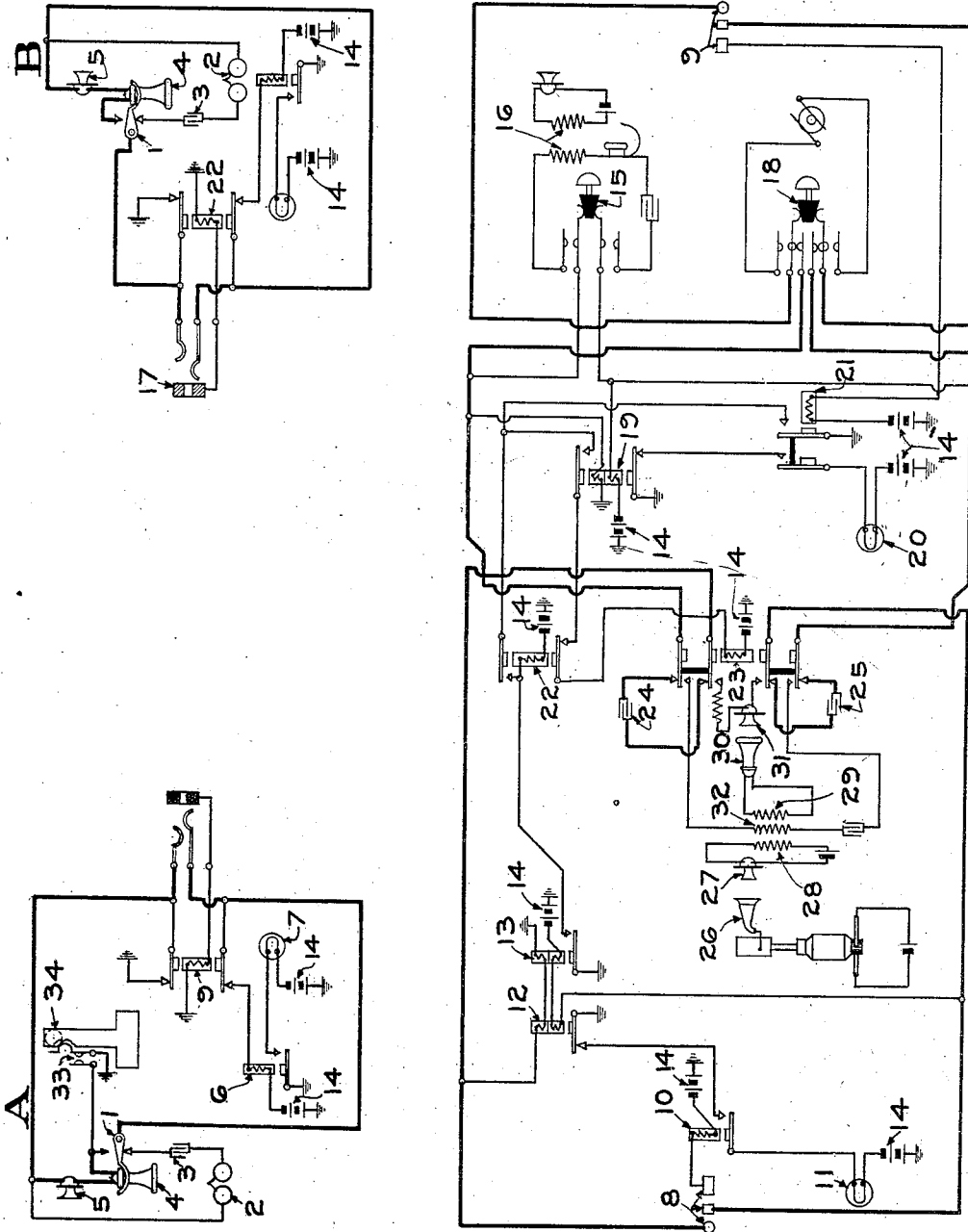


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TELEPHONE EXCHANGE SYSTEM.
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TELEPHONE-EXCHANGE SYSTEM.

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To all whom it may concern:

Be it known that I, MORTON L. JOHNSON, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone exchange systems and has for one of its objects the provision of improved means whereby called parties may talk with prepayment calling parties before the calling parties have deposited their tokens or otherwise operated apparatus which requires prepayment or charge before connection is established.

My invention has for another of its objects the provision of means whereby the called party may receive some manifestation to satisfy him that he is being sought by some calling party without at the same time permitting the calling party to converse with him.

I will explain my invention in its preferred embodiment, to which embodiment the invention is not to be limited, the drawing illustrating a calling prepayment station and a called station whose lines extend to the same exchange and which lines are adapted for telephonic connection through the agency of cord connector equipment. The system, as illustrated, is thus a manual telephone exchange system, though it will be apparent that the invention does not depend upon the employment of manually operated link connectors and I do not therefor limit myself to manual exchange practice.

The prepayment or precharge station A, of which there are of course a number, and the called station B, which may or may not be a prepayment or precharge station, are illustrated as being each provided with the usual telephone equipment including a telephone receiver switch hook 1 having a normal contact for connecting the line sides through a signal bell 2 and a condenser 3 when the telephone receiver 4 is upon its switch hook. The switch hook has an alternate contact whereby the telephone receiver 4 and telephone transmitter 5 are included across the line sides when the tele-

phone receiver is removed from its switch hook. Assuming that the invention is embodied in the manual exchange system illustrated and that the party at station A is initiating a call, the receiver 4 at the calling station A is free of its switch hook to permit said switch hook metallically to connect the sides of the calling line whereby circuit is established through the line relay 6 which in turn establishes circuit through the line signal 7. In case of a manual exchange system, an operator having charge of the signal 7 will insert an answering plug 8, of the selected one of a number of link connectors with which the operator is provided, within the jack of the calling line thereby to operate the cutoff relay 9 thereby to efface the calling line signal at 7, all as is well understood by those skilled in the art. The cutoff relay circuit includes a relay 10 that closes one gap in the circuit of the calling subscriber's supervisory signal 11. The remaining gap in this supervisory signaling circuit is opened by the supervisory relay 12 when the calling subscriber's telephone receiver is free of its hook, circuit for this relay being traceable from the upper grounded winding of the differential relay 13, the upper coil of supervisory relay 12, the tip of the answering plug 8, the tip jack spring of the calling line, the telephone bridge at the calling station A, the sleeve jack spring of the calling line, the sleeve contact of the answering plug 8, the lower winding of supervisory relay 12, the lower winding of differential relay 13 to the grounded battery 14 which may be a battery common to the exchange. When the calling subscriber restores his receiver upon its switch hook the circuit just traced is broken at the switch hook whereby the display by the calling subscriber's supervisory signal 11 is effected. The relay 13 is introduced in practicing my present invention. The two coils of this relay are differentially wound so that the relay is not effectively energized when both of these coils are included in circuit by way of the telephone bridge at the calling station A, this telephone bridge serving to make these coils of equal opposing effectiveness. The operator manipulates her listening key 15 to bridge her telephone set 16 between the sides of the connecting

link circuit for the purpose of receiving from the calling station the number of the desired line. The operator will thereupon take the connecting plug 9 for use and insert the same within the spring jack 17 of the line leading to the called station, assumed to be station B, the operator first having made the test with the tip of the plug 9 if the system is a multiple switch board system and as testing facilities are well known such will not be described in connection with my present invention. The connecting plug 9 having been inserted, ringing current is sent to the signal bell at the called station upon the depression of a ringing key 18 as is well understood by those skilled in the art. When the called subscriber responds his line sides are metallically connected by his telephone bridge whereby circuit is established through his supervisory relay 19 to open one gap in the circuit of his supervisory signal 20, the other gap in this supervisory signaling circuit having been closed by the operation of a relay 21 whose circuit was established when the plug 9 was inserted within the called line jack 17, the circuit for this relay 21 being traceable from the battery 14, the heel of the plug 9, the thimble of the jack 17, to the grounded cutoff relay 22.

As is well known, when the called subscriber restores his receiver upon its switch hook the circuit for the relay 19 is opened so that the circuit for the supervisory signal 20 is established. The called subscriber now having his telephone free of its switch hook and his supervisory relay 19 being now energized, a circuit is established which is traceable from the right hand grounded armature switch of relay 21 and its now engaged contact, the upper armature switch of relay 19 and its now engaged contact, the lower and now unattracted armature switch of relay 22 and its contact, the relay 23, to the grounded battery 14. The two upper armature switches of relay 23 are provided with normal contacts that are connected through a condenser 24 and the two lower armature switches of this relay 23 are provided with normal contacts that are connected through a condenser 25. When the relay 23 is deenergized the tips of the plugs 8 and 9 (assuming the ringing key 18 to be in its idle position) are connected by way of the serially related upper armature switches of relay 23, their normal contacts, and the condenser 24, while at the same time the sleeves of the plugs 8 and 9 are connected by way of the serially related lower armature switches of relay 23, their normal contacts, and the condenser 25.

When the relay 23 is energized, as was previously described, its armature switches are disengaged from their normal contacts so that a gap is introduced in the connec-

tions uniting the tips of the plugs 8 and 9 and a gap is introduced in the connections uniting the sleeves of the plugs 8 and 9 so as to prevent the link connector employing the plugs 8 and 9 from normally performing its function of telephonically uniting calling and called stations, voice currents impressed upon the calling line by the calling subscriber being unable to jump the gaps in the sides of the link connector that are formed upon the energization of the relay 23, it being incumbent upon the calling party to deposit the coin or otherwise perform some act that will impose the cost of the connection upon him before the gaps that telephonically separate him from the called party are closed. The calling party awaits instruction from the exchange before performing the act that will place him in full telephonic connection with the called party, and such instructions are desirably automatically conveyed by means of a phonograph 26 which speaks into a telephone transmitter 27 at intervals, the circuit of this transmitter including a primary coil 28 from which current is induced into a secondary coil 29 included in local circuit with a telephone receiver 30 placed before a telephone transmitter 31. The terminals of the transmitter 31 are connected with the alternate contacts of the two intermediate armature switches of relay 23 which constitute terminals of the answering end of the link connector joining the called and calling lines and when the armature switches of relay 23 are attracted the speech from the phonograph 26 is transmitted to the calling subscriber's telephone receiver 4. The phonograph may be arranged to give the calling subscriber some suitable notice such as "Drop a nickel please" or "Register your connection".

The top and bottom armature switches of relay 23 constitute terminals of the connecting end of the link connector and are provided with alternate contacts that constitute terminals of a coil 32 secondary to the primary 28. When the armature switches of relay 23 are attracted the coil 32 is in circuit with the called station. The phonograph 26 may be caused to say into the transmitter 27 "What is your number please" and the called party will respond so that the calling party may know whether or not he has secured the right station, the coil 32 becoming a primary when the called party responds to the request for his number, whereby the telephonic current in the coil 32 sets up similar current in the coil 29 and receiver 30, the receiver 30 causing the operation of the transmitter 31 and thereby the operation of the telephone receiver 4 at the calling station. The phonograph 26 does not instruct the calling subscriber to deposit his coin

until the coil 32 is connected with the calling line, and the calling line cannot be connected with the coil 32 until the called subscriber has responded, by which arrangement the message "Drop a nickel please" 5 conveyed to the calling subscriber also informs the calling subscriber that the called subscriber has responded.

The calling station A is shown as being 10 equipped with a switch 33 whose contacts are engaged by a token 34 when deposited (though the invention is not to be limited to the employment of token receiving apparatus at the calling station), a path being 15 established upon the engagement of the contacts 33 which may be traced from the grounded one of these contacts through the other contact, the switch hook 1 at the calling station and its alternate contact, the sleeve spring of the jack of the calling line, 20 the sleeve contact of the answering plug 8, the lower winding of the supervisory relay 12, the lower winding of the differential relay 13, to the grounded battery 14. Each 25 winding of each relay 12, 13 may be wound to 100 ohms resistance, assuming a voltage of forty volts for the battery 14. Thus when the contacts 33 are engaged the differential coils of relay 13 are thrown out of 30 balance to cause its armature to be operated whereby circuit is established through the relay 22. As the contacts 33 are closed by the token in passing I provide a locking circuit for the relay 22 which may be traced 35 from the grounded battery 14, the winding of the relay 22, the upper armature switch of this relay to the right hand grounded armature switch of relay 21, this locking circuit being broken when circuit for the 40 magnet 21 is interrupted upon the withdrawal of the connecting plug 9 from the jack 17 of the called line. When the magnet 22 is energized its lower armature switch is attracted to intercept the circuit which 45 was previously established through the magnet 23 as a consequence of the energization of the called subscriber supervisory relay 19 whereby the upper armature switches of relay 23 and their normal contacts are serially 50 included in the tip connection between the answering and connecting plugs 8 and 9 and the lower armature switches of relay 23 and their normal contacts are serially included in the sleeve connection between the answering and connecting plugs. The connection 55 between the calling and called stations is now fully established and each station may communicate with the other. When the parties are through supervisory signals are conveyed to the operator in the usual way 60 whereupon the operator withdraws the answering and connecting plugs to restore the equipment to its idle condition.

While I have herein shown and particularly 65 described the preferred embodiment of

my invention I do not wish to be limited to the precise details of construction and circuit arrangement illustrated as changes may readily be made without departing from the spirit of the invention, but

Thus having described my invention I 70 claim as new and desire to secure by Letters Patent the following:—

1. A telephone exchange system including telephone lines extending from subscribers' 75 stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations coöperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching 80 mechanism for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; and electro-magnetic mechanism governed by the aforesaid 85 devices at calling stations equipped therewith in coöperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called 90 stations. 95

2. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation 100 by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism in the link connectors for permitting and preventing passage of 105 telephonic current from calling stations; electro-magnetic mechanism included in the link connectors within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond 110 to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; and electro-magnetic mechanism included in the link connectors 115 and operated by the aforesaid devices at calling stations equipped therewith for operating said switch mechanism to complete connection between calling and called stations.

3. A telephone exchange system including 120 telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete 125 connection between calling and called subscribers, there being means at the subscribers' stations coöperating with these devices and operable by responding called subscribers; link connectors at the exchange 130

for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; and electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations.

4. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and electro-magnetic means in the link connectors for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations, there being means at responding called stations for operating this means.

5. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the

aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

6. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

7. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers; there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and

called stations for current impressed upon calling lines at calling stations.

8. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

9. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; and means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded.

10. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in

the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; and means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded.

11. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; and means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded.

12. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment

when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; and means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded.

13. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

14. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in

conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

15. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded; and means governed by said switching mechanism for completing telephonic connection between called

stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

16. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; means brought into association with calling lines by said switching mechanism when operated upon response of called subscribers for sending current to calling subscribers' equipment to notify calling subscribers to operate their aforesaid devices and by such notification to indicate to calling subscribers that called subscribers have responded; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

17. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection

between calling and called stations; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

18. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

19. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; and means governed by said switching mechanism for completing

pleting telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

20. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors; electro-magnetic mechanism within the control of called subscribers and operated by called subscribers' equipment when called subscribers respond to break telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism operated by the aforesaid devices at calling stations equipped therewith for operating said switching mechanism to complete connection between calling and called stations; means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations; and means governed by said switching mechanism for completing telephonic connection between called stations and the exchange prior to the complete establishment of telephonic connection between calling and called stations whereby called stations may be instructed to mention their numbers.

21. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations coöperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in coöperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations

for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

22. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations coöperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in coöperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations, there being means at responding called stations for operating this means.

23. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations coöperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in coöperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and means for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling

lines at calling stations, there being means at responding called stations for operating this means.

24. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and electro-magnetic means in the link connectors for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

25. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism included in the link connectors for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation

with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and electro-magnetic means in the link connectors for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations.

26. A telephone exchange system including telephone lines extending from subscribers' stations to an exchange at some of which stations are located devices requiring operation by calling subscribers after responses by called subscribers in order to complete connection between calling and called subscribers, there being means at the subscribers' stations cooperating with these devices and operable by responding called subscribers; link connectors at the exchange for uniting lines in conversation; switching mechanism for breaking telephonic connection between calling and called stations for telephonic current impressed upon calling lines at calling stations; electro-magnetic mechanism governed by the aforesaid devices at calling stations equipped therewith in cooperation with the aforesaid means at stations of responding called subscribers for operating said switching mechanism to complete connection between calling and called stations; and electro-magnetic means in the link connectors for completing telephonic connection between calling and called stations for telephonic current impressed upon called lines at called stations when telephonic connection is broken between calling and called stations for current impressed upon calling lines at calling stations, there being means at responding called stations for operating this means.

In witness whereof, I hereunto subscribe my name this third day of August A. D., 1912.

MORTON L. JOHNSON.

Witnesses:

G. L. CRAGG,
ETTA L. WHITE.