(No Model.) 2 Sheets—Sheet 1.

A. GRAHAM.

TELEPHONE SYSTEM.

No. 563,920. Patented July 14, 1896.

Fig. 1.

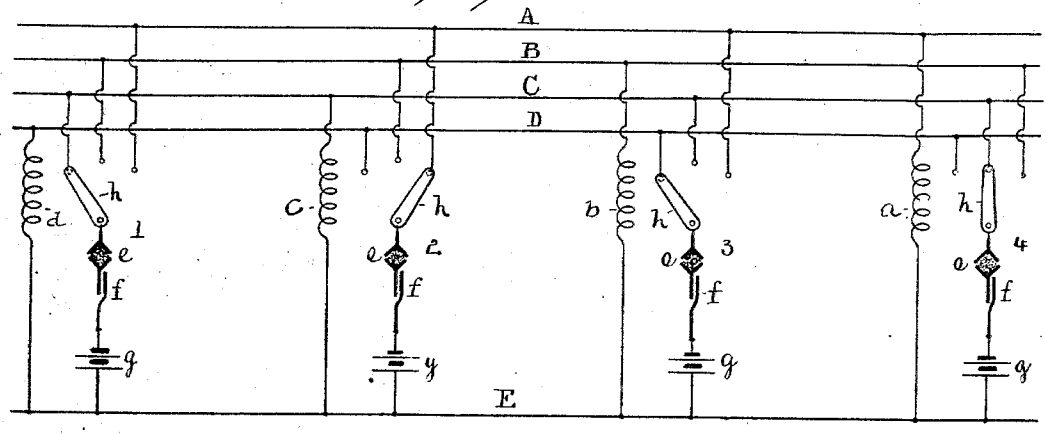
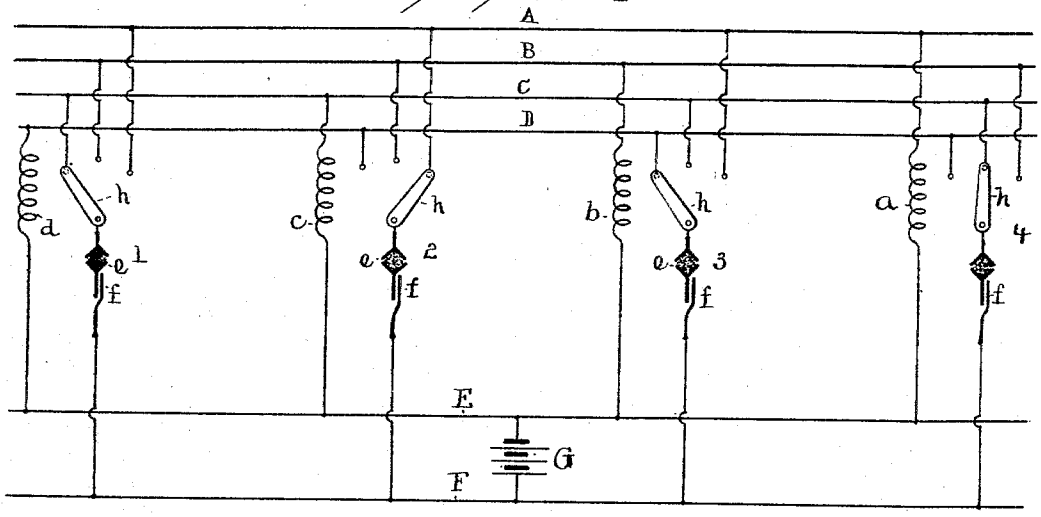


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

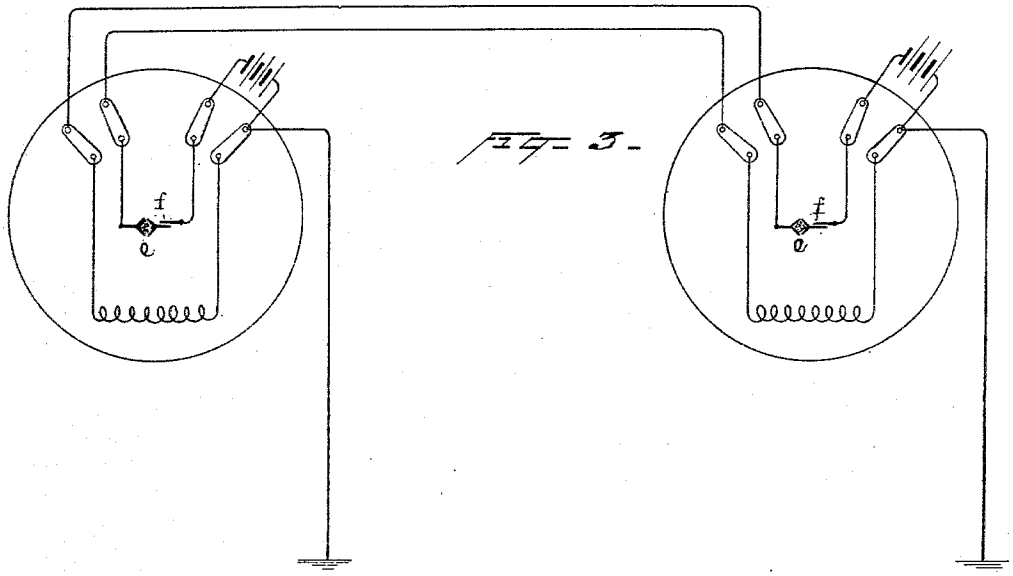
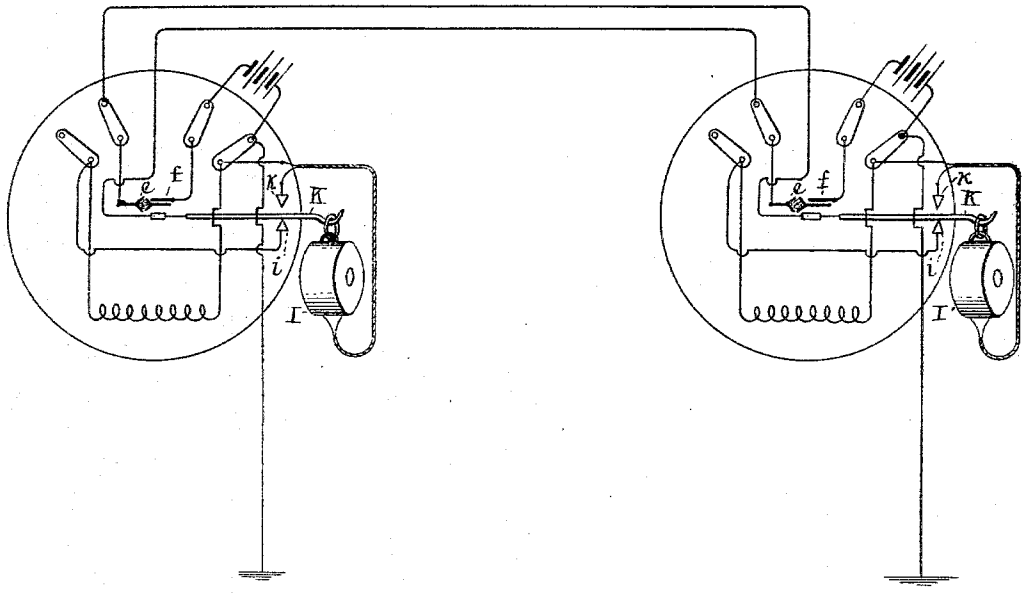


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALFRED GRAHAM, OF LONDON, ENGLAND.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 563,920, dated July 14, 1896.

Application filed May 3, 1894. Serial No. 509,951. (No model.)

To all whom it may concern:

Be it known that I, ALFRED GRAHAM, a subject of the Queen of Great Britain, residing at London, England, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a specification.

The object I have in view is a simple and effective arrangement of telephone-circuits, whereby loud-speaking apparatus can be employed, doing away with the necessity of call-bells, &c.

My object further is to provide a system of this character capable of connecting together a number of stations, so that there may be intercommunication without the necessity of an exchange or similar switchboard, and at the same time giving the advantages of an exchange system with one telephone on each line, in the ability to establish communication between any two stations without disturbing the apparatus at other stations and without the possibility of the conversation being overheard at other stations. This I accomplish by placing the telephone-receiver of each station in an independent circuit which extends to one or more other stations in the system, so that the transmitter at any station may be connected with any one of the receivers without passing through the receiver of any other station. Each receiver being in an independent circuit, there will be connected with this circuit when in operation only the transmitter and receiver and the battery to supply the current. This enables the effective employment of loud-speaking telephones, so that no call-bells are required.

In a system in which only two stations are employed there will be an independent wire for each receiver, and the transmitter at one station will be connected with the receiver at the other station through this wire.

In a system employing more than two stations the transmitter at each station will be connected with a switch-arm by means of which it can be connected to any one of the receiver-wires of the system. The apparatus may also be provided at each of the two or more stations with a silent receiver which may be used in carrying on the conversation if it is not desired that it should be overheard by other persons in the same room. This silent receiver may be hung on a switch-arm which will maintain the loud-speaking receiver normally in circuit by the weight of the silent receiver, but which will throw the loud-speaking receiver out of circuit and the silent receiver into circuit when the silent receiver is removed from the switch-arm.

In the accompanying drawings, forming a part hereof, Figure 1 is a diagram of a system of four stations embodying my invention. Fig. 2 is a similar diagram showing the employment of one battery to work all the lines. Fig. 3 is a view of the simplest form of the invention, illustrating two stations. Fig. 4 shows the employment of the silent receiver.

Referring to Fig. 1, A, B, C, and D are four line-wires with which are connected receiving-telephones *a b c d*. These receivers are connected with the wires at the stations 1, 2, 3, and 4, to which all the wires run. A common return-wire E connects all the receivers together. At the four stations are telephone-transmitters *e*. These are connected through normally open circuit-controllers *f* and batteries *g* to the common return-wire E. The other wire from each transmitter is connected to a swinging switch-arm *h*, whose free end is adapted to be moved into connection with any one of three contacts. These contacts at each station are connected by wires with the three line-wires to which the receivers of the other stations are connected. The contacts at each station are numbered on the board on which they are mounted with the numbers of the other stations, as shown. Thus the transmitter at station 1 can be connected with the receivers of stations 2, 3, and 4. The transmitter at station 2 can be connected with the receivers of stations 1, 3, and 4, and likewise with the other stations.

In Fig. 1 stations 2 and 4 are connected together and stations 1 and 3 may be considered as not in use. The operator at station 2 talks over the line A to the receiver at station 4, while the operator at station 4 talks over the line C to the receiver at station 2. When the conversation is completed, the switches may be left as they were in use. When one user desires to call up another, he throws his switch-arm *h* onto the button bearing the number of the other station. He then

closes the circuit-controller *f*, which produces a sound in the receiver of the station being called. He then calls through his transmitter, giving his name or number, and the loud-speaking receiver may be heard by the person at the other station, who then moves his switch-arm onto the contact for the station which is calling him, and the apparatus will be ready for the commencement of conversation.

Since the receiver at a station is connected to its own independent wire and cannot be connected to any other receiver-wire, the conversation cannot be overheard.

In Fig. 2 the same arrangement is shown as in Fig. 1, except that in place of a single return-wire E, two return-wires E F are employed, and a single battery G is placed between the two return-wires, which answers for all the stations.

In Fig. 3 a simple system of two stations is shown. Two batteries are shown in the figure, but a single battery placed in the common return may be employed. In the operation of the apparatus, each circuit will contain only a transmitter, receiver, and the operating-battery, and with transmitters and receivers adapted for the purpose loud talking can be secured.

In Fig. 4 the addition of the silent receiver is shown. This receiver (shown at I) is hung upon a switch-hook K, playing between two contacts *i k*. When the silent receivers are hung upon their hooks, the switch-arms will rest on the lower contacts *i*, and the loud-speaking receivers will be in circuit; but when the silent receivers are removed from the hooks, the switch-arms will move to the upper contacts *k*, opening the circuits through the loud-speaking receivers, and closing them through the silent receivers.

It is evident that the silent receivers may be used in systems having any number of stations, and it is also evident that my system is applicable to any number of stations for which it may be found practicable to run independent wires.

The system is especially adapted for use in factories, houses, hotels, offices, &c., where it is desired to connect together a number of stations or in small towns where the expense of a local exchange may be advantageously avoided.

Forms of a transmitter and receiver well adapted for use with this system and capable of producing loud and clear articulation are described in applications for patents of even date herewith, Serial Nos. 509,950, 509,951, and 509,952, but since other instruments may be used, I do not wish to limit this invention to the particular forms of instruments described in such applications.

What I claim as my invention is—

1. In a telephone system having two or more stations, the combination of independent receiver-circuits, a talking-receiver at each station connected permanently with its particular receiver-circuit, a talking-transmitter at each station adapted to be connected in circuit with any one of the receiver-circuits of the distant stations, and a return-circuit or ground connected between the transmitter and receiver at each station, substantially as set forth.

2. In a telephone system having three or more stations, the combination of a separate line-wire for the receiver of each station, extending to two or more other stations, and having a talking-receiver connected permanently therewith, with transmitters at the several stations, a switch at each station for connecting the transmitter of that station with the receiver-wire of any other station, and a return-circuit or ground connected between the transmitter and receiver at each station, substantially as set forth.

3. In a telephone system having three or more stations, the combination of a separate line-wire for the receiver of each station, extending to the two or more other stations, and having the talking-receiver connected permanently therewith, with transmitters at the several stations, a switch at each station for connecting the transmitter of that station with the receiver-wire of any of the other stations, a normally open circuit-closer in the transmitter-circuit at each station, and a return-circuit or ground connected between the transmitter and receiver at each station, substantially as set forth.

4. In a telephone system having two or more stations, the combination of independent receiver-circuits, a talking-receiver at each station connected permanently with its particular receiver-circuit, a talking-transmitter at each station adapted to be connected in circuit with any of the receiver-circuits of the distant stations, a wire common to the talking-receivers, a wire common to the talking-transmitters, and a battery connecting said wires, substantially as set forth.

5. In a telephone system having two or more stations, the combination with independent receiver-wires and loud-talking receivers connected with such wires, of silent receivers at such stations and a switch at each station for substituting the silent receiver for the loud-talking receiver in the circuit, substantially as set forth.

This specification signed and witnessed this 25th day of April, 1894.

ALFRED GRAHAM.

Witnesses:
EUGENE CONRAN,
W. PELZER.