the flow through group 2 approximates full power, because the approximate difference of potential existing between *j* and *s* is five hundred volts. The result of this position is that the lamps of group 2 glow brightly, while the lamps of group 1 are dark, thereby indicating "safety" to those interested.

When the controller *v* is operated to run the motors of the car in the reverse or backward direction, it is evident to those familar with controller connections that the wires of the motor-armatures which were positive are through changes of connections in the controller made negative wires and the negative wires of said armatures are made positive wires. Thus the wires *e* and *o* become negative wires and the wires *f* and *p* become positive wires in Figs. IV and V, which figures show the connections as they appear with the said motors reversed. Then as the wires *k* and *m* are connected to the wire *o* at the point *j* the circuit of signal group 1 is completed through the field-coils *q*, and as there is at no time a great difference of potential existing between *r* and *s* the lamps in group 1 are fully lighted and the lamps in group 2 are out. This condition exists in all the reversed controller combinations, either in the series or multiple positions, giving always the danger-signal when the vehicle is backing up.

It is obvious that the arrangement of the signals and the disposition of them relating to the positions which they may occupy on the cars, vehicles, or trains can be such as to cover several functions at the same time, and so while my diagrams show their use as rear-end signals they can, for example, be also used as signals to cars, trains, or vehicles approaching in an opposite direction. When cars or trains are arranged to be operated from either end, either a duplication of circuits or suitable switches in circuits such as herein described may be employed to produce the desired signals. It will also be observed that this system may be employed in connection with any method of control operating any number of motors in series or in multiple, provided the connections are made as indicated herein, so as to take advantage of the varying potentials occurring within the motor-circuits.

Having thus described my invention and what I now consider the best mode of its application, so that those skilled in the art to which it appertains can make and use it either in the form shown herein or under some modification thereof, what I claim as new, and desire to secure by Letters Patent, is—

1. In a car-signal system, the combination of motor-circuits, signal devices, and electrical conductors so connected as to affect the operation of said signal devices by reason of the differences of potential occurring at the points of connection of said conductors to said motor-circuits, substantially as set forth.

2. In a car-signal system, the combination with electric motor-circuits operated by a suitable controller, of a signal device, and electrical conductors connected to said motor-circuits and said signal device so as to affect the operation of said signal device because of

the varying differences of potential occurring through the manipulation of said controller at the points of connection of said conductors to said motor-circuits, substantially as set forth.

3. In a car-signal system, the combination with electric motor-circuits operated by a suitable controller, of two sets of signal devices, and electrical conductors connecting said motor-circuits to said signal devices so as to operate one or the other or both of said signal devices according to the position of said controller, substantially as set forth.

4. In a car-signal system, the combination with a plurality of electric motor-circuits, of a signal device, a conductor leading from the positive end of said motor-circuits to said signal device, and a conductor leading from the negative end of said signal device to the normally positive end of one of the said motor-circuits other than the first, substantially as set forth.

5. In a car-signal system, the combination with a plurality of motor-circuits, of two sets of signal devices, electrical conductors connecting one set of said devices between the positive end of said motor-circuits and the normally positive end of one of the said motor-circuits other than the first, and electrical conductors connecting the other set of said devices between the normally positive and the negative ends of one of said motor-circuits other than the first, substantially as set forth.

6. In a car-signal system, the combination with electric motor-circuits and a suitable controller therefor, of a plurality of signal-lamps adapted to produce differing light effects, and electrical conductors connecting said motor-circuits to said signal-lamps so as to cause either or all of said lamps to glow according to the position of said controller, substantially as set forth.

In testimony whereof I affix my signature, in the presence of two subscribing witnesses, at Cleveland, Ohio, this 23d day of November, 1904.

WILLIAM LINTERN.

Witnesses:
C. R. MINOR,
JNO. T. SULLIVAN.