3 Sheets—Sheet 1

A. M. ROSEBRUGH.

Electric-Telephony.

No. 212,510. Patented Feb. 18, 1879.

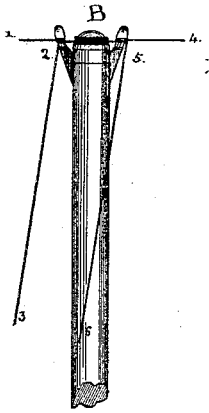

Fig. 4.

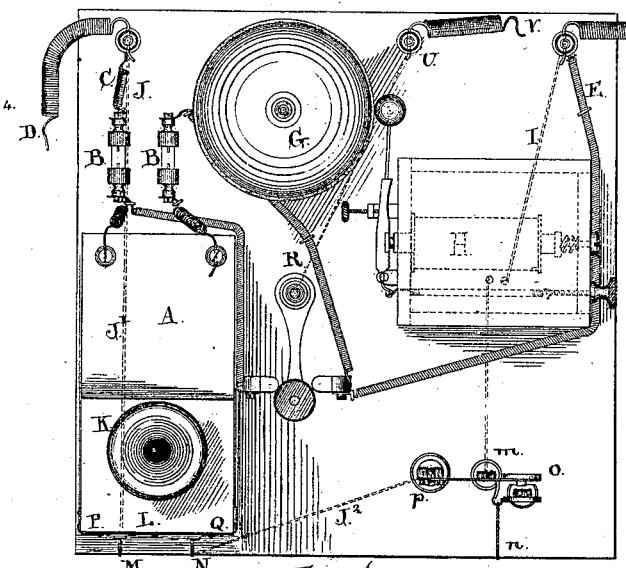

Fig. 1.

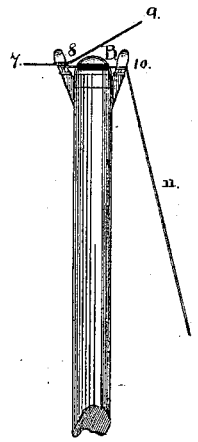

Fig. 7.

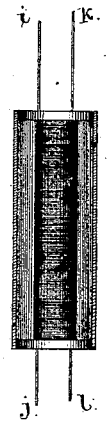

Fig. 5.

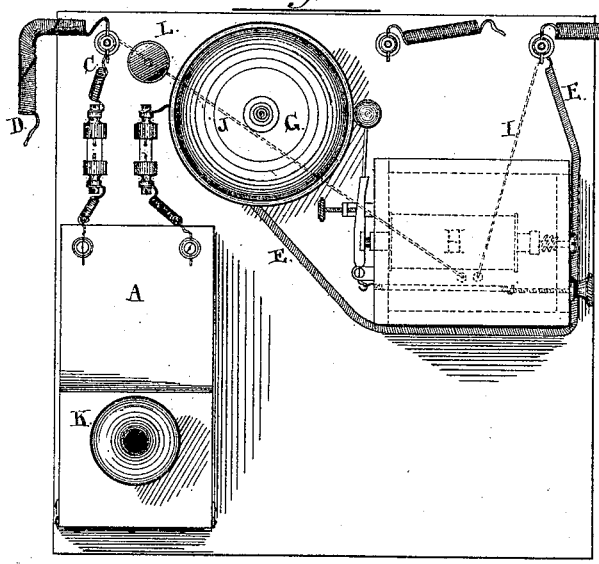

Fig. 2.

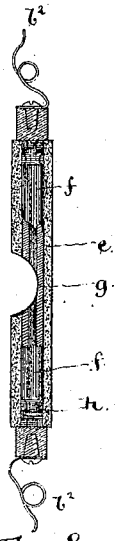

Fig. 8.

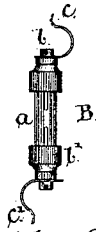

Fig. 6.

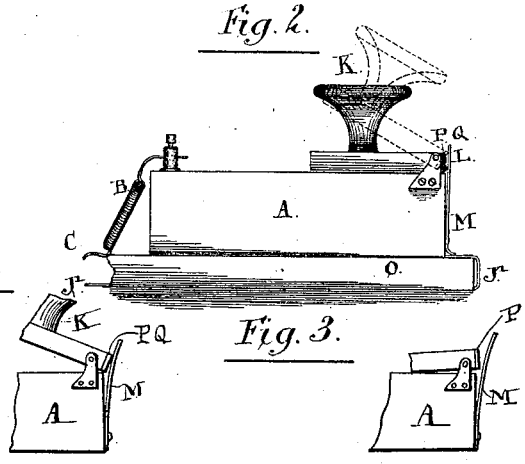

Fig. 3.

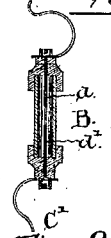

Fig. 9.

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3 Sheets—Sheet 2.

A. M. ROSEBRUGH.

Electric-Telephony.

No. 212,510. **Patented Feb. 18, 1879.**

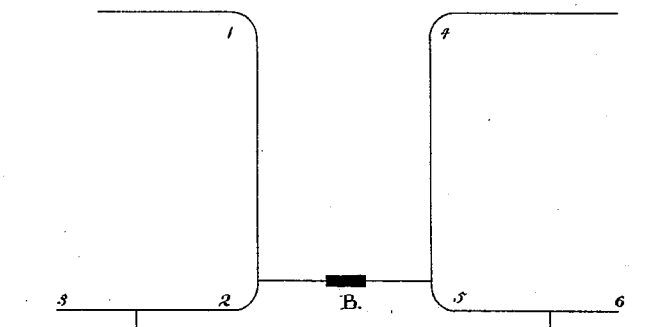

Fig. 10.

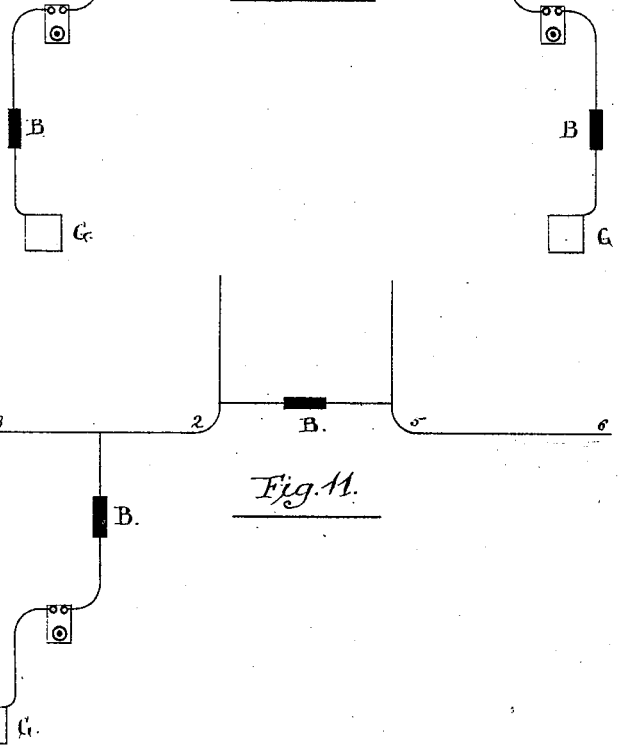

Fig. 11.

WITNESSES

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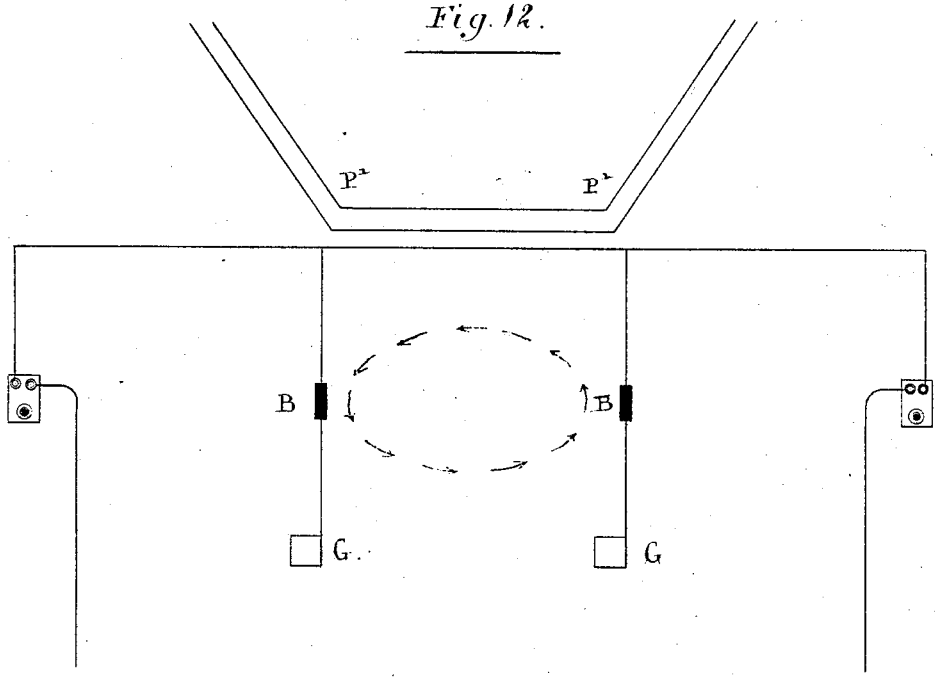
3 Sheets—Sheet 3.

A. M. ROSEBRUGH.

Electric-Telephony.

No. 212,510. Patented Feb. 18, 1879.

Fig. 12.



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S. Ensworth.

Inventor:

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UNITED STATES PATENT OFFICE.

ABNER M. ROSEBRUGH, OF TORONTO, ONTARIO, CANADA.

IMPROVEMENT IN ELECTRIC TELEPHONY.

Specification forming part of Letters Patent No. **212,510**, dated February 18, 1879; application filed May 25, 1878.

To all whom it may concern:

Be it known that I, ABNER MULHOLLAND ROSEBRUGH, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Telephony, which improvements are fully set forth in the following specification and accompanying drawings.

The first part of my invention has for its object, first, to be able to use a galvanic circuit call-bell on a telephone-circuit without breaking the telephone-circuit; second, to be able to construct a secondary-current circuit on any closed galvanic circuit; and, third, to be able to construct a telephonic or secondary-current circuit by making use of the wires of two or more closed independent galvanic circuits without interrupting the working of said galvanic circuit or circuits; fourth, to be able to reduce the strength of foreign induced currents when the wire of the telephone runs parallel with or in proximity to the wire or wires of a telegraph-line. This I accomplish by making use of a medium which offers high resistance to the galvanic current and comparatively little resistance to the secondary or induced current.

The second part of my invention is to use a galvanic circuit call-bell on a telephone-line in such a manner that when the telephones are not being used the galvanic circuit will be kept automatically closed. This I accomplish by using an automatic circuit-closer in connection with the mouth-piece of the telephone.

The object of the third part of my invention is to ground a telephone at pleasure without interrupting the action of the galvanic current used in the same line. This I accomplish by using a switch with two contact-points, and grounding with my resistance medium.

Figure 1 exhibits a telephone-board, with a telephone and call-bell, and having a shunting-switch and grounding-switch attached. Fig. 2 exhibits a telephone-board, with a telephone electro-magnet and call-bell. Fig. 3 exhibits the mechanism of the shunting-switch in connection with the mouth-piece. Figs. 4 and 7 exhibit the manner of applying my resistance medium to outside lines. Fig. 5 is a detail of the resistance-coil, of German silver or other wire. Fig. 6 is an outside, and Fig. 9 a sectional, detail of my fluid resistance medium. Fig. 8 is a detail of my graphite resistance medium. Fig. 10 shows the arrangement of the apparatus when the resistance medium is introduced between two independent circuits. Fig. 11 shows a modification of the arrangement. Fig. 12 illustrates means employed to diminish the effects of foreign induced currents, which injuriously affect the working of the telephone.

In short telephone-circuits, or in telephone-circuits with low resistance, and where the signals are given by means of galvanic current, the arrangement shown in Fig. 2 can be used. It is simple, and, if the enunciation is distinct and the hearing good, the arrangement is quite sufficient for lines of such description; but in other cases it is desirable to get an undivided current through the telephone, and it is desirable to reduce the resistance of the line as much as possible. In such cases I make use of a switch for shunting the electro-magnet of the call-bell and at intermediate stations a switch for grounding the telephone. This is shown in Fig. 1.

Like letters indicate corresponding parts.

In Fig. 1 and Fig. 2, A is a telephone; B, resistance medium; C, wire connecting the telephone with the ground-wire D; E is the wire connecting the telephone with the line-wire F. The call-bell is marked G, and the electro-magnet H. The relay or electro magnet is connected with the line by the wire I, and with the ground-wire by the wire J. K is the telephone mouth-piece, and L an automatic circuit-closer.

By the introduction of the resistance medium B the galvanic signal-bells can be used without breaking the telephone-circuit. When the relay is shunted by means of the circuit-breaker L, high resistance is thrown on the line, which is equivalent to interrupting the galvanic circuit, and a signal is given.

When the wire of a telephone-circuit runs parallel with, or in proximity to, the wire or wires of a telegraph-line, it becomes charged with foreign induced currents, which interfere with the working of the telephone. Without being able to completely neutralize the effect of these disturbing currents, I claim that their

effect can be diminished by the following means: first, by grounding the telephone near the terminal ends with very high resistance; second, using a double-conducting wire; third, at suitable points on the line to run the wire through insulated metallic tubes of very narrow caliber, and grounding the same.

The tubes I make, preferably, of very soft iron, about ten inches long, one-fourth inch diameter, and coated on the inside with a suitable insulating material. Two or more tubes are connected by wires and the series grounded.

In using high resistance in a ground-wire for the purpose of diminishing the injurious effects of foreign induced currents, I use two or more ground-wires, so as to form two or more complete circuits. Parallel wires may cause induced currents in one of these circuits only, as they may not extend beyond the point where the ground-wire is attached to the telephone-line. For instance, a telephone-line at an intermediate point may run parallel with telegraph-wires by attaching a ground-wire before and after it passes the telegraph-wires. The induced currents will then not necessarily pass beyond the ground-wires, (but will take the direction of the arrows in Fig. 12,) and will not affect so seriously the telephones at the extremities of the line.

In Fig. 12, which illustrates the above-described means, P′ P′ represent the parallel telegraph-wires.

In using a return-wire, instead of grounding at each end of the line, the two wires are affected by induced currents simultaneously; but practically they flow in opposite directions, meet, and neutralize each other.

The arrangement of the automatic circuit-breaker is shown in Fig. 3. A is the telephone; O, the telephone-board; K, the mouth-piece, and L the circuit-breaker. M is a brass spring connected with the wire J^1, which is connected with the ground-wire D. N is a brass spring connected with the wire J^2, and between the points P and Q a brass strip is secured to the block to which the mouth-piece K is attached.

The telephone-board is secured in an upright position, preferably to a wall, and the weight of the mouth-piece causes the brass bar P Q to make contact with M N and close the galvanic circuit. A signal can be given by elevating the mouth-piece, and when the mouth-piece is in position for speaking or listening the electro-magnet H is shunted.

In Fig. 1 another form of an automatic circuit-closer is suggested at *m n*. When the circuit is broken by drawing on the cord *n*, this cord *n* may, for convenience, be attached to a foot-treadle. The spring *p o* closes the circuit automatically.

At intermediate stations on long lines or on lines of high resistance it is an advantage to be able to ground the telephone at will. This I accomplish by means of the switch R, which is connected with the ground-wire V at the binding-post U.

The right binding-post of the telephone is connected with T and the left with S.

When a message is being received at an intermediate station and the voice is not well heard, the switch is turned to the opposite side from which the message is being received. Thus, if the message is from the direction D C, the switch is turned to T. The current then passes by way of D C to A, thence to T, and is grounded through R by its connection with the binding-post U and the ground-wire V. When the message is from the direction F the telephone is grounded by turning the switch R to the contact-point S. When the telephone is grounded through the high resistance medium the action of the galvanic current is not interrupted.

If the telephone should be used on any closed galvanic circuit it can neither be placed in direct circuit nor grounded without interrupting the usual working of the galvanic circuit. I find, however, that by forming a derived current, and grounding with my resistance medium, the wires of a galvanic circuit may be used to form part of a telephone or secondary-current circuit without interfering with the action of the galvanic circuit; and, moreover, I claim that by making all the connections with my resistance medium the wires of two or more galvanic circuits may be so used as to form a telephone or secondary-current circuit without interrupting the working of said galvanic circuits.

In Fig. 4, B represents the resistance medium connecting the independent galvanic circuit 1 2 3 to that of 4 5 6. The same figure can also represent one method of shunting or cutting out the instruments of a way telegraph-office for telephone purposes without interfering with the action of said instruments. In this case the wires 3 and 6 represent a loop taken into a way office, and B the resistance medium. A branch line with telephone and resistance medium in circuit and grounded is attached to each independent galvanic circuit for the purpose of forming a telephone-circuit without interfering with the action of the galvanic circuit.

Fig. 7 suggests a method of connecting the resistance medium outside in forming a branch line. Nos. 7 8 9 represent the wire of the galvanic circuit, and 8 10 11 the branch wire for the telephone, the resistance medium being placed between the insulators 8 and 10.

There are various other instances where the introduction of my resistance medium will be found advantageous in telephony. The foregoing, however, will be sufficient to explain its utility, and it is merely necessary now to explain briefly the manner in which the resistance medium B can be made. This is pretty clearly indicated in Figs. 6, 9, 5, and 8. The former of these figures shows the style of instrument I prefer for inside use, while Figs. 5

and 8 exhibit the construction of instruments more particularly applicable for outside purposes.

In Fig. 6, *a* is a glass tube; *b* b^1, metallic cups fitting it air-tight and connected with platinum points *d* *d'*, and to which the wires *c* *c'* are attached. This tube *a*, I fill with water, preferably distilled, or glycerine and water, the proportions thereof being regulated according to the size of the tube, or the desired strength of the resistance, or such other liquid or liquids as may be found suitable for the purpose. If the caliber of the tube is very small the water may be slightly acidulated before sealing.

In Fig. 8, *e* is a small stick of graphite incased in wood, preferably pine, forming, in fact, an ordinary graphite pencil. In or about the center of this I cut away a section, *g*, a quarter of an inch (more or less) in length, of the wood, cutting the graphite in said section *g* entirely away. The section *g* is then scraped smooth and a thin stratum of graphite rubbed in and polished, when it may be varnished and cased in a rubber or glass tube, *h*. The wires b^2 b^2 are suitably connected to the terminal ends of the graphite.

Fig. 5 is a sectional view, showing a novel method of constructing a resistance-coil of German silver or other insulated wire incased in a suitable tube made of a non-conducting material, which is so arranged that by a proper connection of the terminal wires a resistance, say, of five hundred, one thousand, or two thousand ohms may be obtained, according to the requirements of the case.

The non-conducting bobbin is wound double and the terminals permanently connected with strong copper wire. The coil is coated with shellac and incased in a hard-rubber tube. If the two wires *i j k l* have a resistance, say, of one thousand ohms each, by connecting *i k* there will be a resistance of two thousand ohms between *j* and *l;* but when *j* and *l* are also connected, and the double wires used as a conductor, the resistance goes down to five hundred ohms.

The wires *i* and *k* may, for convenience, be connected permanently, and only one terminal used. The resistance of each medium should be marked in ohms.

The amount of resistance must be regulated in each case according to the strength of the galvanic current and the resistance of the galvanic circuit. It should be sufficiently high to insure perfect safety to the galvanic circuit, and not too high to make the induced current of the telephone too feeble for practical use.

I make no claim to 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 at each end to complete the metallic circuit; but

What I claim as my invention is—

1. On the ground-wire H of a branch line of a galvanic circuit, a medium, B, offering high resistance to a galvanic current, combined with a telephone, with or without an electric signal, for the purpose of forming an induced-current circuit without interfering with the action of the galvanic circuit, substantially as specified.

2. A self-acting shunting-switch formed by the mouth-piece K, hinged to the telephone A, and connected to the galvanic circuit, as described, in such a manner that immediately the operator ceases to use the telephone the galvanic circuit is automatically closed.

3. A shunting-switch, R, pivoted between two contact-points, S T, and arranged in connection with a telephone, A, and a resistance medium, B, located between the contact-points and the line-wire, as described, for the purpose of enabling the operator to ground the telephone at pleasure without interrupting the action of the galvanic current used on the same line, substantially as set forth.

4. In telephony, a glass tube, *a*, filled with glycerine and water or other suitable liquid, and provided with air-tight-fitting caps *b* *b*, connected with platinum points *d* *d*, forming a high resistance medium capable of offering high resistance to the galvanic current and comparatively little resistance to the induced current, applied substantially as and for the purpose specified.

5. On a telephone-line, the combination of a telephone, galvanic signal, and resistance medium B, the telephone and resistance medium being in a derived circuit around the galvanic signal, whereby signaling may be effected without interrupting the induced-current circuit, as specified.

6. In telephony, a resistance medium, B, introduced between two independent galvanic circuits, so as to form, in connection with two branch lines, an induced-current circuit without interfering with the action of the independent galvanic circuit, as specified.

7. With one or more branch lines of a telephone-circuit, the combination of a resistance medium, for the purpose of diminishing the injurious effects of foreign induced currents, as set forth.

Signed at Toronto this 26th day of April, A. D. 1878.

A. M. ROSEBRUGH.

In presence of—
JOHN G. RIDOUT,
DONALD C. RIDOUT.