2 Sheets--Sheet 1.

J. G. SMITH.

Railway Telegraphs.

No. 141,604. Patented August 5, 1873.

Fig. 1.

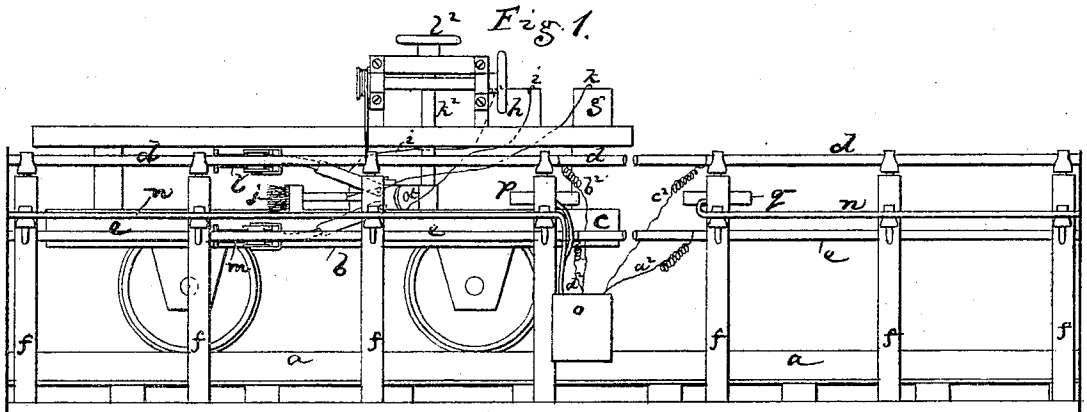


Fig. 2.

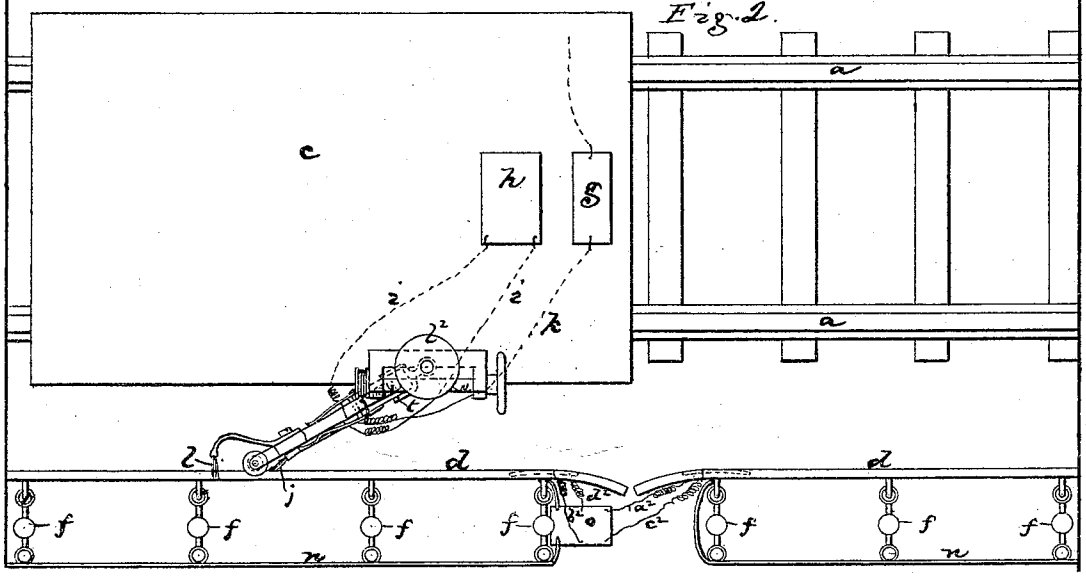
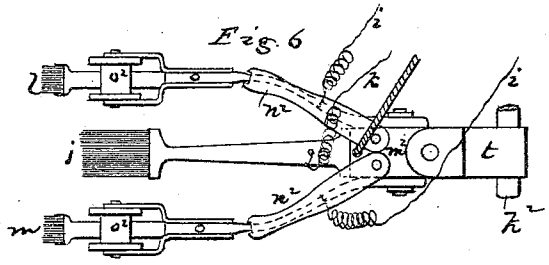


Fig. 6



WITNESSES

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Crosby & Gould

2 Sheets--Sheet 2.

J. G. SMITH.

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Fig. 3.

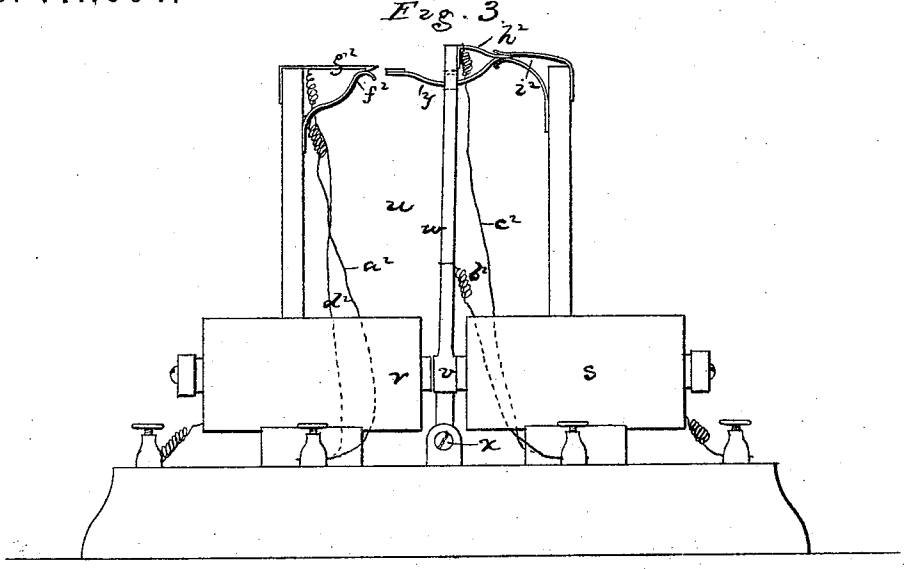


Fig. 4

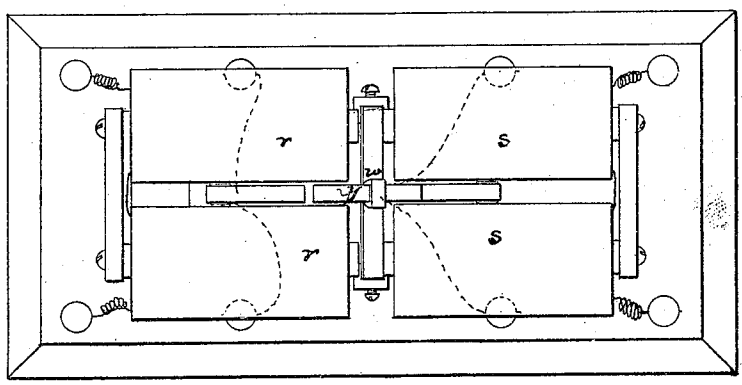
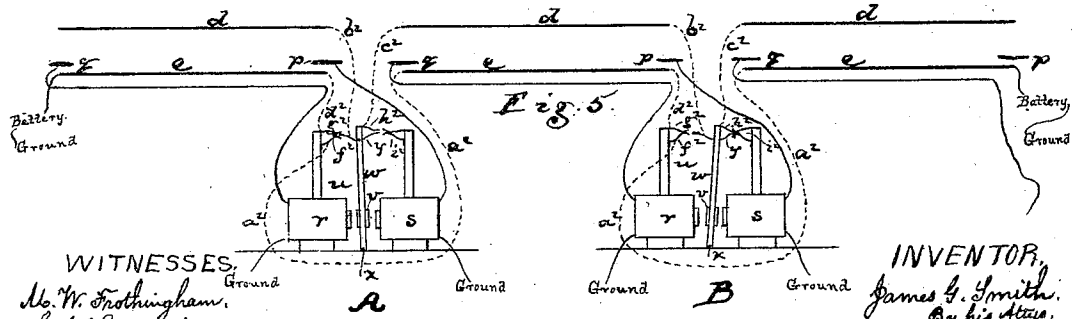


Fig. 5



WITNESSES.
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UNITED STATES PATENT OFFICE.

JAMES G. SMITH, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND JAMES W. BROWN, OF SAME PLACE.

IMPROVEMENT IN RAILWAY TELEGRAPHS.

Specification forming part of Letters Patent No. **141,604**, dated August 5, 1873; application filed March 28, 1873.

To all whom it may concern:

Be it known that I, JAMES G. SMITH, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improved Telegraph-System for Railways; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My invention relates to the construction of a system of railway-telegraph mechanism by which, upon lines of railway, all of the trains of a line may be kept in communication with the various stations of the line, and with each other, if desirable. For this purpose I construct a line with wires so arranged that either a constant or an intermittent current may be kept up between the wire and a projection from a running train or car, and upon each train I have a car containing a battery, a receiving and transmitting telegraph instrument, and a swinging or projecting device, by which a circuit or connection may be formed with the main line, or by which the instrument in the car may be brought into the main circuit. My invention consists, primarily, in the formation of a telegraphic line through the trains of a railway line and the stations upon said line, by means of a main circuit-line running through the stations and an instrument upon each train, and a projection connected with the instrument and held in contact with the main wires of the line as the train is moving.

The drawing represents a system embodying my invention, or a sufficient part of the system to enable the invention to be clearly understood.

Figure 1 shows a car or car-track and the telegraph posts and wires in elevation. Fig. 2 is a plan of the same. Fig. 3 shows in side elevation, and Fig. 4 in plan, an instrument through which the circuit is changed at proper times by the train.

a denotes the rails of the railway track; *b*, a railway truck; *c*, the floor of the car-body supported upon the truck. At the side of the track, or at any suitable location with respect thereto, I run the wire or wires of the main telegraph-line. With the specific arrangement shown in the drawing I use a line having two stout wires, *d e*, supported upon suitable posts *f*. The lower wire has a battery and ground connections at its opposite ends, but the upper wire is open at each end. Upon the car I place a local battery, *g*, and a Morse or other instrument, *h*, and to the side of the car I attach an arm having a metallic finger, which, by swinging the arm outward, is brought into connection with the main wire, which connection will be kept up by the moving car or as the car moves, this finger being connected with the instrument by the wire or wires *i*. For the two wires *d e* there are two fingers, *l m*, extending from the arm, the circuit being formed through the instrument and the respective wires *i*. The wires *d e* are not in themselves continuous, but are built in sections with a third and smaller wire, *n*, said wire *n* being erected upon the same posts *f*, and in sectional lengths corresponding to the lengths of the sections *d e*. The drawing shows the adjacent ends of two adjacent sections, all the sections communicating in the same way. At one end of each section the third wire *n* runs into a box, *o*, containing the circuit-changing instrument *u*, shown in Figs. 3 and 4, said instrument having connection also with a bar, *p*, the opposite end of this wire *n* being in direct connection with a bar, *q*, at the opposite end of the section. The bars *p q* are fixed in position between the wires *d e* at the opposite ends of the sections, and a third finger, *j*, projecting from the swinging arm *t*, comes into contact with each of these bars as it passes from section to section. When the car is between the ends of any section the finger *j* is not in contact with either wire, and the instrument in the car is in the circuit embraced by the main wires, being brought into such circuit by the action of the instrument *u* in the box *o* at the end of the section in which the car is running. This box incloses the mechanism shown at Figs. 3 and 4. In said mechanism are two magnets, *r s*, between which an armature, *v*, plays. This armature is fixed to a vertical arm, *w*, pivoted at *x*. At the top of this arm is a spring, *y*, extending in opposite directions from the arm.

When the armature is drawn to the magnet r, connection is made through the wires a^2 b^2, and when thrown in the opposite direction connection is made through the wires b^2 c^2 and a^2 d^2. Normally, the connection is between the wires b^2 c^2 and a^2 d^2, and direct through the main wires d d and e e, with which such wires b^2 c^2 and a^2 d^2 connect; but to bring the instrument of the car into the circuit this direct connection must be broken, and this is effected indirectly through the battery in the car, the section-wire n, and the instrument at the end of such section-wire; this being effected as follows: The mechanism of all the instruments of the line being in normal position, as shown in Figs. 3 and 4, the car approaches a section, and as the section-finger j strikes the bar q, at the entrance of said section, the battery-circuit, through the section-wire n of said section, is closed, and the armature of the box instrument u in said section is drawn over to the position shown in Fig. 5, at A. This changes the direction of the circuit from the car through the upper wire of the section to and through the lower wire of the section next in advance and throughout the balance of the line—or, in other words, brings the car instrument into the circuit—so that from the car throughout the line, and from any point of the line to the car, communication is established, this communication being kept up throughout the line by the change thus made through the section circuit-wires as the car passes from section to section. When the car passes the bar p, at the end of the section, the finger j strikes said bar, making a circuit from the battery on the car to and through the electro-magnet s to the ground, reversing the position of the armature, and bringing both the wires of that section again into the direct circuit through the wires b^2 c^2 and a^2 d^2. The connections from section to section through the line may be illustrated from the diagram at Fig. 5.

The two conducting-wires d e being constructed in sections of any required length, a battery is placed at each of the extreme ends of the lower wire, one pole of each battery being connected with the ground, the other with the wire, the upper wire being open or disconnected at both of the extreme ends. When a train is upon any section of the road, portions of both of these wires are used to form one complete and continuous circuit through the train and stations upon the road. These portions or sections are placed in position, and connected together in such manner as to form one direct and continuous circuit through the trains and stations, by means of the automatic circuit-changing instruments u, placed at the terminal ends of the different sections of which the line is composed, said instruments being inclosed in iron or other strong and suitable boxes near the line, as already described, the circuit-changer being composed of two electro-magnets, r s, between which the armature v plays, and this armature being fixed to a vertical arm pivoted at x, the spring y extending in opposite direction from the arm, as above described. When the armature is drawn toward the magnet r connection is made through the wires a^2 b^2, and when the armature is drawn in the opposite direction connection is made through the wires b^2 c^2 and d^2 a^2. The normal connection being between the wires b^2 c^2 and the wires d^2 a^2, the connection is thereby completed between the sectional ends of the two main wires, d e. The movement of this automatic circuit-changer u is produced by means of the connection of the changer with the third sectional wire, which is primarily connected with the short lateral bar q placed between the wires d e at the beginning of the section, and extending over the section to the electro-magnet r of the circuit-changer, and through this magnet to the ground, the end of the section where the circuit-changer is located having the similar bar p, from which a wire runs to the electro-magnet s, and through this magnet to the ground.

The swinging arm t attached to the side of the car having the three branches l m j, the upper branch l of which touches and moves along the upper wire d, the lower branch m of which touches and moves along the lower wire e, and the middle branch j of which touches only the short lateral bars at each end of each section, as before mentioned, when the car starts the middle branch at once touches the short lateral bar q, which is connected with the third sectional wire n running to the circuit-changer at the advanced end of the section, as before described, and the small battery upon the car, one pole of which is connected to the ground and the other to the said middle branch, at once throws a current through the third sectional wire, and the electro-magnet r of the circuit-changer draws the armature to the position shown at A. The change in the connection of the wires and consequent formation of the circuit created by this action of the circuit-changer then ensues, as follows: Starting from the battery at the primary end of the first section, a current follows the lower wire e to the arm t projecting from the car, through said arm t (it cannot follow the lower wire farther than this because that wire is broken at the termination of the section) to the instrument upon the car, through said instrument to the other arm projecting from the car, and, touching the upper wire, thence along said wire toward the advanced end of the section, (it cannot follow back upon the upper wire because that wire is open in that direction,) and thence, through the wire b^2, to the spring y upon the arm of the circuit-changer; thence, through the contact of said spring with the spring f^2, (it cannot proceed in the other direction as the spring y is open at the opposite end,) to the wire a^2, which is connected with the lower wire of the next section; thence along said wire to the next sectional circuit-changer, which, being in its normal condition, continues the direct connection

of the lower wire through the medium of the wires d^2 and a^2 and the springs f^2 and g^2, these springs being in contact, and so on, upon the lower wire and through the succeeding circuit-changers at the various sections, all of which are in their normal condition, unless other trains are on the track, to the battery and ground at the extreme end.

When the spring y is in connection with the spring f^2 it is insulated from spring g^2, (by an insulating material on top of the spring y,) and such contact separates the opposite end of the spring y from the spring h^2. The springs i^2 are simply catches to hold the springs y and h^2 when the armature moves over to the magnet s. The connections through the main line, or from wire d to wire d, and from wire e to wire e, are kept up through the wires a^2 d^2 and b^2 c^2, except at any section when a train is passing. The connections may, however, be variously made, and I do not confine myself to the arrangement of the respective wires or circuits as described, although—for the purpose of a complete system by which each train in motion becomes, with relation to the system, the equivalent of a local station on a common telegraph-line in connection with every other station—a system substantially like that described is necessary.

A signal mechanism may be used, in which the position of all trains shall be automatically signaled to the stations of the line, the passing of the car from section to section effecting the changing of the signals. Various other modifications may be employed. The swinging arm t is shown in side view at Fig. 6. The branches or fingers spring from the same arm, but each, of course, is insulated with respect to the others. This arm, for effecting connection between the car and the wires d e n, is preferably made to swing, and for this purpose it is shown as pivoted to a vertical shaft, k^2, at the top of which is a hand-wheel, l^2, and by means of this wheel the arm may be swung, more or less, outward, suitable mechanism being provided for locking it in position. Said arm may also have a joint, m^2, by means of which the fingers l j m may be raised or lowered and secured in proper position as to height. The fingers l m may extend directly from arms n^2 jointed to the piece m^2, so that the arms n^2 may contract or expand, as may be required by the position of the wires, suitable flanged guide-rolls c^2 being used to keep the fingers in position against the wires. These, however, are details of construction which may be more or less modified.

I claim—

1. A railway telegraph, substantially as described, or a telegraph system for railways, in which, by means of an arm projecting from a car of each moving (or stationary) train, and connected with a telegraph instrument upon said car, connection is or may be made between said instrument and the wire or wires of a line parallel with the railway, and with all of the trains upon the track.

2. A line having the sections of wires d e connected to transmit the electric current substantially as described, the wires being normally connected, and having their direct connections changed for connection with the instrument upon the train.

3. In combination with the wires d e, the third wire n, bars p q, and instruments u, arranged substantially as shown and described.

4. The battery g, finger j, wires n, and bars p q for effecting the change of the armature v, substantially as described.

5. The wires d e, fingers l m, instrument h, battery g, finger j, wires n, bars p q, instruments u, and their various connections, arranged and operating substantially as described.

6. In combination with a line formed in sections, an instrument connected with each section to change the circuit, substantially as or for the purpose described.

7. In combination with the instrument h and battery g, an arm, t, having extended from it the respective branches or fingers l m j, which fingers are insulated from each other, and are respectively connected with the instrument and battery, substantially as shown and described.

Executed this 13th day of March, A. D. 1873.

JAMES G. SMITH.

Witnesses:

FRANCIS GOULD,

M. W. FROTHINGHAM.