(No Model.) 3 Sheets—Sheet 1.

D. E. SMITH.

TELEPHONE REPEATER.

No. 297,724. Patented Apr. 29, 1884.

Fig. 1

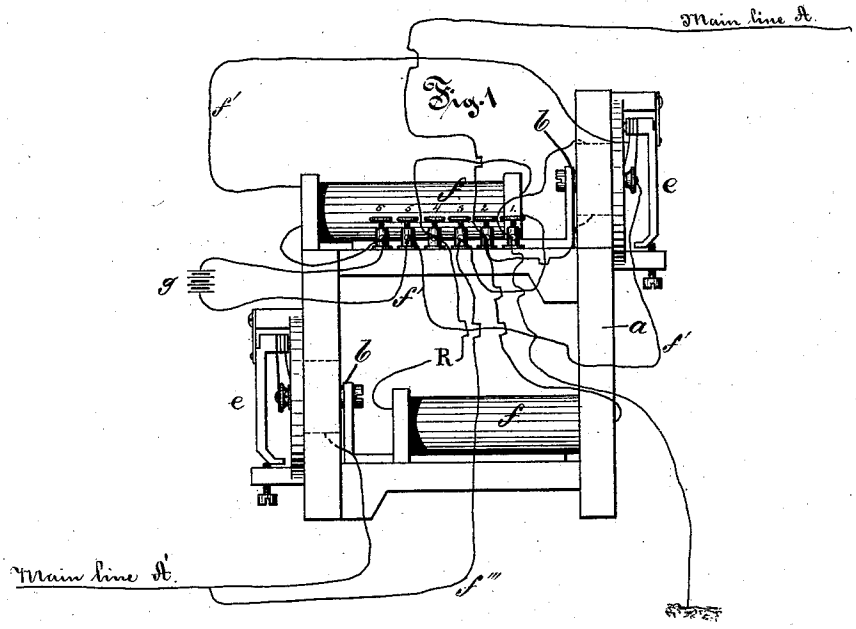

Fig. 2

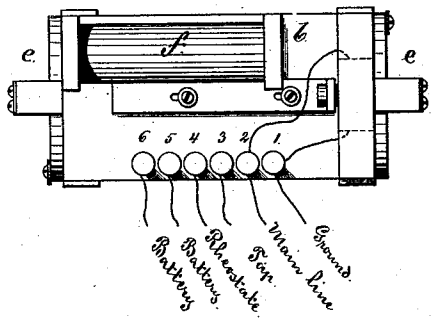

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Fig. 3

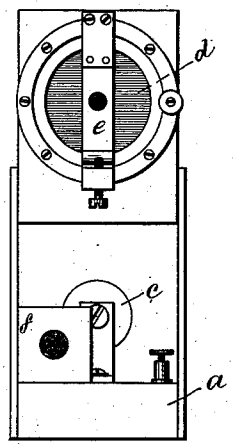
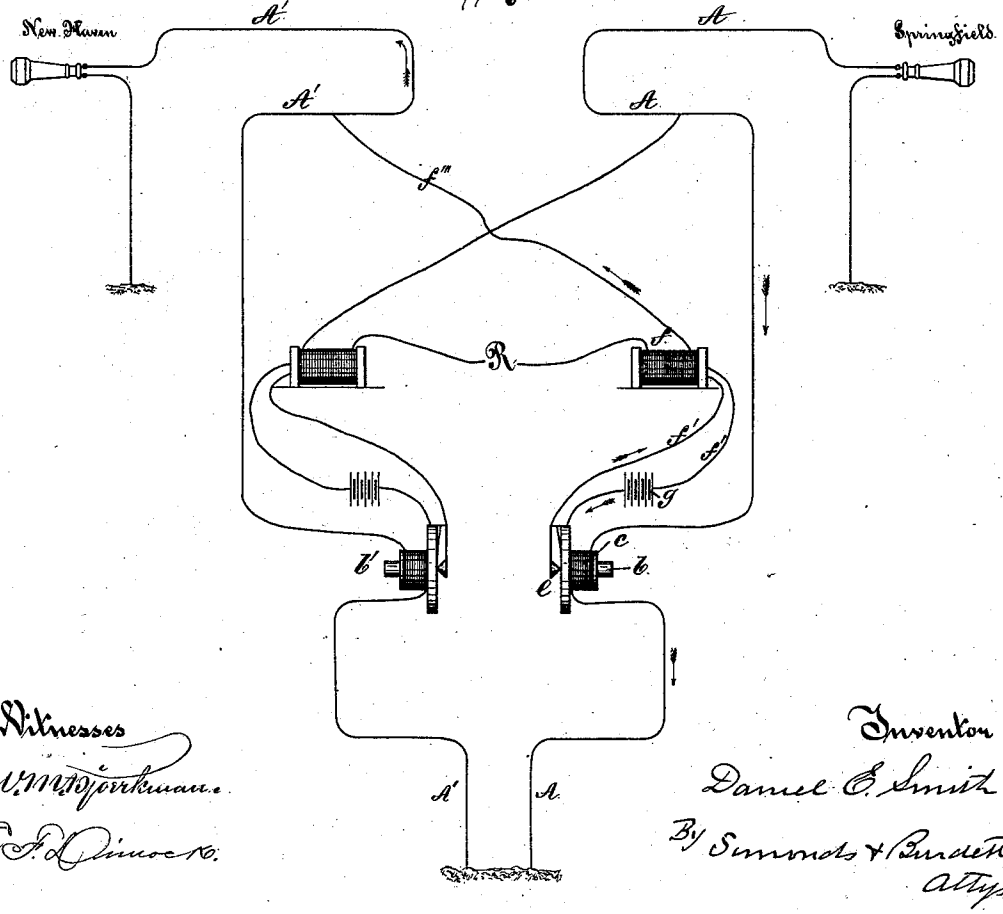


Fig. 4



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TELEPHONE REPEATER.

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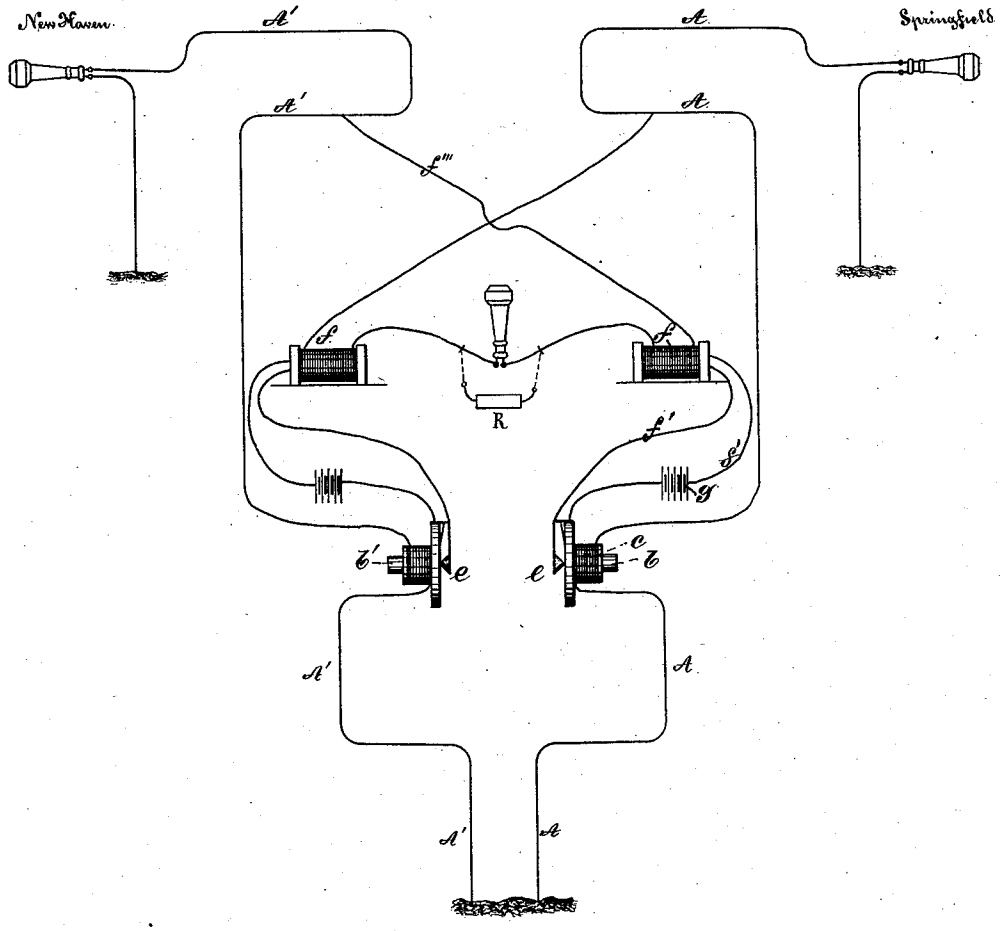
Fig. 5



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UNITED STATES PATENT OFFICE.

DANIEL E. SMITH, OF HARTFORD, CONNECTICUT.

TELEPHONE-REPEATER.

SPECIFICATION forming part of Letters Patent No. 297,724, dated April 29, 1884.

Application filed September 27, 1883. (No model.)

To all whom it may concern:

Be it known that I, DANIEL E. SMITH, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Telephone-Repeaters; and I do hereby declare that the following is a full, clear, and exact description thereof, whereby a person skilled in the art can make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Like letters in the figures indicate the same parts.

Figure 1 is a side view of the induction-coils and transmitters used in my improved device, mounted upon a frame and compactly arranged for convenience in use. Fig. 2 is a top view of same. Fig. 3 is an end view of same. Fig. 4 is a diagram view of the various parts of my device, showing the method of connection. Fig. 5 is a diagram view of the various parts of my device, showing a receiving-telephone in place of the rheostat.

My invention relates to the class of devices adapted to convey from one length of line electrical waves or impulses generated in that line, as by means of the telephone and its ordinary accessories, to another line.

My improvement is especially applicable to telephone-lines, in which, as at present used, serious trouble is caused by induced currents. These induced currents in telephone-lines are, other things being equal, proportioned to the length of the line between the extreme stations. By means of my invention I greatly reduce these induced currents.

In the accompanying drawings, the letter *a* denotes the frame or stand, of ordinary insulating material, as wood; *b*, a repeating-magnet; *c*, a helix arranged about the end of this magnet; *d*, the diaphragm of a transmitter, *e*, which is of ordinary construction and serves as the armature for the magnet *b*, and needs no detailed description. This transmitter is connected to the induction-coil *f* and the local battery *g* by means of the primary-circuit wire *f'* of the induction-coil. These parts are duplicated at the repeating-station.

The main-line wire A from a point, as Springfield, connects through the helix *c* directly with the ground. (See Figs. 4 and 5.) One end of the secondary-circuit wire of the induction-coil joins up to the rheostat, and the other, *f'''*, connects with the main wire A', to a point beyond the repeating-station. The line from this point (New Haven) to the repeating-station connects with the helix of the duplicate magnet *b'* at this station and then directly with the ground. It is this grounding of the main-line wire at the repeating-station which materially reduces the induction between the extreme points, as Springfield and New Haven.

The diagram, Fig. 4, clearly illustrates the joining up of the different parts and the principle on which my device operates. The electrical undulations caused by talking into the telephone at Springfield are repeated by the transmitter through the primary circuit of the induction-coil, amplified in the secondary circuit of the coil, and pass through to the main line to the farther station, the rheostat interposed between the induction-coils on this secondary circuit being of a sufficient resistance to more than counterbalance the resistance of the wires on either side of the repeating-station, and the main part of the waves, therefore, following the path of the least resistance, are repeated in the telephone at New Haven, the farther station. The use of this interposed resistance is to prevent a great portion of the currents from one station from passing over the line to the farther station without passing through the coil *b* or *b'*. Whatever current is generated at the transmitter at one station is thus made effective at the repeating-magnet, and the great resistance of the secondaries of the two induction-coils, together with the extra resistance R, will divert the greater part of such current into the desired channel—viz., through the repeating-magnets *b* or *b'*.

In the place of the rheostat in the secondary circuit of the induction-coils, I may use a receiving-telephone so arranged as to switch into the circuit, thus enabling me to use the telephone as an intermediate, although imperfect, receiver. My improvement in this regard is a complete telephone-relay. The overlying arrows indicate the path of the impulses.

I claim as my invention—

1. The combination of two main wires to and from the repeating-station which ground at that station, repeating-magnets in the main-

line circuits, microphones in the primary circuit of the induction-coils, a local battery in the latter circuit, and a rheostat interposed between the induction-coils in their secondary circuit, the said secondary circuit being completed by joining the free ends of the wire to the opposite main-line wires at the repeating-station and beyond the repeating-magnet on the wire to be transmitted into, all substantially as described.

2. In a telephone repeating apparatus, the combination of the main-line wires that ground at the repeating-station directly through the repeating-magnets in the line-circuits, the said repeating-magnets in operative proximity to microphones in local-battery circuits, each battery-circuit including the primary of an induction-coil, the secondaries of the two induction-coils connected in series and with the line beyond the repeating-magnets, and the resistance included in said secondary circuit, all substantially as described.

DANIEL E. SMITH.

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