

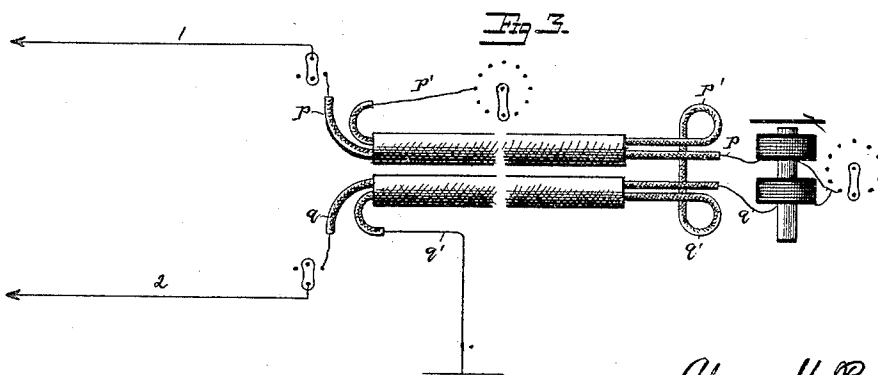
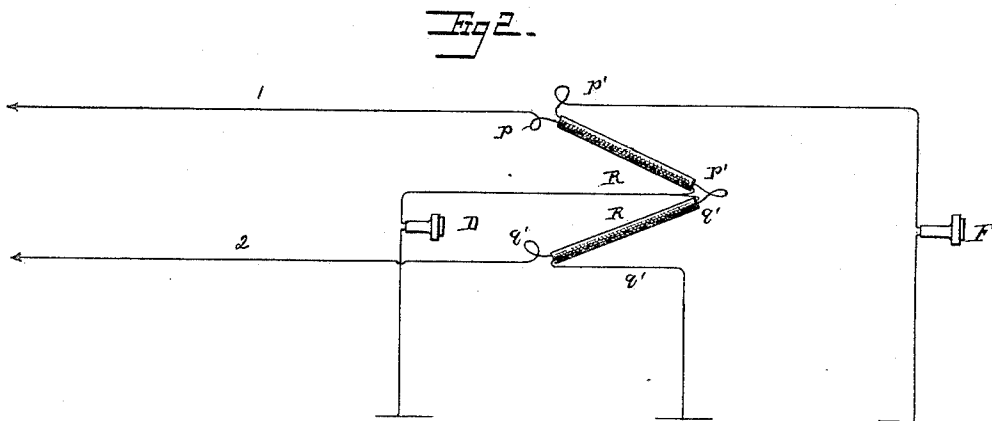
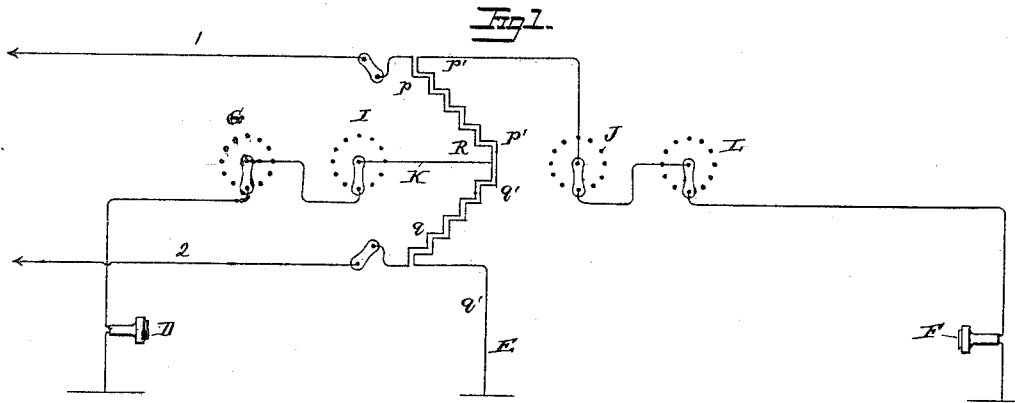
(No Model.)

2 Sheets—Sheet 1.

A. M. ROSEBRUGH.
MULTIPLE TELEGRAPH OR TELEPHONE.

No. 442,139.

Patented Dec. 9, 1890.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

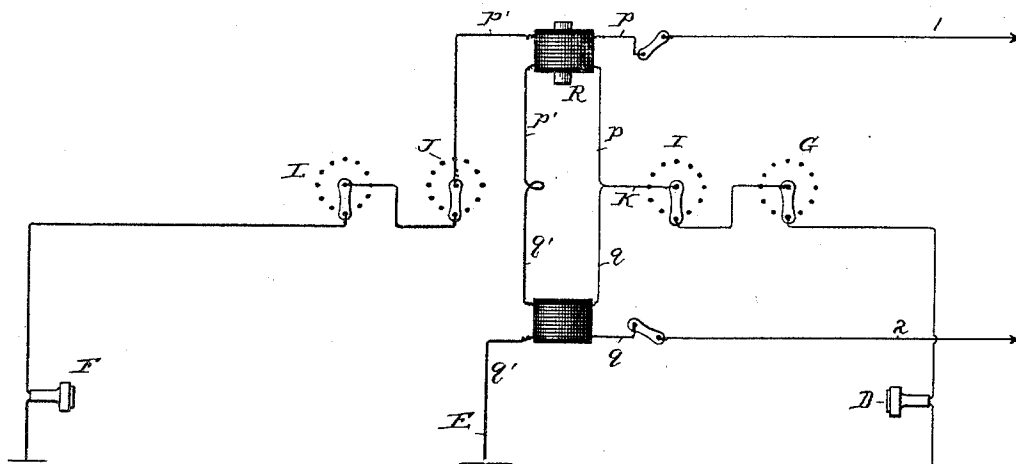
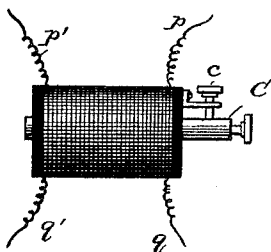


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

ABNER M. ROSEBRUGH, OF TORONTO, CANADA, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

MULTIPLE TELEGRAPH OR TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 442,139, dated December 9, 1890.

Original application filed November 27, 1886, Serial No. 220,072. Divided and this application filed June 6, 1887. Serial No. 240,447. (No model.) Patented in England August 15, 1885, No. 4,231.

To all whom it may concern:

Be it known that I, ABNER MULHOLLAND ROSEBRUGH, surgeon, of the city of Toronto, county of York, Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Multiple Telegraphs or Telephones, of which the following is a specification.

This invention was patented in Great Britain August 15, 1885, No. 4,231.

The object of this invention is to increase the working capacity of metallic telephone-circuits, so that long-distance telephony may be facilitated, so that either two telephone-subscribers or a telephone subscriber and a telephone operator at each end of a metallic circuit may communicate with each other simultaneously.

My present invention relates to the general subject-matter set forth in my application Serial No. 220,072, filed November 27, 1886, and is a division thereof; and it consists in the construction and arrangement of devices, substantially as hereinafter pointed out.

In the accompanying drawings, Figure 1 is a diagrammatic representation of an arrangement of circuits at one end of the line. Figs. 2 and 3 are modifications of the same. Fig. 4 is a diagrammatic representation of the arrangement of circuits, showing the adjustable induction-coils, and Fig. 5 is an enlarged detail showing one of the coils.

1 and 2 are the two wires of a metallic circuit at one of two central stations, and K is a branch line for grounding said metallic circuit.

R is a repeater arranged as a duplex or differential repeater.

D and F are two subscribers' lines. Subscriber F is represented as being connected with the duplex repeater and subscriber D with the branch line K, while G and L represent the ordinary central-office telephone switch.

I is a special switch for the branch line K, and J is a special switch for the duplex repeater. The repeater is divided into two parts, one on each side of the branch line K, the wire *p* of one part being connected

with wire 1, and the wire *q* on the other part being connected with wire 2. The wires *p* and *q*, forming one side of the repeater, are continuous with the metallic circuit 1 and 2, while the wires *p'* and *q'*, forming the other side of the repeater, are connected at one end with the ground-wire E and at the other end with the switch J.

The principle of a telephone-repeater is well known. A simple form is that of an induction-coil with or without a soft-iron core, the primary being in one electric circuit and the secondary coil being in an independent electric circuit, so that an impulse generated in one circuit will affect the other circuit by induction.

In the duplex repeater the subscriber's line at each telephone-office is brought within the inductive influence of both branches of the metallic circuit 1 and 2 in such a manner that the induction into and from the two branches shall be equal. Any form of repeater may be used so long as the inductive action between said repeater and the two branches of the metallic circuit and on each side of the branch line is equal and so long as said repeater does not cause retardation of the telephone-current either by high resistance or by self-induction.

I preferably construct the duplex repeater as follows: Referring to Fig. 3, a cable with two insulated wires is used, one wire *p q* being continuous with the metallic circuit and the other *p' q'* with the subscriber's line. 1 and 2 are the two wires of the metallic circuit connecting two central offices, each wire being continuous with one of the insulated wires of the repeating-cable. R is a repeater, and *p q* are the repeating-wires passing through the cables and being continuous with the metallic circuit, while *p' q'* are the wires of the cable which connect with the subscriber's line. By this arrangement when the transmitter at D is used the current divides equally and passes into the two branches of the metallic circuit 1 and 2, and in so doing passes through the two sides of the repeater, which it affects by induction, but in opposite directions, and then one side neu-

tralizes the other and the subscriber at F does not overhear what is being said. When the subscriber at F is to be placed in communication with another subscriber at the distant station, the switches L and J are connected with such subscriber's line and the duplex repeater and the line-wires act as a metallic circuit, as hereinbefore explained, and repeat into the subscriber's line at the distant station, and when subscriber D communicates with the subscriber at the distant station the lines 1 and 2 act as a double conductor, and thus the two messages will not interfere with each other, as already explained. Hence the two subscribers at D and F may communicate with two subscribers at the distant station by means of a metallic circuit without interference.

Fig. 4 shows substantially the same arrangement of circuits as is shown in Fig. 1 and having the same letters of reference, with the addition of indicating the adjustable induction-coils.

Fig. 5 shows the adjustable induction-coils on a larger scale, the circuits being lettered the same as in Fig. 4. The device is provided with a core C, which slides through the coils, the two wires of which are preferably wound side by side, and an adjusting-screw c, which is used to maintain the core in proper adjustment.

Having thus fully described my invention, what I claim is—

1. The combination, in a system of telephonic communication, of a metallic or double parallel line-circuit extending between two or more stations, local circuits including telephone apparatus connected by means of induction-coils with both sides of the said double-line main circuit, and earth branches including telephones connected with the said metallic circuits at the terminal stations thereof and at a point between the said induction-coils, whereby the stations inductively connected with the double-line circuit may be enabled to communicate with one another, to the exclusion of the earth-branch stations, and vice versa, as hereinbefore described.

2. In a system of telephonic communication, a metallic or double parallel line main circuit, a series of local circuits, each including telephones, and induction-coils, two for each

local circuit, connecting the said local circuits with both sides of the main circuit, one wire of each coil of a pair being included in the local circuit and the remaining wire of the two coils being interposed one in each line of the metallic circuit and earth-branch circuits, with telephones included therein united to the said metallic circuits at the terminal stations thereof and at a point substantially equidistant from both induction-coils, substantially as and for the purposes hereinbefore described.

3. The combination, substantially as hereinbefore described, of a main metallic or double-line circuit, a series of local circuits, each including telephones and each connected by means of induction-coils with both sides of the double-line circuit, earth branches connected with the said metallic circuit at the termini thereof and at a point thereof between the said induction-coils, and adjusting devices whereby the inductive power of the said coils may be varied, so that currents passing between the earth branches may be accurately balanced in the two induction-coils and so that their effect upon the local-circuit receiving-instruments may be neutral.

4. The combination, in a system of telephone communication, of a metallic or double parallel line-circuit, earth branches including telephonic apparatus connected with the metallic circuit at both termini, a series of local circuits including telephones, and a pair of induction-coils for each local circuit, whereby the said local circuits are inductively connected with both sides of the metallic circuit, as herein described, the said induction-coils having their two wires wound together, being of approximately equal resistance and inductive power, and being provided with adjustable cores, whereby communication may be individually maintained between the several local-circuit instruments and between the earth-branch instruments, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ABNER M. ROSEBRUGH.

Witnesses:

T. R. ROSEBRUGH,
R. M. ROSEBRUGH.