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J. W. FROST.

ELECTRIC SIGNAL FOR RAILWAY CABS.

(Application filed Jan. 25, 1902.)

(No Model.)

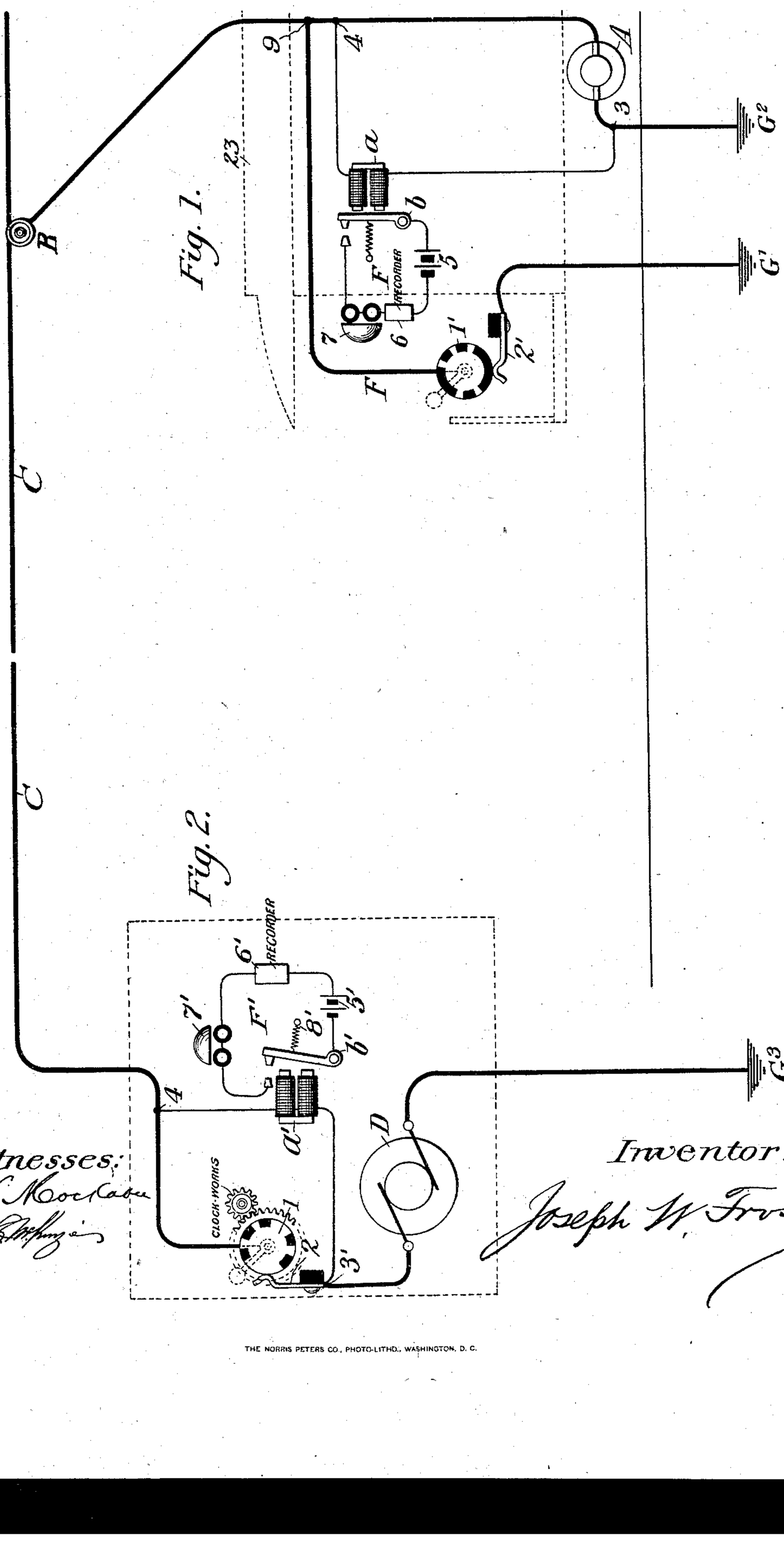

Fig. 1.

Fig. 2.

Witnesses:
D. L. Moorhouse
[illegible]

Inventor:
Joseph W. Frost

UNITED STATES PATENT OFFICE.

JOSEPH W. FROST, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC SIGNAL FOR RAILWAY-CABS.

SPECIFICATION forming part of Letters Patent No. 705,662, dated July 29, 1902.

Application filed January 25, 1902. Serial No. 91,182. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. FROST, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Electric Signals for Railway-Cabs, of which the following is a specification, reference being had therein to the accompanying drawings.

It is well known and generally conceded by those versed in the art that the method of signaling between stations and moving railway-trains or between two moving trains, known as the "induction" method, is for obvious reasons delicate, expensive, unreliable, and not altogether practical, so much so, indeed, that it is used, if at all, only to a very limited extent and where the conditions for its successful operation are exceptionally favorable. It is also a fact that another well-known method of establishing electrical connection between a moving and stationary object or between two moving ones involving the construction and maintenance of a properly-insulated and separate wire along the line of the road and traveling contacts for establishing the connection to same is too expensive to be practicable, these statements referring to railway-carriages propelled by steam or other than by electrical power. Moreover, the speed of carriages propelled in such other manner being comparatively limited there is not nearly as much necessity for train-signaling as in the case of electrically-propelled carriages, the attainable speed of which is practically unlimited and the danger of accidents to which is proportionately great.

The object of my invention is to provide a cheap, simple, and practicable method of signaling between electrically-propelled vehicles employing the ordinary stationary current-conductor and traveling contact or between such traveling vehicles and stations along the route, and it applies particularly to the transmission of danger or other signals calculated to promote safety, although, as will be made plain, it may be applied to the transmission of all classes of signals or to general telegraphic communication.

The invention consists, broadly, in the utilization of the regular stationary conductor and the traveling trolley-wheel (or contact used to establish electrical connection between the car-motor and the stationary generator) as part of the signaling-circuit and in the combination of same with shunt circuits and connections, as well as with transmitting and receiving apparatus, to be hereinafter more fully described.

In the accompanying drawings, Figure 1 shows the apparatus and connections necessary to be employed at the car or other vehicle, and Fig. 2 shows the circuit connections and apparatus employed at the station or other point along the line of the road.

Referring more particularly to Fig. 1, A is a car-motor, which is of the ordinary type, connected to and receiving its current from the stationary generator D, (shown in Fig. 2,) as follows: from ground at G^3 through dynamo or generator D, contact-spring 2, transmitting-wheel 1 to the line C, and from thence to the traveling contact or trolley-wheel B, through the motor to ground at G^2. At the car-station a shunt-circuit, which includes a signaling or receiving magnet or other translating device, is made around the motor A, as follows: beginning at connection 3, to and through the coils of the magnet *a* to connection 4 on the other side of the motor. The coils of this magnet are wound to (or the translating device is of) an extremely high resistance as compared to that of the motor, so that a comparatively small part of the current flows through the same—enough, however, to energize the magnet, so as to operate its armature *b* when the current passes through the line, this armature being normally attracted to the coils of the same and operating by means of its contact-points the local signal-circuit F, included in which is the battery 5, the recording-register 6, and the signal-bell 7 in a well-known manner. This local circuit could be dispensed with and the bell and register operated directly by the magnet *a*.

For the station at Fig. 2 is provided a circuit-controlling device or what is commonly known as a "manual signal-transmitter," consisting of a notched wheel suitably geared to a clockwork and a contact-spring 2 normally in contact with same. The transmitting-wheel 1 is adapted to be revolved by the clock mechanism in the same manner as is the ordinary district call-box. Around this break-wheel is established a shunt-circuit similar to the

one around the motor A, Fig. 1, and similarly including a high-resistance signaling-magnet A′ and the local receiving-circuit F′, as follows: from contact 3′ on one side of the transmitting mechanism through coils of magnet A′ to connection 4′ on the other side of the transmitting-wheel. This shunt serves three distinct purposes, viz: It prevents an absolute break in the line when the transmitter is operated, and thus provides against sparking between the contact-spring 2 and the wheel 1; it receives the return-signals from the cab-station at Fig. 1, as more fully described hereinafter, and it also confirms to the operator the signals transmitted from the ground-station.

As the most important signals to be transmitted are those from the ground-station to the car, I will first explain the operation of the apparatus thus far described and necessary for that purpose, it being borne in mind where this particular form of signaling mechanism is employed that each train upon the line is numbered and that certain arbitrary and predetermined signals are employed to indicate different information.

If it is desired, for instance, to notify train No. 23 that there is danger ahead and to come to a full stop, a wheel 1, notched so as to transmit such a signal to 23, is placed on the shaft of the transmitter-clockwork, the mechanism is set in motion and the signal is transmitted to the train 23 and received by the bell 7 and register 6, the magnet-coils *a* responding to each break or change in the circuit made by the operation of the wheel 1 and contact 2. This signal may be repeated any number of times to give other information or orders, or the well-known service-indicating mechanism of a multiple district call-box may be employed. In transmitting information from the ground-station to the moving station the signal will be confirmed at the sending-station by means of the relay magnet-coils *a*, battery 5′, register 6′, and bell 7′, included in local circuit F′, already described. The armature *b* of the relay A′ is normally held away from its magnet by means of the coiled spring 8′. When, however, the transmitting-wheel 1 is made to revolve, as described, and the main circuit is broken, the current flows through the relay shunt-circuit and energizes the magnet which by means of the attraction of its armature operates the local circuit F′.

In order that an answer may be sent from the moving station or other information transmitted from it to the ground-station, I provide a transmitter practically similar in its mechanism to the transmitter at the ground-station, except that the contact-spring 2′ normally rests upon an insulated portion of the wheel 1′, the uninsulated signal-notches of which wheel correspond to the insulated portion of the wheel 1 of Fig. 2. This transmitting-wheel and its contact 2′ is included in the normally open shunt-circuit F, one end of which is connected to the line between the generator and the car-motor at 9 and the other to the ground at G′. When the contact-spring 2′ touches the uninsulated parts of the wheel, this shunt-circuit is completed, and because of the cutting out of the resistance of the motor A and the consequent increase of current in the line the magnet *a*′ of Fig. 2 is energized so as to operate the local circuit F′, as before described. This signal is also confirmed at the sending (car) station by means of the relay *a* and its local circuit, the relay being operated by the alternate cutting on and off of the current by the transmitting-wheel 1′.

I wish it to be understood that I do not confine myself to the use of the particular form of transmitting or receiving devices here shown, the gist of my invention being to provide simple and efficient means of communicating or signaling over a trolley line or wire carrying a very high current and utilized for other purposes requiring such high current to and from moving trains of cars or from one point along said line or wire to another by means of comparatively high-resistance shunts including receiving and translating devices, and particularly of a high-resistance shunt or shunts around the cab-motor including said devices, (whether visual or audible, or both,) in connection with duplicate devices at another station on the line. For instance, an electric light might be substituted for the magnets *a* and A for receiving the distinctive signals to be transmitted from another station or a regular Morse telegraph-key might be used as a transmitter instead of the circuit-controlling wheel here shown.

Where the circuit-controlling devices shown at the ground-station could not be for obvious reasons utilized at a moving station, yet where it was desired to communicate between moving stations the devices for receiving and transmitting here shown could be operated in connection with duplicate apparatus at another cab on the line. Similarly if it was desired to communicate between two or more ground-stations the apparatus shown as at the ground-station could be duplicated at the other stations. The magnet A at the ground-station could be included in series with the transmitting-wheel 1, (as an absolute break or many of them, such as would be caused by a rapidly-transmitted signal, would in no manner interfere with the practical operation of the cab-motor,) though I prefer the device shown. I have found that the very-high-resistance secondary circuit of a telephonic induction-coil with the receiver can be substituted for or used in connection with the devices here shown and be used for general signaling or communicating purposes.

The receiving device could be of very low resistance, so much so as to not materially interfere with the electromotive force going through the motor and yet enough to operate a magnet-coil of low resistance (wound with

coarse wire) in the motor branch without departing from the spirit of the invention, or another contact traveler could be added in which the receiving device might be put, the gist of the invention being the utilization of the trolley-wire to transmit and receive definite signals, notwithstanding the heavy current necessary on such lines and the presence of the dynamo and motor.

What I claim is—

1. In an electric cab-signaling device the combination of the stationary generator D, the line C, contact traveler B, and motor A, with a signaling-magnet included in a shunt around the said motor and a transmitting device at a distant station included in the circuit of the generator substantially as described.

2. In an electric signaling device the combination of a stationary generator D, the line C carrying a current from the said generator, a contact traveler, and a cab-motor receiving its current from the line through the said contact traveler, with a comparatively high-resistance receiving device included in a shunt around the said motor, all at one station, and a transmitting device at another station on the line of the said conductor and connected with the same, substantially as described.

3. In an electric cab-signaling device the combination of the stationary generator D, the line C, contact traveler B, and motor A, with a relay-magnet of high resistance included in a shunt around the said motor, said relay controlling a local circuit, and a definite and distinctive signal-transmitting device at a distant station controlling the circuit of the generator, substantially as described.

4. In an electric cab-signaling device the combination of the stationary generator D, the line C, contact traveler B, and motor A, with a receiving device included in a shunt around the said motor, a transmitting device, also in a shunt around the said motor, and duplicate apparatus at a second station, substantially as described.

5. In an electric signaling device the combination of a stationary generator D, line C, contact traveler B and motor A, with a receiving-magnet of comparatively high resistance included in a shunt around the said motor, a definite signal-transmitting device, also included in a shunt around the motor, at one moving station, and a definite signal-transmitting device at a ground-station controlling the circuit of the line C, together with a shunt around the said transmitting device, including a receiving-magnet, substantially as described.

6. In an electric signal device, the combination of a stationary generator D, the line C carrying a current from the said generator, a contact traveler, and a cab-motor receiving its current from the line through the said contact traveler, with a comparatively high resistance receiving-magnet included in a shunt around the said motor, all at one station, and a transmitting device at another station on the line of the said conductor and connected with the same, substantially as described.

7. In an electric cab-signaling device, the combination of the stationary generator D, the line C, contact traveler B and motor A, with a signal-receiving device between the said contact traveler and the ground or common return, and a distinct signal-transmitting device at another station controlling the said receiving device and connected to said line C, substantially as described.

8. The combination of the definite and distinctive transmitting device and the generator D, both at one station; the line C and the contact traveler B; together with the motor A and a definite and distinctive signal-transmitting device and a receiving device both in the motor branch between the said contact traveler and the common return, at a second station, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOSEPH W. FROST.

Witnesses:
CHAS. C. FROST,
WM. H. DE LACY.