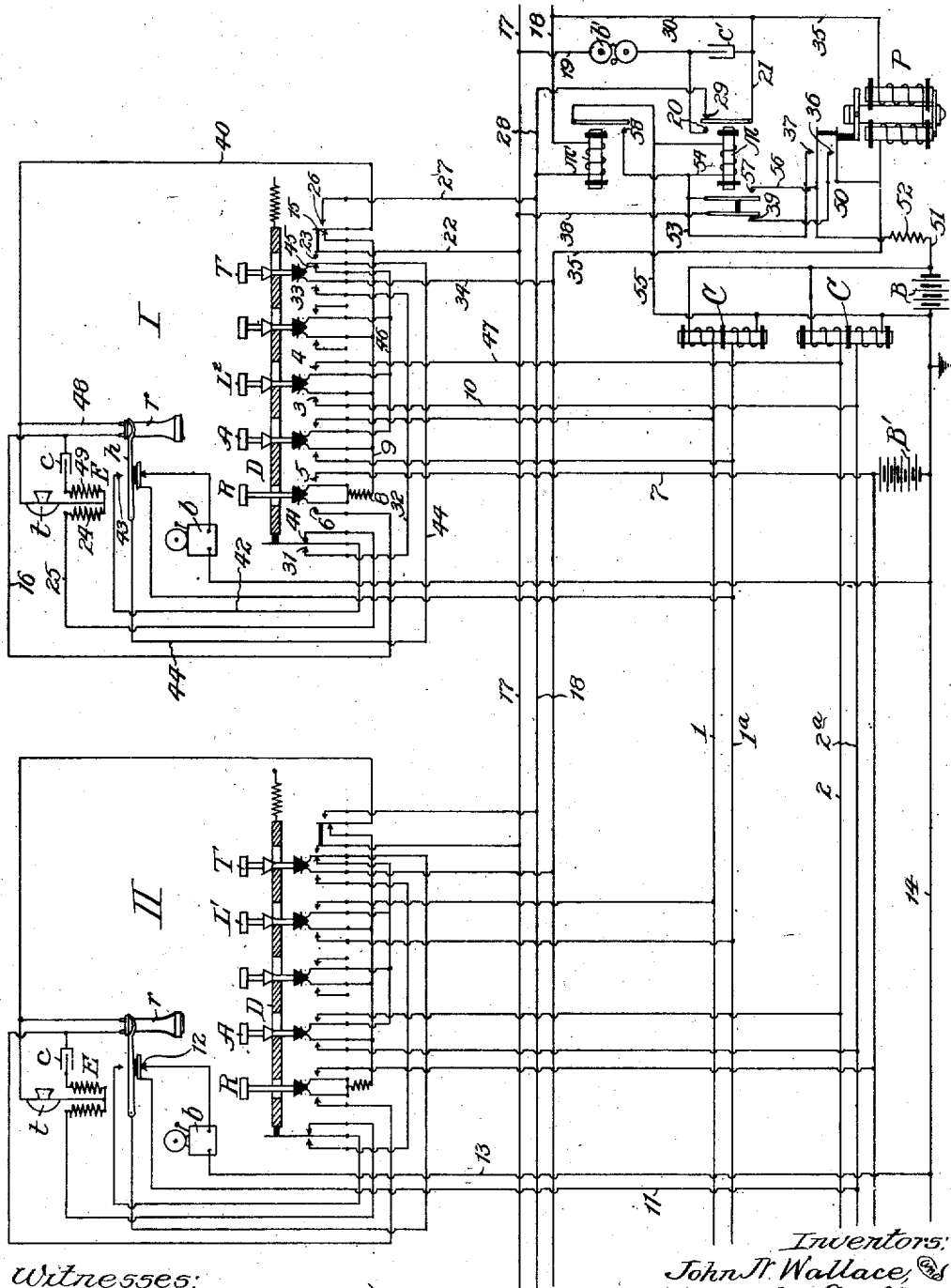


J. N. WALLACE & E. B. CRAFT.
PRIVATE BRANCH INTERCOMMUNICATING TELEPHONE SYSTEM.
APPLICATION FILED NOV. 23, 1907.

970,975.

Patented Sept. 20, 1910.

2 SHEETS—SHEET 1.



Witnesses:
Irving Mac Donald
Alfred H. Moore

Fig 1

Inventors:
John N. Wallace, &
Edward B. Craft,
By Barton Tanner & Fack
Attys

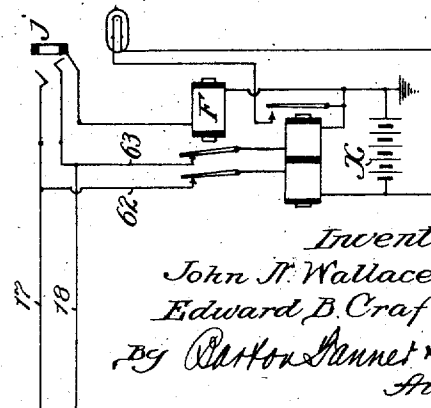
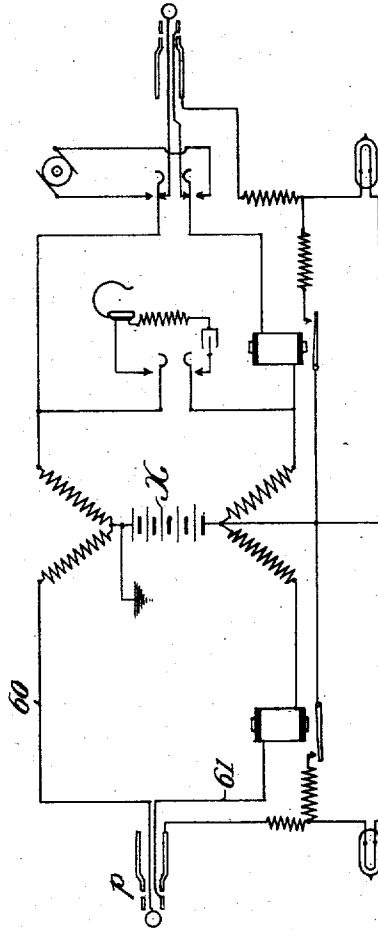
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2 SHEETS-SHEET 2.

Fig. 2.



Witnesses:
Irving Mac Donald
Alfred H. Moore.

Inventors:
John N. Wallace &
Edward B. Craft,
By Barton Bennett Falk
Attys.

UNITED STATES PATENT OFFICE.

JOHN N. WALLACE, OF LA CROSSE, WISCONSIN, AND EDWARD B. CRAFT, OF CHICAGO, ILLINOIS, ASSIGNORS TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PRIVATE-BRANCH INTERCOMMUNICATING TELEPHONE SYSTEM.

970,975.

Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed November 23, 1907. Serial No. 403,548.

To all whom it may concern:

Be it known that we, JOHN N. WALLACE, of La Crosse, La Crosse county, Wisconsin, and EDWARD B. CRAFT, of Chicago, Cook county, Illinois, subject of the King of Great Britain and citizen of the United States, respectively, have invented a certain new and useful Improvement in Private-Branch Intercommunicating Telephone Systems, of which the following is a full, clear, concise, and exact description.

Our invention relates to a private branch exchange telephone system, embodying an intercommunicating system, and also providing for outside connection with the central office exchange.

Our invention relates more particularly to an arrangement whereby a call over a trunk line may be answered at any one of several stations in the private exchange, and whereby the telephone used for answering an outside call may be utilized for communicating with another local station without affecting the signals at the central office during the interval of such use.

The object of our invention is to provide a simple and efficient system, to reduce the number of operations involved in transferring a call received over a trunk line from one station to another, and to otherwise simplify the structure and operation of the system.

Our invention provides means at two or more stations of an intercommunicating system for maintaining the direct current circuit continuity of a trunk line leading to said intercommunicating system from the central office exchange, said means being in addition to and in substitution of the telephone set at said stations. By such arrangement, means are provided for holding a calling line while the telephone set which answered the call is being utilized for communicating with another local station. Likewise, our invention provides means whereby said call may be transferred to another station without the act of transferring causing a disconnect signal at the central office. Likewise, our invention also provides means for holding a trunk line while the station at which the call is received may communicate with another local station without the central office party hearing the conversation.

Our invention contemplates an arrangement of circuits and apparatus whereby the operations required of a party when a call received over a trunk line at one station is to be transferred to another station, are identical with those performed in calling up a local station for local intercommunication only.

One feature of our invention consists in dispensing with a special transfer key and in providing in lieu thereof contacts operated by the movement of the locking plate associated with the group of operating keys.

A further feature of our invention consists in the provision of a special relay associated with the trunk lines at the intercommunicating system, which relay differentiates between when the central office operator has the plug in the line jack and when the trunk line is in a normal condition. This special relay is preferably a polarized relay, in which case provisions are made at the central office whereby the normal polarity of the current over the trunk line is reversed by the insertion of the plug in the jack.

These and other features of our invention may be more readily understood by reference to the accompanying drawing, in which—

Figures 1 and 2 are diagrams of circuits and apparatus which may be employed at the intercommunicating station and at the central office, respectively, in embodying our invention.

For the sake of clearness, only two stations of the intercommunicating system and one trunk line leading from the central office terminating in the intercommunicating system are shown, it being obvious that as many trunk lines may be employed as may be deemed necessary, and that the stations of the system may be duplicated within the usual limits.

Referring to Fig. 1, each station is provided with local keys associated with the local lines of every other station, the key at station I associated with the local line of station II being designated L^2 and the key at station II associated with the local line of station I being designated L^1 . Each station is also provided with an answering key A associated with its own local line. Each station is further provided with a ringing key R for applying ringing current to the

line selected by the operation of the local key. At each station is the usual call bell *b*, the circuit through which is closed at the switch contacts when the receiver is on its hook. The battery *B'* furnishes the source of ringing current. In addition to said local answering and ringing keys, which provide for local intercommunication only, each of said stations is provided with a trunk key *T*.

It will be noted that with the exception of the ringing key *R*, all the keys at a station are held locked down when depressed by means of a plate *D*, and the depression of one key releases any key already locked down. The manipulation of key *R*, however, has no effect on any other key, and said key is not adapted to be locked down by the plate *D*.

Each local station of the intercommunicating system, as shown, for example, at station I and station II, is equipped with the usual telephone set comprising a transmitter *t* and a receiver *r*. Corresponding with each local station is a local line 1, 1^a, and 2, 2^a, respectively, connected with a common battery *B* through the usual retardation coils *C*.

Considering first merely the intercommunicating features of the system, the manner in which a subscriber at one station may call up another station is obvious. For example, if the subscriber at station I desires to communicate with station II he will remove his receiver *r* from its switch hook *h*, and depress key *L*², thus closing contacts 3, 4, and connecting his telephone set with local line 2, 2^a. He will then depress his ringing key *R* thereby closing contacts 5 and 6, whereupon, if the coiled line is not in use, current will flow from battery *B'* through conductor 7, contact 5, resistance 8, conductor 9, contact 3 of key *L*², conductors 10, 2^a, 11, contact 12, bell *b*, conductors 13, 14, back to battery *B'*. The subscriber at station II will respond by depressing his answering key *A* and by removing his receiver *r* from its hook. Stations I and II are now in telephonic communication, the telephone sets thereof being connected to local line 2, 2^a, through local key *L*² and answering key *A* respectively. Bridged across conductors 2, 2^a, as before stated, is the retardation coil *C* through which current from battery *B* is supplied for local communication.

It will be observed that the drawings show a standard equipment of telephone set. A circuit is closed at station I, for example, from conductor 2^a, through conductor 10, contact 3 of key *L*², conductor 9, contact 15 of key *T*, conductor 40, transmitter *t*, winding 24 of induction coil *E*, conductor 25, contact 41, conductor 42, contact 43, switch hook *h*, conductor 44, contact 45 of key *T*,

conductor 46, contact 4 of key *L*², conductor 47 to conductor 2. The receiver *r* and the condenser *c* are in shunt on the transmitter *t*, which shunt extends from one terminal of transmitter *t* through conductor 48, receiver *r*, conductor 16, condenser *c*, winding 49 of induction coil *E* back to the opposite terminal of transmitter *t*. The telephone set at station II is connected to the local line 2, 2^a by a similar circuit arrangement including the contacts of the answering key *A* at that station, and hence a further description thereof is unnecessary.

The circuit arrangement just described provides means whereby the calling party is informed whether or not the station called is busy. At the time the party at station I depressed his ringing key *R*, current was supplied for ringing the bell *b* at station II, said current flowing through resistance 8. One terminal of the receiver *r* is connected through conductors 48, 40, normally closed contact 15 of key *T* and conductor 9 to one side of said resistance, and the other terminal of the receiver is connected to the other side of said resistance through conductor 16 and the closed contact 6 of the key *R*. The ringing of the bell *b* at station II causes a tone or buzz in the receiver *r*, due to the difference in potential across the terminals of resistance 8, this resistance being in series with the bell at station II. The current flowing through resistance 8 is intermittent, owing to the opening and closing of the circuit in the usual manner in the contact of the bell *b*. The buzz denotes to the party at station I that the telephone at station II is not in use, since if it were, contact 12 would be open, the bell *b* at station II would not ring, and the party at station I would not hear a buzz in his receiver.

It will be observed that the arrangement thus far described in detail provides what is commonly designated as an intercommunicating system. Our invention provides circuits and apparatus whereby such a system may be connected to a central office exchange to provide for outside communication, and means permitting transferring of calls and maintaining central office signals unchanged during the interval of transfer.

Conductors 17, 18 constitute a trunk line extending from the central office exchange to the intercommunicating system. Said trunk line is multiplied, as shown, with each station of the intercommunicating system. A signal bell *b'* is associated with the trunk line in a manner to give a signal at the stations, at which it is desired to answer calls received over the trunk line. The bell *b'* may be located, for example, at some point where it can be heard from any station.

As hereinbefore stated, each of the stations with which the trunk line is multiplied is provided with a trunk key *T*. The trunk

key, when depressed, closes a pair of contacts adapted to connect the telephone set of that station to the trunk line.

A relay P is in a bridge of the trunk line including the normally open contacts 23 and 33 of the trunk key T, the normally open contact 31 controlled by the movement of the plate D, and the switch hook contact 43. The relay P is so constructed that it will not respond to the normal current in the trunk line but will respond to the current in the line when the plug is in the line jack at the central office. Said relay P controls circuit conditions which result in closing a bridge of the trunk line in substitute of the telephone set of the station, as will hereinafter be more fully described. It will be observed in this connection that in order for the relay P to operate, a trunk key must be depressed, the operator at the central office must have plugged into the line jack, and the normally open contact 31 must be closed. All of these conditions were not fulfilled in the mere local communication from one station to another hereinbefore described, and hence the relay P performs no function so far as the purely intercommunicating features of the system are concerned.

The relay P is preferably a polarized relay which will not operate to close its contacts when, as shown in Fig. 2, the trunk circuit is in its normal condition, that is, when conductors 17, 18 are connected by the conductors 62, 63, respectively, to the central office battery X. However, upon the plug *p* being inserted in the line jack *j*, the cut-off relay F operates to open the circuit through conductors 62, 63, and the connections of the conductors 17, 18 through the tip strand 60 and ring strand 61, respectively, with the battery X are such as to reverse the flow of current over the trunk line. Under such conditions, the relay P, operates to close its contacts upon the completion of its circuit.

The function of the relay P is to bring about circuit conditions which will maintain the direct current continuity of the signaling circuit over a bridge of the trunk line in substitution of the telephone set, thus enabling the local station at which a trunk call is answered to call up and communicate with any other station without giving a disconnect signal at the central office. As shown in Fig. 1, such continuity of the trunk line is maintained over a bridge of the line extending from conductor 17 to conductor 18 through conductor 19, including the bell *b'*, contact 20 of a holding relay M, and conductors 21, 30, said bridge being normally open at contact 20.

A call over the trunk line may be answered at any station with which the trunk line is multiplied, and the answering sta-

tion may thereafter communicate with any other station without giving a disconnect signal at the central office. Furthermore, the party at the station at which the trunk call was answered may then renew the conversation with the calling party, or request the called party to answer over the trunk line.

An important feature of our invention is that a trunk call may be transferred from one station to another as many times as may be desired, without the manipulation of any special transfer key, and the party instructed to answer on the trunk line will in doing so cause the holding circuit to be opened, and will control the disconnect signal at the central office in the usual manner.

The various features of our invention may be more readily understood from a description of the operation of the system as a whole. Assume that a call is received over a trunk line, and is answered at station I. The party at said station removes his receiver from its hook and depresses trunk key T. Current then flows from the central office battery X, Fig. 2 over conductor 60 of the cord circuit, conductor 17 of the trunk line, conductor 22, contact 23 of key T, conductor 44, switch hook *h*, contact 43, conductor 42, contact 41, conductor 25, winding 24 of induction coil E, transmitter *t*, conductor 40, contact 26 of key T, conductor 27, conductor 28, contact 29 of holding relay M, conductor 21, conductor 30, and conductor 18 of the trunk line to central office, through the conductor 61 of the cord circuit back to battery X. This completes the circuit continuity of the trunk line and establishes conditions at the central office which show, in the usual manner, that the call has been answered. Station I is now so connected to the trunk line that conversation can take place between the private branch exchange party and the calling party, connected through the central exchange, the party at station I controlling the central office signals in the usual manner, that is, by means of the switch hook.

If the party at station I now wishes to call up any other station of the intercommunicating system for any purpose, as for example, to receive instructions or to transfer the call, he presses down the local key corresponding to the station desired which key releases trunk key T and is itself held down by the plate D. In the act of depressing the local key, and prior to the release of the trunk key T, contact 31 is momentarily closed. By depressing the local key, the key T is released, and the before mentioned bridge in substitute of the telephone set is placed across the trunk line conductors 17, 18, thus maintaining the direct current continuity of the signaling circuit of that line, and connecting the tele-

phone set of the party at station I with the local line corresponding to the local key that is depressed.

The depression of key L^2 for example to call up station II momentarily closes contact 31 prior to the release of key T, and a circuit is established for the polarized relay P as follows: from battery X at the central office exchange through the tip strand 60, conductors 17, 22, contact 23 of key T, conductor 44, contact 43 of switch hook h , conductor 42, contact 31, conductor 32, contact 33 of key T, conductor 34, conductor 35 including winding of polarized relay P, conductor 30, conductor 18, back to the central office exchange, and through ring strand 61 back to battery X. The polarity of the current in this circuit is such as to cause relay P to operate to close contacts 36 and 37. In closing contact 36, the relay P established a temporary locking circuit for itself to maintain said relay temporarily operated after trunk key T has in its release opened contacts 23 and 33 in the above described circuit for relay P. This locking circuit is as follows: from conductor 17, through conductor 38, contact 39 of holding relay M, conductor 50, contact 36, conductor 35, including windings of relay P, and conductor 30 to conductor 18. Said locking circuit is thus controlled at a normally closed contact 39 of relay M.

The operation of relay P, resulting in the closure of contact 37, establishes a circuit for relay M as follows:—from battery B, through conductor 51, including a resistance 52, contact 37, conductor 53, conductor 54 including the winding of relay M, and conductor 55 back to battery B. Relay M in operating establishes a locking circuit for itself as follows:—from battery B, through conductor 51, including resistance 52, conductor 56, contact 57, of relay M, conductor 54 including the winding of relay M, and conductor 55 back to the battery B.

Holding relay M, when operated, closes a short circuit of the condenser c' at contact 20, thus completing a direct current bridge of the trunk line, said bridge extending from conductor 17 through conductor 19, including the bell b' , contact 20, conductors 21 and 30 to conductor 18. Said bridge is a holding circuit in substitute of the telephone set and prevents the display of a disconnect signal at the central office exchange. Relay M, when operated, also opens contact 39 in the locking circuit of the polarized relay P, and causes the deenergization of said polarized relay. Relay M, when operated, also opens contact 29, which is in a short circuit of a clearing-out relay M' , said short circuit including conductor 28, contact 29, and conductors 21 and 30. The winding of relay M' being in series with the trunk conductor 18, the removal of said

short circuit establishes a condition which will permit of the operation of the clearing-out relay M' upon the depression of a trunk key associated with the trunk line. The telephone set of station I is now connected with the local line 2, 2^a in the manner hereinbefore described, and the party at station I can ring up and communicate with station II. In the meantime, the disconnect signal is not displayed at the central office since said relay M as before stated is locked up through its own contact 57 and maintains the bridge of the trunk line closed at contact 20. Assuming the party at station I has communicated with the party at station II, either may then connect with the trunk line by depressing the trunk key T at that station, the conditions brought about being the same in either case. Let us assume, however, that the party at station I desires to transfer the call to station II. After calling up station II in the above manner, he instructs the party at that station to answer over the trunk line. The party at station II then depresses his trunk key T, and in so doing releases his answering key A, leaving his telephone set connected only with the trunk line. The party at station II is now in position to talk with the outside calling party. The circuits established through the connections of station II are substantially the same as those hereinbefore traced from the trunk line through station I and may be readily followed without further description.

Since at the time the trunk key T at station II was operated, the short circuit of relay M' was open at contact 29 of relay M, as hereinbefore described, the current of the trunk line operates the relay M' upon the depression of said trunk key T. The relay M' by its operation closes contact 58, thereby short circuiting the winding of relay M. The consequent deenergization of relay M results in the opening of contact 20 and the closing of contact 29. The opening of contact 20 removes the holding bridge of the trunk line. The closing of contact 29 short circuits relay M' as hereinbefore described. The short circuiting of relay M' removes the impedance of said relay from the circuit of the trunk line, after said relay has performed its useful function. The resistance 52 is placed in series with relay M to prevent short circuiting the battery at the time relay M' operates. Upon the party at station II hanging up the receiver, the direct current continuity of the trunk line is destroyed at the switchhook contact, and the usual disconnect signal is given at the central office.

In case the party at station II, after answering over the trunk line, desires to communicate with a party at some other local station, he would proceed in the usual manner, that is, would place the receiver on the hook so as to give a disconnect signal at the

central office and then subsequently take the receiver from the hook, depress the local key of the station desired and then the ringing key in the manner hereinbefore described.

- 5 It is apparent that after the disconnect signal has been given to the central office operator, resulting in the removal of the plug from the jack, the polarized relay P cannot operate its contacts and in consequence the operation of the party at station I in calling a local station does not affect the trunk line.

It will be noted that the local, trunk or answering key last operated remains locked down until the subsequent operation of one of said keys. Assume that the party at station II found his trunk key depressed, and, in responding to the ringing of the bell *b* in above described method of transferring a call, should remove the telephone receiver from the hook before depressing the answering key A. While this would remove the holding bridge of the trunk line, the subsequent operation of the answering key A would restore the same, the operation being identical with that performed in transferring a call. Assume further that a party who wishes to call up a local station finds his trunk key depressed. By taking the telephone receiver from the hook and then depressing the local key corresponding to the station desired, he would perform the initial operations of calling up said station. It is evident that under these conditions it is essential that the relay P should not operate. Hence the importance of that feature of our invention which consists in the provision of a relay P which will not respond to the normal current flow in the trunk line.

40 The connection of the circuit including the telephone set with the trunk line is controlled at the normally open contacts 23, 26 of the trunk key. The connection of the telephone set with a local line is controlled at the normally closed contacts 15 and 45 of the trunk key T. These contacts 15 and 45 are provided in order that when the trunk key is in its actuated position, the lines of the intercommunicating system will be cut off from the trunk line, and the telephone circuit will not be connected by the actuation of a local or answering key with a local line until the trunk key has been released.

We claim:—

- 55 1. The combination with an intercommunicating telephone system, of a trunk line multiplied with two or more stations of said system, switching means at each of said stations for connecting the telephone set thereof to said trunk line, a path in substitute of the telephone for maintaining the direct current continuity of the trunk line, and a relay associated with the trunk line for controlling the insertion of said substitute path, said relay being unresponsive to

the normal current of said trunk line, but being responsive when the central office operator has plugged into the trunk line.

2. The combination with an intercommunicating telephone system, of a trunk line multiplied with two or more stations of said system, switching means at each of said stations for connecting the telephone set thereof to said trunk line, a path in substitute of the telephone for maintaining the continuity of the trunk line, a relay associated with the trunk line for controlling the insertion of said substitute path, said relay being unresponsive to the normal current of said trunk line, but being responsive when the central office operator has plugged into the trunk line, and switching means at each of said stations for closing the circuit of said relay.

3. The combination with an intercommunicating telephone system, of a trunk line leading from a central office exchange and multiplied with two or more stations of said system, switching means at each of said stations for connecting the telephone set thereof to said trunk line, a path in substitute of the telephone for maintaining the continuity of the trunk line, a polarized relay associated with the trunk line for controlling the insertion of said substitute path, and means for reversing the flow of current in the trunk line when the central office operator plugs into said trunk line.

4. The combination with an intercommunicating telephone system, of a trunk line leading from a central office exchange and multiplied with two or more stations of said system, switching means at each of said stations for connecting the telephone set thereof to said trunk line, a path in substitute of the telephone for maintaining the continuity of the trunk line, a polarized relay associated with the trunk line for controlling the insertion of said substitute path, means for reversing the flow of current in the trunk line when the central office operator plugs into said trunk line, and switching means at each of said stations for closing the circuit of said relay.

5. The combination with an intercommunicating telephone system, of a trunk line leading from a central office exchange to said intercommunicating system and multiplied with two or more stations thereof, a trunk key and one or more local keys at said stations for connecting the telephone set of a station to the trunk line or to a local line of the system, respectively, a polarized relay in a normally-open bridge of the trunk line adapted to be momentarily closed upon the operation of a local key at the time the trunk key of that station is in its operated position, a connecting circuit at the central office adapted when connected to the trunk line to reverse the battery connec-

tion of said trunk line, a bridge of the trunk line constituting a holding circuit in substitute of the telephone set, and circuits controlled by said polarized relay for controlling the closure of said holding circuit.

5 6. The combination with an intercommunicating telephone system, of a trunk line leading from a central office exchange to said intercommunicating system and multiplied with two or more stations thereof, a trunk key, and one or more local keys at said stations for connecting the telephone set of a station to the trunk line or to a branch local line of the system, respectively, 10 a movable locking plate common to said keys, a bridge of the trunk line including a normally open contact of said trunk key and a normally open contact controlled by said plate, a polarized relay included in said 15 bridge, a connecting circuit at the central office adapted when connected to the trunk line to reverse the battery connection of said trunk line, a bridge of the trunk line constituting a holding circuit in substitute of the telephone set, and circuits controlled by 20 said polarized relay for controlling the closure of said holding circuit.

7. The combination with an intercommunicating telephone system, of a trunk line 30 leading from a central office exchange to said intercommunicating system and multiplied with two or more stations thereof, a trunk key and one or more local keys at said stations for connecting the telephone set of a station to the trunk line or to a local line 35 of the system, respectively, a movable locking plate common to said keys, a bridge of the trunk line including a normally open contact of said trunk key and a normally 40 open contact controlled by said plate, a polarized relay included in said bridge, a holding relay responsive to the operation of said polarized relay, a locking circuit for said 45 holding relay, a bridge of the trunk line constituting a holding circuit in substitute of a telephone set, a contact in said holding circuit closed by the energization of said holding relay, and a connecting circuit at the central office adapted when connected to 50 the trunk line to reverse the battery connection of said trunk line and thereby to control the operation of said polarized relay.

8. The combination with an intercommunicating telephone system, of a trunk line 55 leading from a central office exchange to said intercommunicating system and multiplied with two or more stations thereof, a trunk key and one or more local keys at said stations for connecting the telephone 60 set of a station to the trunk line or to a local line of the system, respectively, a movable locking plate common to said keys, a bridge of the trunk line including a normally open contact of said trunk key and a

normally open contact controlled by said 65 plate, a polarized relay included in said bridge, a holding relay responsive to the operation of said polarized relay, a locking circuit for said holding relay, a bridge of the trunk line constituting a holding circuit 70 in substitute of a telephone set, a contact in said holding circuit closed by the energization of said holding relay, a connecting circuit at the central office adapted when connected to the trunk line to reverse 75 the battery connection of said trunk line and thereby to control the operation of said polarized relay, a clearing-out relay in series with the trunk line adapted when energized to open said locking circuit of said holding 80 relay, and a short circuit of said clearing-out relay closed upon the deenergization of said holding relay.

9. In an intercommunicating telephone system having a trunk line leading from a 85 central exchange to said system and multiplied with two or more stations thereof, a telephone set at each of said stations, a trunk key and one or more local keys for connecting said telephone set to the trunk 90 line or to a local line of the intercommunicating system respectively, a holding bridge of the trunk line in substitute of the telephone set for maintaining the continuity of the signaling circuit of said trunk line, a 95 polarized relay in a normally open bridge of the trunk line, said polarized relay controlling the substitution of the holding bridge for the telephone set, a connecting circuit at the central office exchange adapted 100 when connected with the trunk line to establish a flow of current over the trunk line for operating said polarized relay, and means automatically operated by the depression of a local key at the time a trunk key is in its 105 operated position for closing the circuit of said polarized relay.

10. In an intercommunicating telephone system having a trunk line leading from a 110 central exchange to said system and multiplied with two or more stations thereof, a telephone set at each of said stations, a trunk key and one or more local keys for connecting said telephone set to the trunk 115 line or to a local line of the intercommunicating system respectively, a holding bridge of the trunk line in substitute of the telephone set for maintaining the continuity of the signaling circuit of said trunk line, a 120 polarized relay in a normally open bridge of the trunk line, said polarized relay controlling the substitution of the holding bridge for the telephone set, a connecting circuit at the central office exchange adapted when connected with the trunk line to establish 125 a flow of current over the trunk line for operating said polarized relay, means automatically operated by the depression of

a local key at the time a trunk key is in its operated position for closing the circuit of said polarized relay, and thereby substituting said holding bridge of the trunk line for the telephone set, and a relay in series with the trunk line and adapted to be energized by the subsequent depression of a trunk key at any one of said stations to remove said holding bridge.

11. A telephone central station, a trunk line extending therefrom, an intercommunicating telephone system, means for uniting the telephone sets of the intercommunicating system to the trunk, a circuit for holding a central station signal and which may be substituted for said telephone sets, means for controlling the substitution of the holding circuit, and means operable from the central station for preparing for the operation of the controlling means.

12. The combination with an intercommunicating telephone system, of a trunk line connected therewith, switching mechanism for the telephone sets of the intercommunicating system, locking means for the switching mechanism, a holding bridge of the trunk line which may be substituted for said telephone sets, means for effecting the substitution of the bridge, and means for controlling such substitution and including a contact operable by the locking means.

13. The combination with an intercommunicating system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, a holding bridge for said trunk line adapted to be substituted for a station, and means to effect such substitution under the joint

control of said station and the central station.

14. The combination with an intercommunicating telephone system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, locking means for said switching mechanism, a holding bridge for said trunk line adapted to be substituted for a station, and means to effect such substitution under the joint control of said locking means and the central station.

15. The combination with an intercommunicating telephone system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, a holding bridge for said trunk line adapted to be substituted for a station, and a polarized relay operable to effect such substitution under the joint control of a station and the central station.

In witness whereof, we hereunto subscribe our names this 5th day of November A. D., 1907 and this 9th day of November, 1907, respectively.

JOHN N. WALLACE.
EDWARD B. CRAFT.

Witnesses to signature of John N. Wallace:

JOHN F. PFELFFER,
L. J. SHADBOLT.

Witnesses to signature of Edward B. Craft:

J. J. LYNG,
C. G. STOTT.

It is hereby certified that in Letters Patent No. 970,975, granted September 20, 1910, upon the application of John N. Wallace, of La Crosse, Wisconsin, and Edward B. Craft, of Chicago, Illinois, for an improvement in "Private-Branch-Intercommunicating Telephone Systems," an error appears in the printed specification requiring correction as follows: Page 2, line 40, for the word "coiled" read *called*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of May, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

a local key at the time a trunk key is in its operated position for closing the circuit of said polarized relay, and thereby substituting said holding bridge of the trunk line for the telephone set, and a relay in series with the trunk line and adapted to be energized by the subsequent depression of a trunk key at any one of said stations to remove said holding bridge.

11. A telephone central station, a trunk line extending therefrom, an intercommunicating telephone system, means for uniting the telephone sets of the intercommunicating system to the trunk, a circuit for holding a central station signal and which may be substituted for said telephone sets, means for controlling the substitution of the holding circuit, and means operable from the central station for preparing for the operation of the controlling means.

12. The combination with an intercommunicating telephone system, of a trunk line connected therewith, switching mechanism for the telephone sets of the intercommunicating system, locking means for the switching mechanism, a holding bridge of the trunk line which may be substituted for said telephone sets, means for effecting the substitution of the bridge, and means for controlling such substitution and including a contact operable by the locking means.

13. The combination with an intercommunicating system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, a holding bridge for said trunk line adapted to be substituted for a station, and means to effect such substitution under the joint

control of said station and the central station.

14. The combination with an intercommunicating telephone system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, locking means for said switching mechanism, a holding bridge for said trunk line adapted to be substituted for a station, and means to effect such substitution under the joint control of said locking means and the central station.

15. The combination with an intercommunicating telephone system, of a trunk line connected to a central station multiplied at a plurality of stations of said system, switching means for interconnecting said stations and for connecting said stations to the trunk line, a holding bridge for said trunk line adapted to be substituted for a station, and a polarized relay operable to effect such substitution under the joint control of a station and the central station.

In witness whereof, we hereunto subscribe our names this 5th day of November A. D., 1907 and this 9th day of November, 1907, respectively.

JOHN N. WALLACE.
EDWARD B. CRAFT.

Witnesses to signature of John N. Wallace:

JOHN F. PFELFFER,
L. J. SHADBOLT.

Witnesses to signature of Edward B. Craft:

J. J. LYNG,
C. G. STOTT.

It is hereby certified that in Letters Patent No. 970,975, granted September 20, 1910, upon the application of John N. Wallace, of La Crosse, Wisconsin, and Edward B. Craft, of Chicago, Illinois, for an improvement in "Private-Branch-Intercommunicating Telephone Systems," an error appears in the printed specification requiring correction as follows: Page 2, line 40, for the word "coiled" read *called*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of May, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

It is hereby certified that in Letters Patent No. 970,975, granted September 20, 1910, upon the application of John N. Wallace, of La Crosse, Wisconsin, and Edward B. Craft, of Chicago, Illinois, for an improvement in "Private-Branch-Intercommunicating Telephone Systems," an error appears in the printed specification requiring correction as follows: Page 2, line 40, for the word "coiled" read *called*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

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[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.