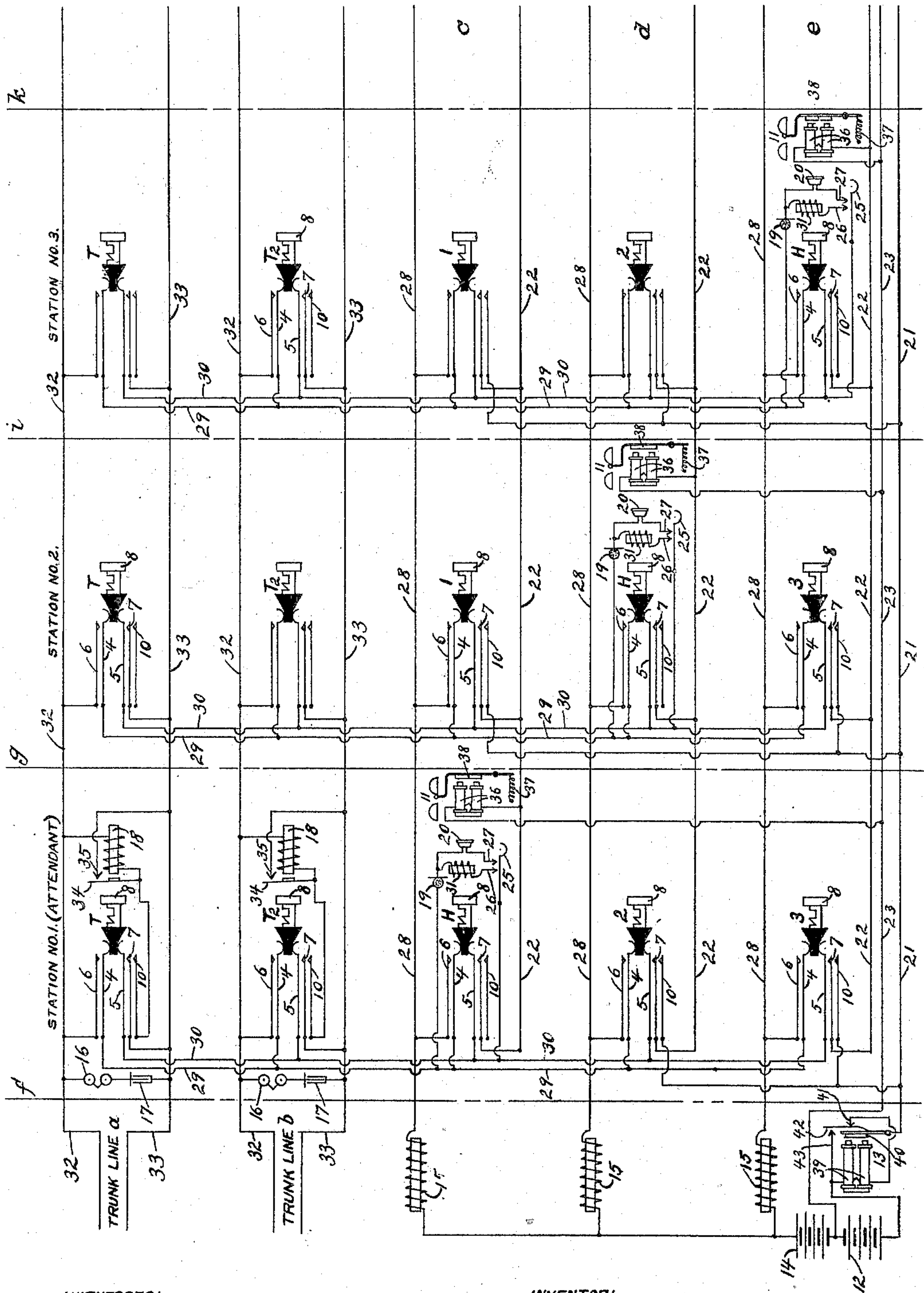


E. R. CORWIN.
INTERCOMMUNICATING TELEPHONE SYSTEM.
APPLICATION FILED SEPT. 23, 1907.

957,869.

Patented May 17, 1910.



WITNESSES:

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INTERCOMMUNICATING TELEPHONE SYSTEM.

957,869.

Specification of Letters Patent.

Patented May 17, 1910.

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To all whom it may concern:

Be it known that I, ELMER R. CORWIN, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Intercommunicating Telephone System, of which the following is a specification, reference being had to the accompanying drawing, illustrating same.

My invention relates to telephone systems, and in particular to such systems wherein a plurality of parties at respective stations may call each other and communicate with each other in pairs throughout the system, the circuit wiring being arranged so that each party may call and converse with any of the other parties on the system; such a system being generally termed an "intercommunicating system."

The principal objects of my invention are to provide efficiency in such a system; to simplify the apparatus and circuit wiring; to provide improved means for receiving incoming calls from trunk lines and for sending out outgoing calls over the trunk lines; to provide an intercommunicating telephone system which is metallic throughout; to provide improved means for ringing the several parties on the system; to improve the impedance arrangement from the several lines to the central source of current; to decrease the number of conductors leading to a telephone set in such a system; and to provide general improvements.

Other objects will be apparent from the following specification.

Generally stated my present invention provides a telephone system in which a number of stations are connected through impedances to a central source of electrical supply, each station being so arranged on the system that by means of suitable switching mechanism thereat it may be connected with any of the other stations on the system as desired, without the intervention of the ordinary telephone central switchboard, for communication between any two parties on the system, such connection also permitting any of the other parties on the system to simultaneously converse with each other. At each station on the system is also provided switching mechanism whereby each of the parties on the system may ring any of the other stations as desired, to signal same for

a connection. The system is also provided with switching mechanism whereby any of the parties on the system may call out to a central exchange over suitable trunk lines, one of the stations on the system (called the attendant's station) being provided with signaling apparatus on the trunk lines for receiving incoming trunk calls, and suitable switching mechanism for answering the trunk calls.

The accompanying drawing illustrates diagrammatically a number of stations and trunk lines on the system of my invention, with suitable connections for the operation and utilization thereof.

The apparatus at the various stations, 1, 2, 3, etc., is included between lines *f g*, *g i*, *i k*, etc., respectively.

Each of the stations on the system is provided with a plurality of push-button keys, such as T, T², H, 1, 2, 3, etc., each key being provided with a pair of spring contact members 4 5 adapted to engage a pair of contact members 6, 7, respectively, when the push-button 8 is depressed, and to lock in this depressed position so as to keep the said contacts closed. Each push-button switch or key is also provided with a contact member 10 adapted to engage contact member 7 when the push-button 8 is depressed past the locking position. All of the keys at any one station on the system are connected with a common locking mechanism whereby the depression of any one of the push-buttons releases any of the other keys at this station which may be in locking position, and allows same to return to normal position, each key being so constructed that it will return to its normal position when the locking mechanism is released.

As there are known in the art several different locking keys and banks of keys which could be readily adapted for use in connection with this invention, it is not thought to be necessary to herein describe, in detail, any particular locking mechanism for the keys herein shown. In this connection it is believed to be sufficient to merely state that each of the keys shown in the drawing locks in a position in which spring members 4 and 5 engage contacts 6 and 7, respectively, and that each key is capable of being further depressed until contact 7 engages contact 10, not locking in this latter position, but re-

turning to the aforesaid locking position when the pressure is removed from the button 8. At each station on the system is a push-button key H called the home key, which connects the transmitter 19 and receiver 20 at that station across the line of that station for use.

The local lines of the intercommunicating system are designated on the drawing by *c*, *d* and *e*, respectively. Each of the keys at a station is adapted to connect the transmitter 19 and receiver 20 of that station across the various local lines of the system, respectively, or across a trunk line. At each station on the system is provided an interrupted-current ringer 11 adapted to be rung from a central battery 12 through an interrupter 13, from any of the other stations on the system. The ringers 11 are rung from a pulsating current from battery 12, produced by the interrupter 13 when the circuit of battery 12 is closed through the interrupter 13 and a ringer 11. When this latter circuit is closed the operation of the interrupter 13 is as follows:—First the current through the double coil magnet 39 of interrupter 13 causes the armature 40 thereof to be attracted to the poles of the magnet, the armature thus breaking contact 41 42 and closing contact 42 43 which latter contact now connects battery 12 direct with conductor 21. As contact 41 42 is now broken, the magnet 39 becomes deenergized whereupon the armature 40 recedes from the poles of magnet 39, thereby opening contact 43 42 and closing contact 42 41. Now the magnet becomes reenergized with current from battery 12 and again produces the cycle of operations just described above. It will be seen that with this interrupter a pulsating current is produced which has double the frequency of such a current produced by ordinary interrupters such as buzzers or direct-current bells. With this high frequency pulsating current the ringers 11 may be rung harder, even with a slower operation of the interrupter 13. Each ringer 11 serves as an impedance from the central talking battery 14 to one side of its line, there being provided an impedance coil 15 connected from the central talking battery 14 to the other side of the line, for each station. There are no contacts at the ringers 11 to be operated when the ringer is operated, each ringer simply comprising a double-coil magnet 36 bridged direct from conductor 23 to the corresponding line conductor 22, and having a spring 37 for pulling the armature 38 away from the poles of the magnet when the latter is not magnetized. Such a ringer may be operated with a pulsating current in either direction in the circuit and is therefore not a polarized ringer. It is clear, however, that polarized ringers could be used at the several stations on the

system of this invention. Across each trunk line *a*, *b*, etc., at the attendant's station, are bridged a ringer 16 and a condenser 17, through which the operator at a central exchange may send a ringing current to signal the attendant on the intercommunicating system. On each of the trunk lines is also provided a relay 18, at the attendant's station, which is arranged to automatically bridge itself across the trunk line when the trunk key at the attendant's station is depressed so that contact 7 engages contact 10, to avoid giving a disconnect signal on the trunk line to the operator at the central exchange when the attendant presses a local-line key at his station to call a local station and thereby releases the trunk key. This will be more fully described in the description of the operation of the system.

The operation of the system is as follows: To show how one party on the system calls another party on the system and how connection is made for conversation between these two parties, I will assume that the party at station 1 calls the party at station 3, and will trace the operations and connections necessary to enable the party at station 1 to converse with the party at station 3. It will be understood that any party on the intercommunicating system may call and converse with another party on the system in a manner similar to that next hereinbelow described, even if other stations on the system are busy; the ringing circuits having one individual conductor, and a common-return, for each ringer, and the talking circuits being metallic throughout. In calling the party at station 3, the party at station 1 first depresses his push-button key 3 to the ringing position, that is until contact 7 thereof engages contact 10, and thereby closes a circuit from ringing battery 12 through interrupter 13, conductor 21, contact 10 7 of key 3 at station 1, limb 22 of line *c*, ringer 11 of station 3, and conductor 23 back to battery 12. Current from battery 12 now flows through interrupter 13 and ringer 11 at station 3, and thereby rings the ringer 11 due to the interrupted current produced by the interrupter 13 in a manner hereinbefore described. It will be readily seen that the interrupted-current ringer 11 at station 3 could be replaced by an alternating-current ringer if the interrupter 13 were replaced by a pole-changer placed in a pair of conductors leading from battery 12 and connecting with conductors 21 and 23, respectively. When party 1 has rung station 3 sufficiently, he releases his key 3 which returns to locking position, that is, to the position in which spring members 4 and 5 engage contacts 6 and 7, respectively, contact 10 7 being open, and then removes his receiver 20 from the switch hook 25 which bridges his transmitter 19 and receiver 20 through conductors 29 and

30 of station 1, and through contacts 4 6 and 5 7 of key 3 at station 1, across the limb 28 and 22 of line *e*. Conductors 29 and 30 extend to all of the spring members 4 and 5, respectively, of the several push-button keys or switches at this station. The party at station 3 answers his call by lifting his receiver 20 from the switch hook 25 which connects with contacts 26 and 27, and then 5 depresses his home key H to locking position which bridges his transmitter 19 and receiver 20 across the limbs 22 and 28 of his metallic line *e*. Now the talking circuit is closed from transmitter 19 at station 1, 10 through conductor 29 at station 1, contact 4 6 of key 3 at station 1, limb 28 of line *e*, contact 6 4 of key H at station 3, transmitter 19, receiver 20 and switch hook 25, at station 3, contact 5 7 at key H of station 3, 15 limb 22 of line *e*, contact 7 5 of key 3 at station 1, conductor 30, and switch hook 25 and receiver 20, at station 1, back to transmitter 19 at station 1. This talking circuit is fed with current from talking battery 14 through 20 impedance coil 15 and the coils 36 of ringer 11 corresponding to station 3, which are connected from battery 14 to limbs 28 and 22, respectively, of line *e*.

The impedance coil 31 at each of the stations is of high impedance and of low resistance compared to the resistance of receiver 20, and is provided as a shunt around receiver 20 so as to take most of the direct-current supply flowing through the transmitter 19 and at the same time allow receiver 20 to take approximately all of the talking currents passing through the transmitter 19. The direct current which supplies the transmitter 19 is thus shunted from 30 the receiver 20 so that the latter will not become demagnetized or over magnetized thereby.

When the conversation between parties 1 and 3 is completed these parties hang up 35 their receivers on their respective switch hooks, which opens the circuits of their talking sets at the respective switch hooks and thereby stops the flow of current from battery 14 over the aforetraced talking circuit between stations 1 and 3. Party 1 leaves 40 his key 3 depressed until he desires to use his line again, either in communication with station 3 or any of the other stations or trunk lines of the system. The depression of any 45 of the other keys at station 1, when it is desired to again use the talking set at station 1, releases the key 3 as hereinbefore stated. Party 3 also leaves his home key H depressed until he desires to use his talking set again, 50 his key H being restored by the depression of any of his other keys, as just stated in connection with station 1.

If any of the parties of the intercommunicating system desires to make an outgoing 55 trunk call over a trunk line, as for example

the party at station 2 calling out over trunk line *a*, he depresses his trunk key T corresponding to the trunk line, to locking position, and then removes his receiver 20 from the switch hook 25 which bridges his transmitter 19 and receiver 20 through conductors 29 and 30 at his station, and contacts 4 6 and 5 7, respectively, of his trunk key T, across the limbs 32 33 of the toll line *a*, which signals the central-energy exchange 70 to which the trunk line *a* leads, the same as any ordinary central-energy subscriber signals his central office. Conversation may be now carried on over the trunk line *a* the same as in an ordinary central-energy telephone system. When the conversation is 75 completed the party at station 2 hangs up his receiver 20 on the switch hook 25 and thereby breaks the circuit between the limbs 32 33 of the toll line *a*, at the switch hook 25, 80 and thus gives the usual disconnect signal to the operator at the central exchange. The party at station 2 leaves his trunk key T depressed until he desires to use his talking set again, his key T being restored by the 85 depression of any of his other keys, as stated above in connection with stations 1 and 3.

The "attendant", shown in the drawing at station 1, answers all of the incoming trunk calls to the intercommunicating system as follows: When the operator at the 90 central exchange desires a connection with a station of the intercommunicating system, she rings the ringer 16 of the trunk line *a* (or *b*) in the usual manner, whereupon the 95 "attendant" depresses his trunk key T corresponding to the trunk line, to locking position and then removes his receiver 20 from the switch hook 25 which bridges his transmitter 19 and receiver 20 through conductors 29 and 30 of station 1, and contacts 4 6 and 5 7, respectively, of key T at station 1, across the limbs 32 33 of the trunk line *a*. Now the attendant converses with the party 100 connected from the central exchange over the trunk line and learns from him the station of the intercommunicating system with which communication is desired. Assuming this latter station to be station 2 of the intercommunicating system, the attendant proceeds to call station 2 by first depressing his 105 trunk key T to ringing position and simultaneously hanging his receiver 20 upon the switch hook 25 which disconnects him from the toll line, and then depressing his key 2 to ringing position which signals the party at station 2 by closing the circuit of battery 12 through interrupter 13, conductor 21, contact 10 7 of key 2 at station 1, limb 22 of line 110 *d*, ringer 11 of station 2, and conductor 23 back to battery 12. The attendant by depressing his trunk key T to ringing position as he hangs up his receiver 20, bridges the trunk relay 18, corresponding to trunk line 115 *a*, through contact 10 7 of key T of station

1, across limbs 32 33 of the trunk line α , whereupon the relay 18 attracts its armature 34 and thereby closes contact 34 35 which permanently bridges the winding of relay 18 across the limbs 32 33 of the trunk line after the key T returns to locking position in which position the contact 10 7 is open. Bridging the relay 18 across the trunk line in this manner is for the purpose of holding the line, or to avoid giving a disconnect signal when the attendant hangs up his receiver 20 which opens his talking set bridge across the limbs of the toll line, until the party 2 answers the trunk call as directed by the attendant.

When the attendant depresses his key 2 to signal the party at station 2, he automatically releases his key T and restores same to normal position in which position all of the contacts of the key are open. When the party 2 answers the signal of his ringer 11, he depresses his home key H to locking position and removes his receiver 20 from the switch hook 25 which bridges his transmitter 19 and receiver 20 across the limbs 28 22 of his line d , as hereinbefore described. The attendant upon removing his receiver 20 from the switch hook 25, after his key 2 returns to locking position, bridges his transmitter 19 and receiver 20 through conductors 29 and 30 of station 1, and contacts 4 6 and 5 7, respectively, of his key 2, across the limbs 28 22 of line d so that he can converse with the party at station 2 and instruct him to come in on the trunk line α to answer the trunk call. Now the party at station 2 depresses his trunk key T, which releases his home key H, and thereby bridges his transmitter 19 and receiver 20 through conductors 29 and 30 of station 2, and contacts 4 6 and 5 7, respectively, of trunk key T at station 2, across the limbs 32 and 33 of the trunk line α . Now the party at station 2 may converse with the party who is connected from the central exchange through the trunk line α , transmitter 19 of station 2 being supplied with talking battery from the central exchange over the trunk line α . The talking set of station 2 being of low resistance compared with the resistance of relay 18 of trunk line α , now shunts this relay and causes same to release its armature and thereby break the contact 34 35 which breaks the bridge of this relay 18 across the trunk line α . Now when conversation is completed and the party at station 2 hangs up his receiver 20 on the switch hook 25, he breaks the bridge of his talking set across the trunk line α at his switch hook and thereby opens the circuit of the trunk line and thus gives the usual disconnect signal to the operator at the central-energy exchange. The party at station 2 leaves his trunk key T depressed to locking position until he desires to use his talking set again, when the depression of

any one of the other keys at his station releases the trunk key T.

It will be readily seen that the ringing and talking keys of this system are self-indicating, that is, they indicate the party with whom conversation was last had, or, in the case of calling a party who does not respond, they indicate the station with which communication is desired, so that the calling party may again readily depress the proper key to ringing position to signal the called party a second time. It will also be seen that in this system only two conductors are required at each of the stations to connect the talking sets thereof with the system. This greatly simplifies the wiring which is necessary to connect a talking set with the system, over other systems where more than two conductors are required to connect a talking set with the system.

I do not wish to limit this invention to all of the particular details herein shown, as many modifications of same may be made without departing from the scope of the appended claims.

What I claim as my invention is:

1. The combination with an intercommunicating telephone system having a plurality of stations and a trunk line common thereto, of a relay, a key adapted in itself to bridge the relay across the trunk line, independently of the condition of the other apparatus of the system, and a switch controlled by the relay whereby the latter when bridged across the trunk line by the said key maintains its own bridge after the key has been released, until properly deenergized, for purposes substantially as described.

2. The combination with an intercommunicating telephone system having a plurality of stations and a trunk line common thereto, of a relay, means for bridging the relay across the trunk line to hold the latter while calling the called station, the said relay being adapted to control its own bridge, and means whereby the telephone set of the said called station, when connected with the trunk line for use, forms a direct shunt around the said relay to deenergize the latter sufficiently to cause it to break its own bridge, for purposes substantially as described.

3. The combination with an intercommunicating telephone system having a plurality of stations and a trunk line common thereto, of a relay, a key adapted in itself to bridge the relay across the trunk line, independently of the condition of the other apparatus of the system, to hold the trunk line while calling the called station, a switch controlled by the relay whereby the latter when bridged across the trunk line by the said key maintains its own bridge after the key has been released, and means whereby

the telephone set of the said called station,
when connected with the trunk line for use,
forms a direct shunt around the said relay
to deenergize the latter sufficiently to cause
5 it to break its own bridge, for purposes sub-
stantially as described.

As inventor of the foregoing I hereunto

subscribe my name in the presence of two
subscribing witnesses, this 19th day of Sep-
tember, 1907.

ELMER R. CORWIN.

Witnesses:

FREDERICK R. PARKER,
H. ROY COOK.