(No Model.)

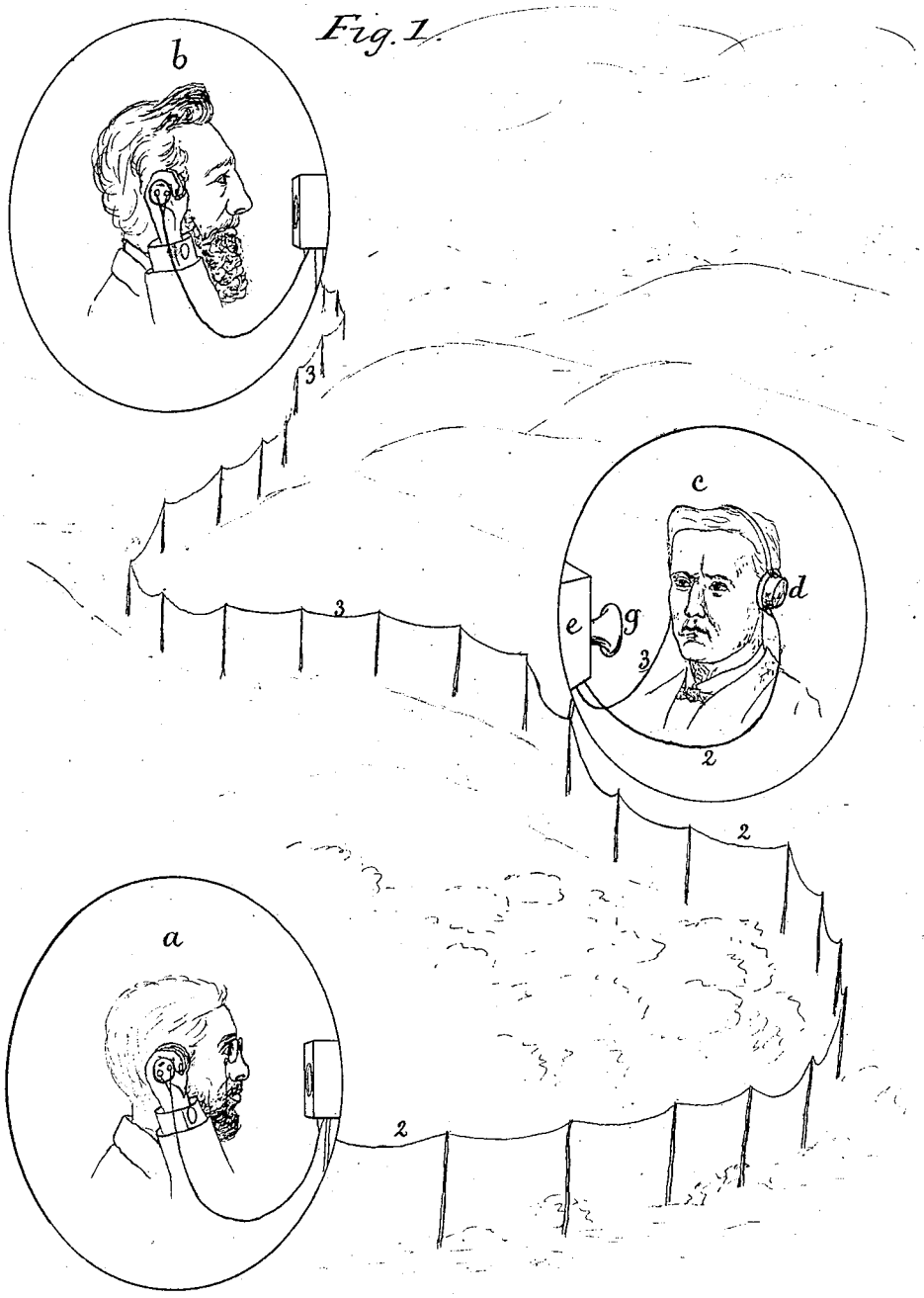
2 Sheets—Sheet 1.

T. A. WATSON.

TELEPHONE SYSTEM.

No. 267,387. Patented Nov. 14, 1882.

Fig. 1.



Witnesses.
Jos. P. Livermore.
L. F. Connor.

Inventor.
Thomas A. Watson
by Crosby & Gregory
attys.

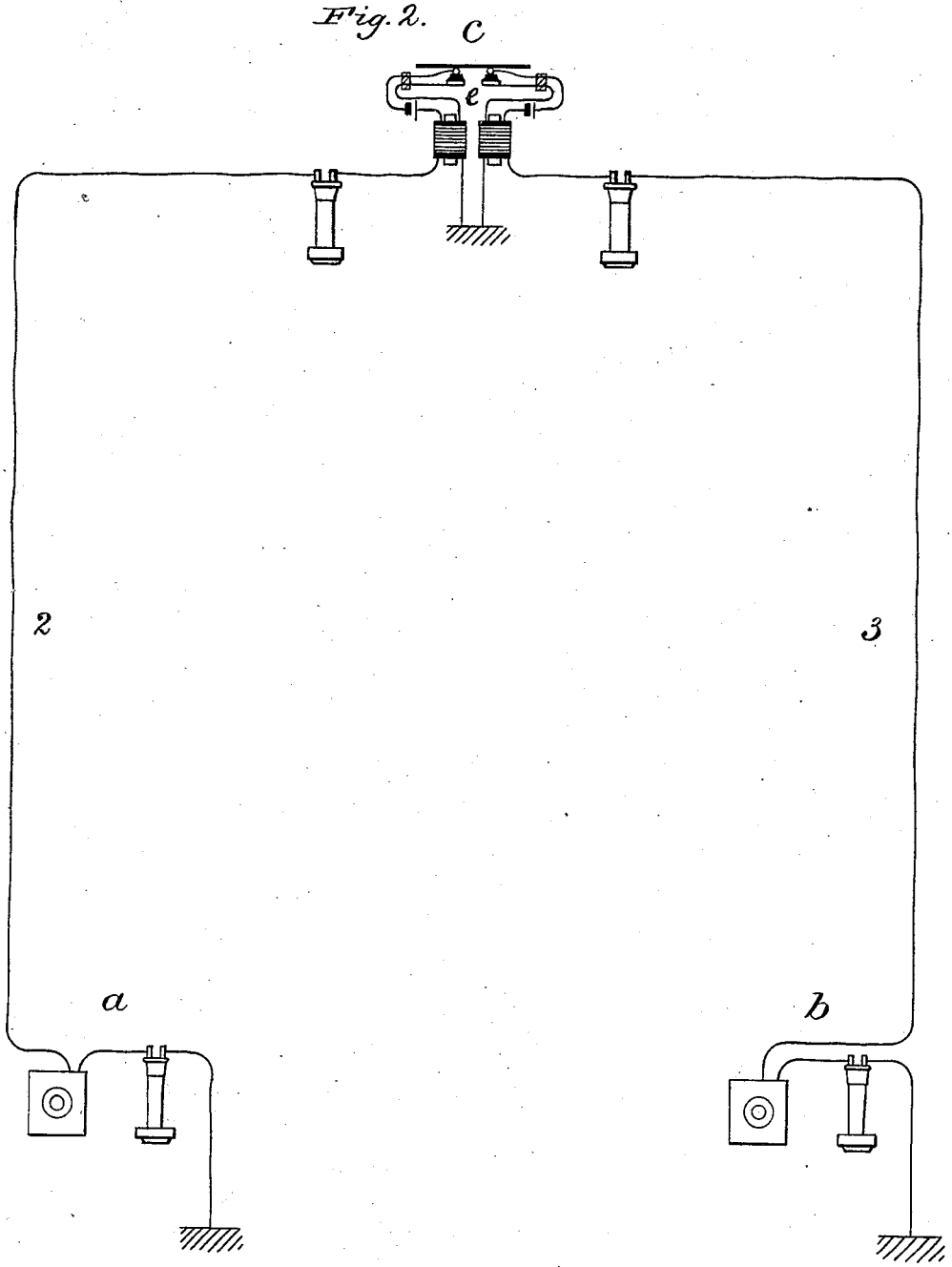
(No Model.) 2 Sheets—Sheet 2.

T. A. WATSON.

TELEPHONE SYSTEM.

No. 267,387. Patented Nov. 14, 1882.

Fig. 2.



Attest.
E. L. Whitt
W. B. Masson

Inventor:
Thomas A. Watson
by Pollok
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS A. WATSON, OF EVERETT, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 267,387, dated November 14, 1882.

Application filed May 27, 1880. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. WATSON, of Everett, county of Middlesex, State of Massachusetts, have invented an Improvement in Telephonic Communication, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to telephonic transmission, and has for its object to enable telephonic communication to be carried on expeditiously over distances too great for operating the usual telephonic instruments.

Telephones as constituted up to this present time have been found not to be available for use in circuits of much above one hundred miles, and consequently the employment of telephones for conversing over long distances, or over a distance greater than the distance limited by the effective power of one telephonic circuit, has been impossible, and the usefulness of the telephone as a means of communicating speech has been circumscribed within certain bounds and limits.

I have by experiment devised a plan by which I am enabled to make the present form of telephone available for conveying speech for any desired distance, thus enabling telephonic lines of communication to be extended unlimitedly as to distance. To accomplish this greatly desired and needed end I have devised a method of transmission consisting in dividing such distances over which it is desired to transmit speech into a number of sections which may be independent electric circuits, each of suitable length for direct transmission, at the adjoining ends of which I have placed receiving and transmitting instruments under the control of the operater, the said instruments being preferably, for the greatest facility and accuracy, so arranged in the circuits as to enable the operator at an intermediate station, simultaneously with the sending forward of the telephonic message toward its destination, also to send back to the operator next preceding him the message just received and sent forward.

By placing the repeating-operator in communication with both the sections or circuits at the same time, as by having a telephone connected with each circuit at each ear, and by placing transmitters in each of the circuits in such position that the words of the repeating-operator will affect both, the said operator will, after some practice, be able to regulate a conversation to prevent confusion, in case both parties should try to speak at once, and at other times will repeat the words of one communicant immediately upon receiving them, so that the other party will hear them and reply, if necessary, the conversation being carried on in a somewhat similar manner to one between persons using different languages and employing an interpreter, but with much greater rapidity and facility.

If desired, two separate telephones may be used—one in each circuit at each ear of the repeating operator—and two separate transmitters placed in proper proximity to the said operator or compound telephones and transmitters may be used—such as invented by me and described in a former application, filed April 29, 1880, to which reference may be had.

The drawings show an intermediate and two terminal stations of a line of communication divided into two sections, the whole line being supposed to be in the neighborhood of two hundred miles long.

Figure 1 is a diagram illustrating the invention, showing two terminal and one intermediate station; and Fig 2 is also a diagram showing the construction and connections of the transmitter at the intermediate or repeating station.

It will be readily understood that the electric circuit can be continuous, the said sections being merely divisions thereof, over which the speech will be transmitted with distinctness and a single receiving and transmitting instrument used, which will serve for both the sections on either side of it; but I prefer to have the sections entirely independent circuits, as there can then be no confusion arising from indistinct sounds, which might pass for a distance of two or more sections of a continuous circuit.

The communicants at the terminal stations *a b* of the line of communication are provided with the usual telephonic instruments, the circuit-wire, 2 from *a*, being shown as passing through a receiving-telephone, *d*, and one secondary coil of the microphone-transmitter *e* of the intermediate or repeating operator's sta-

tion *c*, while the circuit-wire 3, from station *b*, passes through another secondary coil in the transmitter *e'* and another receiving-telephone similar to the one *d*, but at the other ear of the operator at the station *c*.

The compound transmitter *e* may consist of two separate transmitters, of any usual construction, inclosed in a single case in proper position to receive the sound equally from the single mouth-piece *g*, the separate transmitters preferably having independent batteries and induction-coils, as shown in Fig. 2. This arrangement makes a single line of communication of the two sections between *a c* and *b c*, as far as the transmission of sound from the station *c* is concerned, for, although when considered as electrical circuits the two sections are entirely independent and the sound is electrically transmitted only the length of one section, the voice of the repeating operator affects both circuits exactly as much as it would either one alone, so that he is heard equally well by the communicants at the other ends of both the sections between which he is placed. When there are more than one intermediate stations each operator will hear the next one repeat the words he has just spoken, but will not hear and be disturbed or confused by the repetition of the operator at the second station from him.

By this method a communication can be sent either by short sentences, if there be only one or two sections, or preferably word by word if there be a large number of sections, and, if desired, the words may be recorded by a stenographer at the other end of the line, such operation requiring no more time than an ordinary dictation. When sending a message the communicant at one end of the line, as at *a*, will say one word and will then immediately hear it repeated from the next station, and so be able to correct it, if wrong, and upon hearing will wait just a moment for the first repeating operator to hear the next one repeat it, when he may send the next word, the whole communication thus requiring but slightly more than three times as long as it would to clearly deliver the words in the usual manner, and there being no more likelihood of causing confusion or mistake.

Where a line consists of but two or three or a small number of sections, the conversation may be carried on between the parties in the usual manner, short sentences being sent and then answered; but when the line consists of a large number of sections it is preferable to use trained operators at the terminal stations as well as the intermediate ones and to send the messages word by word, the parties communicating either writing their messages or dictating them to the operator, as most convenient.

It is obvious that this method of communication is also applicable in any case in which it is impossible to transmit directly from one point to another by a continuous circuit, but is possible to have two or more circuits arranged in adjoining series, so that a single operator can control two of the said series simultaneously.

I claim—

1. The combination, with a telephone-line passing through an intermediate station, of telephonic apparatus at said station, comprising a battery-transmitter connected with the branches of the line on both sides of said station and a separate receiver in each branch, substantially as described.

2. The combination, with distinct lines of communication or the contiguous sections of a telephone-line, of transmitting apparatus common to said lines or sections, and independent receiving apparatus for each line or section, substantially as described.

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

THOMAS A. WATSON.

Witnesses:
JOS. P. LIVERMORE,
G. W. GREGORY.