G. BLACK & A. M ROSEBRUGH.

Electric Telephony.

No. 212,433. Patented Feb. 18, 1879.

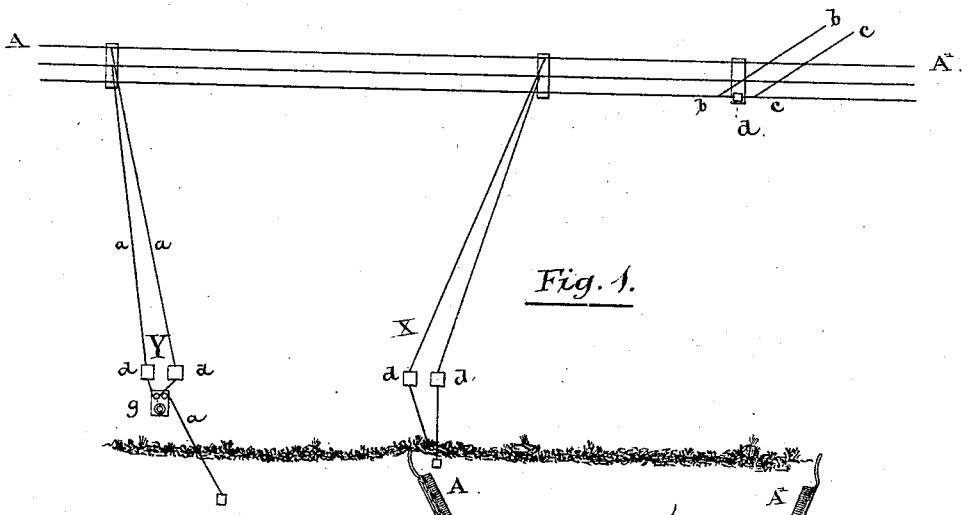

Fig. 1.

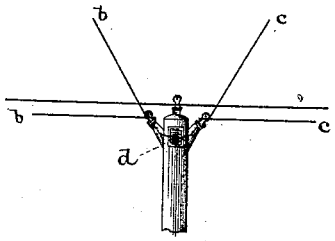

Fig 4.

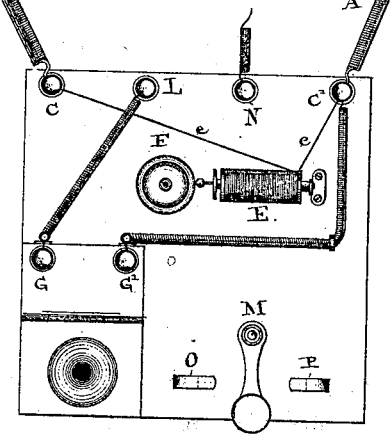

Fig. 2

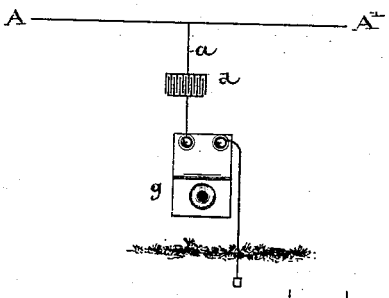

Fig. 5.

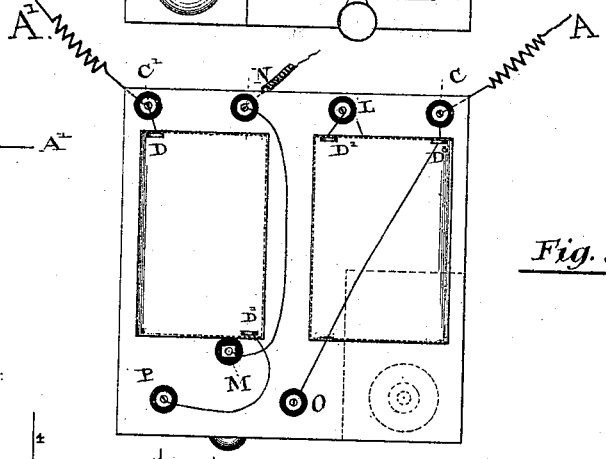

Fig. 3.

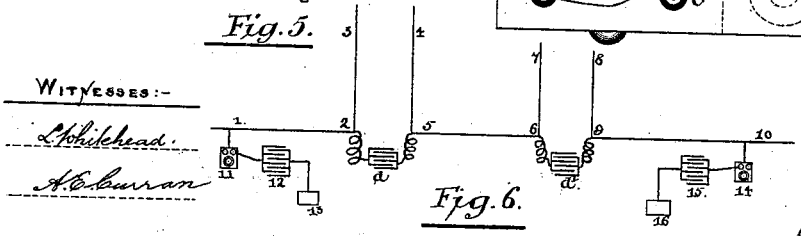

Fig. 6.

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UNITED STATES PATENT OFFICE.

GEORGE BLACK, OF HAMILTON, AND ABNER M ROSEBRUGH, OF TORONTO, ONTARIO, CANADA.

IMPROVEMENT IN ELECTRIC TELEPHONY.

Specification forming part of Letters Patent No. **212,433**, dated February 18, 1879; application filed June 4, 1878.

To all whom it may concern:

Be it known that we, GEORGE BLACK, of the city of Hamilton, in the county of Wentworth, in the Province of Ontario, Canada, and ABNER MULHOLLAND ROSEBRUGH, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, doctor of medicine, have jointly invented certain new and useful Improvements in the Art of and Apparatus Appertaining to Telephony; and we do hereby declare that the following is a full, clear, and exact description of the same.

This invention has relation, first, to improvements upon an invention for which application for patent has been made by the said A. M. Rosebrugh; and it consists in the substitution for the resistance medium described in said application of the apparatus commonly known and described in electrical works as a "condenser," the object being to enable a telephone or other secondary current apparatus to be connected with the wire of any galvanic circuit without interfering with the action of said galvanic current.

Our invention consists, secondly, in connecting two or any number of parallel wires of a telegraph-line by means of a condenser or condensers, and using them as a conductor for the purpose not only of diminishing the resistance of the line, but also for the purpose of diminishing the injurious effects of foreign induced currents.

Our invention further consists in using, in connection with two or any number of parallel telegraph-wires, the combination of two or more condensers, a telephone and a ground-wire at each end, of a telephone-line, for the purpose of reducing the resistance of the line, as also with the view of diminishing the injurious effects of foreign induced currents without interfering with the action of the galvanic current used on said telegraph-wires, all as hereinafter particularly set forth.

Our invention consists, lastly, in connecting two or more independent galvanic circuits by means of a condenser for the purpose of forming a telephone-circuit without interfering with the action of said galvanic circuits.

In the accompanying drawings, Figure 1 is a general line plan view of the apparatus embodying our improvements. Figs. 2 and 3 are detail plans. Fig. 5 is a view showing the condenser inserted in an intermediate ground-wire. Figs. 4 and 6 are views of the condenser applied to two or more independent galvanic circuits.

The method of constructing the condenser is fully described in electrical works, and is well known to scientific men.

Its construction may be briefly described, as follows: A condenser is made to expose a large surface to inductive action, and is constructed of alternate layers of tin-foil and thin plates of mica, gutta-percha, or paper saturated with paraffine arranged like the leaves of an interleaved book. Each alternate metal plate is connected so as to form a distinct series, and each series is insulated from the other, one of which should in this case be connected with the line and the other with the earth, the telephone being inserted above or below the condenser, as may be most convenient, but forming part of the same circuit.

A A′ is the line; C C′, screw-posts of telephone-board; E, electro-magnet of call-bell, and G G′ screw-posts of telephone. D D^1 and D^2 D^3 are the condensers, secured behind the telephone-board, and F is the call-bell, connected by wires *e e* to the line at C C′. One pole of the condenser D^2 D^3 is connected with the line at C, and the other pole with the screw-post L, by which it is connected with the telephone at G. One pole of the telephone at G′ is connected with the line at C′, and the other pole, passing through the post L, connects with one pole of the condenser D^2 D^3, through the screw-post L.

By means of the condenser D^2 D^3, the secondary current circuit through the telephone remains unbroken, notwithstanding the interruption of the galvanic circuit through the coil E during signaling.

In order to ground the telephone at will at an intermediate station without interfering with the galvanic circuit, a second condenser, D D^1, is added, one pole of which, D, is connected with screw-post C, and the other pole, D^1, is connected with the contact-point P.

Referring to Fig. 5, the method of using the condenser in connection with a telephone may

be described as follows: At any point or points on a wire, A A′, of a galvanic circuit a branch line, *a*, is attached, and connected with the ground in the usual way. In this branch line a condenser, *d*, and a telephone, *g*, with or without an induced signal apparatus, are inserted, so as to form part of the circuit between the line A A′ and the ground. When a single wire is used, the condenser may be placed either between the telephone and the line or between the telephone and the ground; but when two or more wires are used as a conductor the condensers are inserted in the branch lines between the telephone and the main line, as shown in Fig. 1, at Y.

In using a condenser in connection with a galvanic signal the condenser may be secured either behind the board to which the telephone or signal apparatus is attached, or it may be secured behind a wall-bracket used for depositing papers, letters, &c., and hung near the telephone; and in using a second condenser for the purpose of being able to ground the telephone at pleasure, the two condensers may be placed together. If the message is from the direction A′, the switch is turned to the contact-point O, which connects it and one pole of the condenser D^2 D^3 with the ground-wire through the binding-post N. The induced current will then pass from A′ C′ through the telephone, to G, to the binding-post L, and then to the pole D^2 of the condenser D^2 D^3, the opposite pole, D^3, being grounded through O M N. If the message is from the direction A, the switch M is turned to the contact-point P, when the induced current will pass from A C to D^3, and from D^2 to L, and through the telephone to G′, and thence to D of the second condenser, the opposite pole, D^1, being grounded through P M N.

The method of placing the condensers and the connection of the wires, as above described, will appear on reference to Figs. 2 and 3.

In Fig. 1, at X, the condenser is shown as introduced on a ground-wire at an intermediate point on a telephonic circuit for the purpose of diminishing the injurious effects of foreign induced currents.

Figs. 4 and 6 represent the method of connecting two or more galvanic circuits for the purpose of forming a telephonic or secondary current circuit without interfering with the action of said galvanic circuits. 1 2 3 represent the first galvanic circuit, 4 5 6 7 the second, and 8 9 10 the third, galvanic circuit. A condenser, *d*, is connected by one pole to the first galvanic circuit, and by the other pole to the second galvanic circuit; and a condenser, *d′*, is connected in a similar manner to the second and third galvanic circuits. 1 11 12 13 represent the branch line, attached to the first galvanic circuit at 1 and grounded at 13, and 10 14 15 16 is a branch line, attached to the third galvanic circuit at 10 and grounded at 16.

11 is a telephone, and 12 is a condenser, with or without other secondary current apparatus inserted in the one branch line; and 14 and 15 represent corresponding apparatus in the other branch line.

By means of the condensers *d d′* the wires 1 2 of the first, 5 6 of the second, and 9 10 of the third, independent galvanic circuits can be utilized to form a secondary current circuit between the branch lines 1 11 12 13 and 10 14 15 16.

In using two or more parallel telegraph-wires as a conductor for a telephone or secondary-current circuit, we gain the double advantage of reducing the resistance of the line and diminishing the injurious effects of foreign induced currents without interfering with the working of said telegraph-lines. Foreign induced currents on parallel wires will flow in the same direction, and will meet and neutralize each other. A complete circuit is thus formed for these foreign induced currents, and the telephone being outside of this circuit—namely, between the condensers and the ground—the injurious effect of these foreign induced currents on the telephone is either neutralized or very much diminished. This is shown in Fig. 1, A A′ being one of two parallel wires of a telegraph-line, *d d′* two condensers connecting the same with the telephone *g*, and *a* the ground-wire.

We do not claim the combination of a telephone-wire, or a telegraph-wire used telephonically, with an additional metallic wire running parallel with the said telephone-wire, and in close proximity thereto, but insulated therefrom, the wires being connected to each end to complete the metallic circuit; but

We claim as new and desire to secure by Letters Patent—

1. At any station on a telegraph or telephone line, and on a derived line of the same, the combination of a telephone, with or without other secondary-current apparatus, and a condenser, so that the secondary-current apparatus may be used without interfering with the action of the galvanic circuit, and so that the galvanic circuit may be broken between the points where the two ends of the derived line are attached without breaking the secondary-current circuit, substantially as set forth.

2. At an intermediate station on a telegraph or telephone line, and on a derived line of the same, the combination of two condensers, D D^1 D^2 D^3, a telephone, with or without other secondary-current apparatus, a shunting-switch, and a ground-wire, so that the telephone may be grounded at pleasure without interfering with the action of the galvanic current used in the line, substantially as herein set forth.

3. The combination of a condenser or condensers, *d* and *d′*, the wires of two or more independent galvanic circuits, and two branch lines, (each branch line with a condenser, induced-current apparatus, and ground-wire,) for the purpose of utilizing the wires of inde-

pendent galvanic circuits to form an induced-current circuit without interfering with the action of said galvanic circuits, substantially as specified.

4. In connection with two or any number of parallel telegraph-wires, the combination of two or more condensers, a telephone, and a ground-wire at each end of a telephone-line, for the double purpose of reducing the resistance of the line and diminishing the injurious effects of foreign induced currents without interfering with the action of the galvanic current used on said telegraph-wires, substantially as herein specified.

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