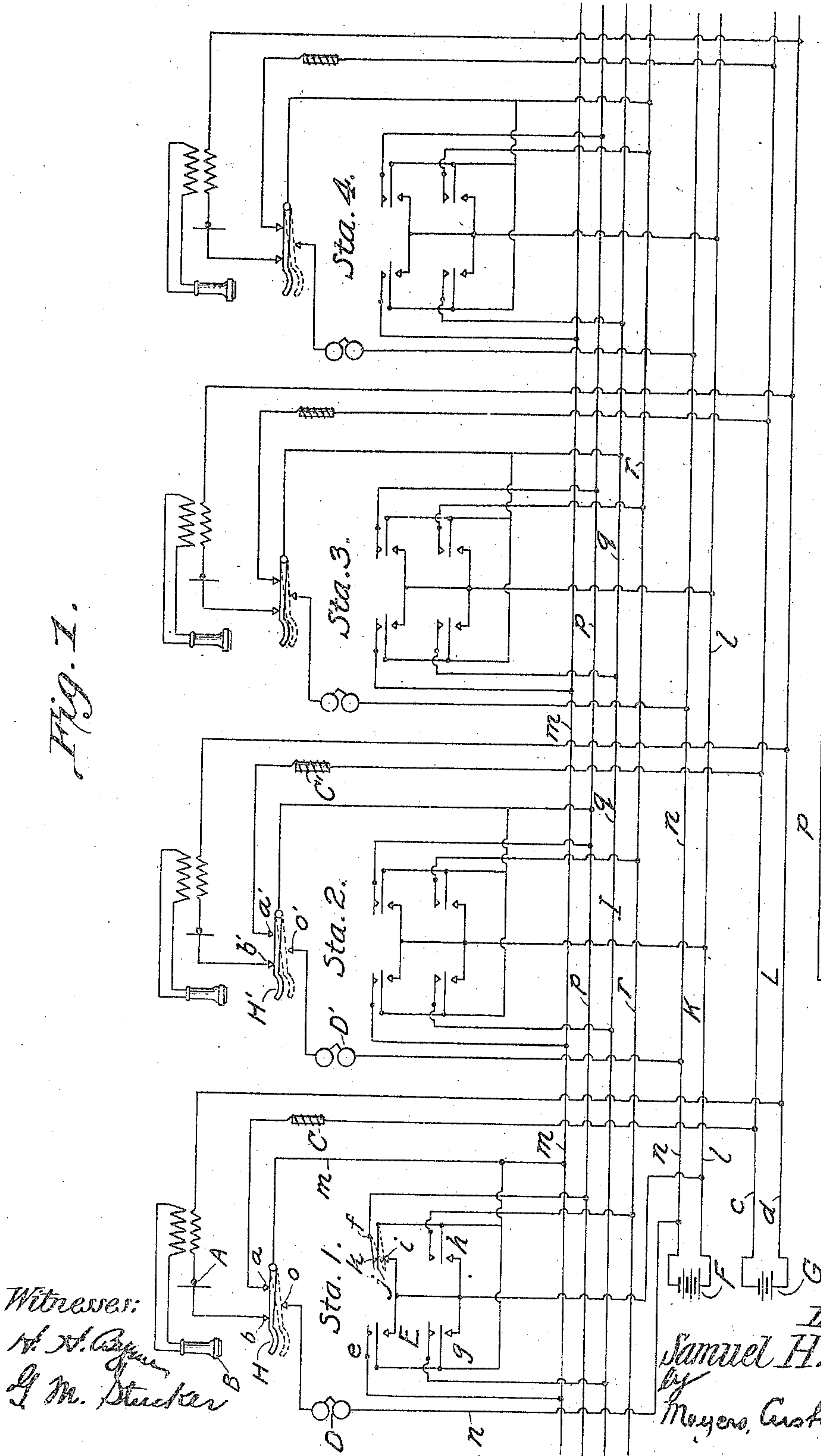


S. H. COUCH.
TELEPHONE SYSTEM.
APPLICATION FILED JUNE 2, 1906.

951,558.

Patented Mar. 8, 1910.

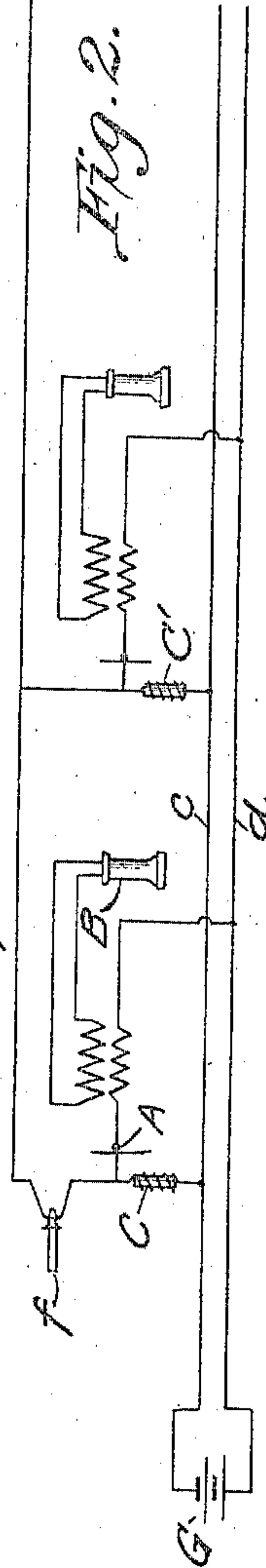
Fig. 1.



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Fig. 2.



UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

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To all whom it may concern:

Be it known that I, SAMUEL H. COUCH, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Telephone Systems, of which the following is a specification.

This invention relates to telephone systems and more particularly to those systems in which a common battery is used for supplying the energy to different talking circuits, in which certain of the conductors are common to different circuits and where selective apparatus is provided at each of the different stations whereby communication can be established with any of the other stations.

The object of the present invention is to provide a system of the character above outlined which shall accomplish the desired objects without cross-talk or other disadvantages usually incident to such systems and which shall be simple in design and operation.

Systems of the character referred to have heretofore been proposed and have been more or less successful. They all have required, however, that, in order to place any two stations in communication, the telephones at these stations should be connected in certain relations to each other and to the source of supply, these relations being different for each pair of telephones.

According to the present invention the telephones are connected in precisely the same relation to each other and to the source of supply whichever of the stations are to be placed in communication and the selection of stations which are to communicate is effected by establishing an electrical connection between the respective junctions of the telephones and retarding coils of the two stations. This will be more fully set forth hereinafter in connection with the accompanying drawings which illustrate the invention and of which—

Figure 1 is a diagram setting forth the apparatus and connections of a system constructed according to this invention, and Fig. 2 is a simplified diagram showing the relative connections of the apparatus of stations connected for conversation.

Referring to the drawings the apparatus at each of the stations comprises a telephone consisting of a microphone A, and a tele-

phone receiver B inductively connected to the circuit of the microphone in the usual manner, a retardation coil C, a signal such as a bell D, a selective device E and a receiver hook H of usual construction adapted to rise and effect certain contacts when the receiver is removed and to be depressed by the weight of the receiver to make certain other contacts. A suitable source of current, as a battery F, supplies the signaling or ringing current for all the stations while a suitable source of current, as battery G, supplies the talking current for all the stations. Extending to all of the stations are a number of selective conductors I, one corresponding to each station. From the battery F conductors K extend to all of the stations and in a similar manner conductors L extend from the battery G to all of the stations.

Referring to the drawings in detail, it will be seen that the telephone comprising the microphone and the receiver, the contacts *a* and *b* adapted to be closed by the hook H when the receiver is removed, and the retarding coil C, are connected in a circuit, the extremities of which are connected respectively to the conductors *c* and *d* extending from the battery G.

The selective device comprises a plurality of switches *e*, *f*, *g* and *h*, there being as many of these switches as there are stations, in this case four. Each switch comprises a lower contact *i*, a middle tongue *j* of conducting material and a conducting key *k*. The lower contacts of all these switches are connected with the conductor *l* extending from the battery F. The middle tongues of all the switches are connected with the hook H and the hook H is also connected with one of the selective conductors *m*.

The bell D is connected in a circuit which on the one hand terminates in the conductor *n* extending from the battery F and on the other, in the selective conductor *m*, the circuit through the signal being closed when the receiver is upon the hook and the latter depressed into contact with the contact *o*. Since the tongues *j* of the selective switches are connected to the selective conductor *m* these tongues will also be connected with the signal. It will now be apparent that circuit will be made through the battery and signal when the receiver is in position upon the hook and any one of the keys *k* is depressed,

thereby throwing its corresponding tongue j into contact with the contact i .

The apparatus at each of the stations is the same and is similarly connected with the exception that each station has its corresponding or "home" conductor. Thus at station 2 of the drawing, the tongues j and the receiver hook H' are not connected to the selective conductor m which is the "home" conductor to station 1, but are connected to the selective conductor p which is the "home" conductor to station 2. In a similar manner it will be understood that the other stations will have their own conductors, thus the "home" conductor of station 3 will be q and that of station 4, r , and so on.

Suppose now that a person at station 1 desires to call and converse with some other station, as 2. The first operation is to press the key k of the switch which corresponds with the station which it is desired to call, in this case switch f . When the key k has pressed the tongue j into engagement with the contact i , circuit may be traced from the conductor n through the bell D , contact o , hook H , tongue j of the switch f , contact i to conductor l , thus placing the bell D across the battery F and causing it to ring. Circuit can also be traced from the tongue j of the switch f through its key k , selective conductor p , hook H' , contact o' and bell D' to the conductor n . The signal D' will now be seen to be connected across the terminals of the battery F and it will ring. Station 2 having been thus called the key k is released whereupon the tongue j moves out of engagement with the contact i but remains in engagement with the key k . The receivers being removed from both hooks H and H' , when these hooks rise and make contact with the contacts a and b , a' and b' respectively. Circuit can now be traced from the conductor c through the retarding coil C , contacts b and a , and the telephone to conductor d , the retarding coil and the telephone being connected across the terminals of the battery G . In a similar manner circuits can be traced showing that the retarding coil C' and the telephone at station 2 are connected across the terminals of the battery G . The retardation coils C and C' are especially designed to prevent the passage of voice currents and therefore the telephones of the two stations although connected in closed circuit could not successfully communicate with each other. It will be remembered, however, that the hook H is connected with the tongue j of each of the selective switches and therefore circuit can be traced from the hook H through tongue j of the switch f , key k of the same switch, and selective conductor p to the hook H' . Each of the receiver hooks is connected with contacts located between the telephone and the retarding coil at each

station and therefore the circuit just traced whereby the hooks are connected operates to connect the junction of the retarding coil and the telephone at one station with the corresponding junction at the other station. The telephone of the two stations are by this means connected in a closed low resistance circuit, one end of each of the telephones being connected with one side of the battery G while the other ends of the telephones are connected through the retarding coils C and C' with the other side of the battery G . This is clearly shown in Fig. 2 which simply shows the relative connections of the telephones, retarding coils and battery. It may also be observed that the telephones are connected in parallel with each other and in series with the retarding coils between the two terminals of the battery G . Current will therefore flow through the telephones and retarding coils (the latter offering slight resistance to the passage of continuous current) from one terminal of the battery to the other, the current dividing between the telephones according to their resistance. The laws according to which current divides in parallel conductors is well understood. When a party at one of the stations speaks into the transmitter he causes a variation in its resistance as is well understood and thereby establishes different relative resistances in the two parallel conductors containing the telephones with the result that variation of current is caused in both the telephones, the variation in one corresponding to the variation in the other and thus vibrations are produced in the receiver of one telephone corresponding to those which are directed against the transmitter of the other telephone. On account of the low resistance connections between the telephones, each is extremely sensitive to any variation in the other. The retardation coils, however, which are interposed between the telephones on the one hand and one terminal of the battery G on the other, prevent voice currents from any other station than those selectively connected together from entering those telephones which are in conversation therefore cross-talk is avoided between pairs of stations which are not selectively connected together but which may be in operation at the same time. Any other of the stations of the system might have been selected to be connected with station 1 by operating the proper selecting switch and thereby establishing connection of the apparatus of station 1 with the selective conductor corresponding to the station selected and in a similar manner any station might be called from any other station as well as station 1. The operation of calling at all the stations is the same and the circuits traced between any calling station and the particular called station are exactly analogous to those traced between the call-

ing station and any other called station except that in every case a station is called over its particular selective conductor.

The invention has been illustrated in what is considered its best embodiment, but it may be embodied in other structures and should not therefore be limited to the structure shown.

What I claim is:—

1. In a telephone system, the combination with two stations, each comprising a telephone, a receiver hook and contacts adapted to be closed by said hook when the receiver is removed, a retarding coil at each station, said contacts being located between the telephone and retarding coil, a source of current, the said retarding coil, telephone and contacts of each station being connected in series in a circuit across the terminals of said source when the receiver is off the hook, and means for connecting the hooks independently of said circuits.

2. In a telephone system, the combination with a plurality of stations, each comprising a telephone, a receiver hook and contacts adapted to be closed by said hook when the receiver is removed, of a retarding coil at each station, said contacts being located between the telephone and retarding coil, a source of current, conductors extending between the stations, the said retarding coil, telephone and contacts of each station being connected in series in a circuit across the terminals of said source when the receiver is off the hook and means, comprising selective means at each station, for connecting the hook of each station with the hook of any other of the stations independently of the said circuit at each of the stations.

3. In a telephone system, the combination with a plurality of stations each comprising a telephone and a retarding coil, selective conductors extending to all the stations, there being a single selective conductor corresponding to each station and independent of the bus wires, a source of current, conductors extending from the terminals of said source to all the said stations, the retarding coil and telephone being located in a circuit having its extremities connected to the conductors extending from the source, a conductor at each station adapted to connect the junction of its telephone and retarding coil with the selective conductor corresponding to the particular station and selective means at each station adapted to connect the said junction with any other one of the selective conductors.

4. In a telephone system, a plurality of stations, a ringing battery, a pair of bus wires extending therefrom to all the stations, a talking battery, a pair of bus wires extending therefrom to all the stations, an additional wire connecting a calling and a called station, and coöperating with said

ringing bus wires to form the calling circuit, and with said other bus wires to form the talking circuit, a selector switch for first connecting said wire in the calling circuit and then breaking said connection and connecting said wire in the talking circuit.

5. In a telephone system, a plurality of stations, a ringing battery, a talking battery, a pair of bus wires extending from each battery to all of the stations, one selector conductor only for each station independent of the bus wires also extending to all the stations, a local circuit at each station containing a telephone and a retardation coil, all of said circuits being normally open, and permanently connected in multiple across said talking bus wires, and means for selecting any one of said selective conductors and connecting it in a circuit comprising either the talking or ringing battery.

6. In a telephone system, the combination with a plurality of stations, each comprising a telephone, a retarding coil, a receiver hook and contacts adapted to be closed by the said hook when the receiver is removed, of a source of electricity, conductors extending from the terminals of said source to all of said stations, selective conductors, one corresponding to each station, extending to all of said stations, the telephone, the said contacts and the retarding coil of each station being connected in series in a circuit having its extremities connected to the conductors extending from the source, the said contacts being located between the telephone and retarding coil, a conductor independent of said circuit at each station connecting the hook with the selective conductor corresponding to the station and selective means at each station adapted to connect the hook with any other one of the selective conductors.

7. In a telephone system, the combination with a plurality of stations, each comprising a telephone, a retarding coil, a receiver hook and contacts adapted to be closed by the said hook when the receiver is removed, of a source of electricity, conductors extending from the terminals of said source to all of said stations, selective conductors, one corresponding to each station, extending to all of said stations, the telephone, the said contacts and the retarding coil of each station being connected in series in a circuit having its extremities connected to the conductors extending from the source, the said contacts being located between the telephone and retarding coil, a conductor at each station connecting the hook with the selective conductor corresponding to the station, selective means at each station adapted to connect the hook with any other one of the selective conductors, a second source of electricity, conductors extending therefrom to all the stations, a signal at each station having one terminal connected with one termi-

nal of said second source, a contact at each station connected with the other terminal of said signal and adapted to be engaged by the hook when the receiver is in position thereby connecting the signal with the selective means, said selective means being connected with the other terminal of said second source whereby the signal at the calling station is connected across the conductors extending from the terminals of the second source and the selective conductor corresponding to the station called is connected to one of the conductors extending from the second source thereby connecting the signal of the called station across the conductors extending from the second source.

8. In a telephone system, a plurality of stations, a receiver hook at each, a pair of bus wires connected to a source of current, and extending to all stations, and a normally open local circuit at each station comprising a receiver energizing means, a transmitter, and a retardation coil connected permanently in series with contacts controlled by said hook, all of said circuits being connected in multiple across said bus wires, and each circuit being independently closed across the bus wire by the removal of the receiver from the hook, selector conductors one for each station independent of said bus wires for connecting one station with another.

9. In a telephone system, a plurality of inter-connected stations, a receiver hook at each, a pair of bus wires connected to a source of current, and extending to all stations, normally open local circuits, one at each station, connected across said bus wires in parallel, each of said circuits comprising a transmitter, a retardation coil, and a re-

ceiver energizing means, all connected permanently in series with contacts controlled by said receiver hook, and a conductor independent of said series circuits connecting the receiver hooks of a calling and a called station, and coöperating with one of the bus wires to form the talking circuit.

10. In a telephone system, the combination of receiver energizing means, a transmitter, and a retarding coil at each station, a source of power across which said elements are connected, bus-lines common to all stations extending from said source, and means comprising a single conductor for placing the transmitters of a pair of stations in parallel with each other, in series with the corresponding retarding coils, and across the bus lines from the source to form a communicating circuit.

11. In a telephone system, the combination of a receiver energizing means, a transmitter, and a retarding coil at each station, the transmitters and receiver energizing means of each station being permanently connected in series, a source of power across which said elements are connected, bus lines common to all the stations extending from said source, and means comprising a single conductor for placing the transmitters and receiver energizing means of a pair of stations in parallel with each other, and in series with the corresponding retarding coils, and across the bus lines from the source to form a communicating circuit.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SAMUEL H. COUCH.

Witnesses:

WILLIAM COUCH,
FRANK H. WUEST.