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PATENTED JULY 2, 1907.

J. M. STORKERSON.  
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APPLICATION FILED APR. 25, 1906.

2 SHEETS—SHEET 1.

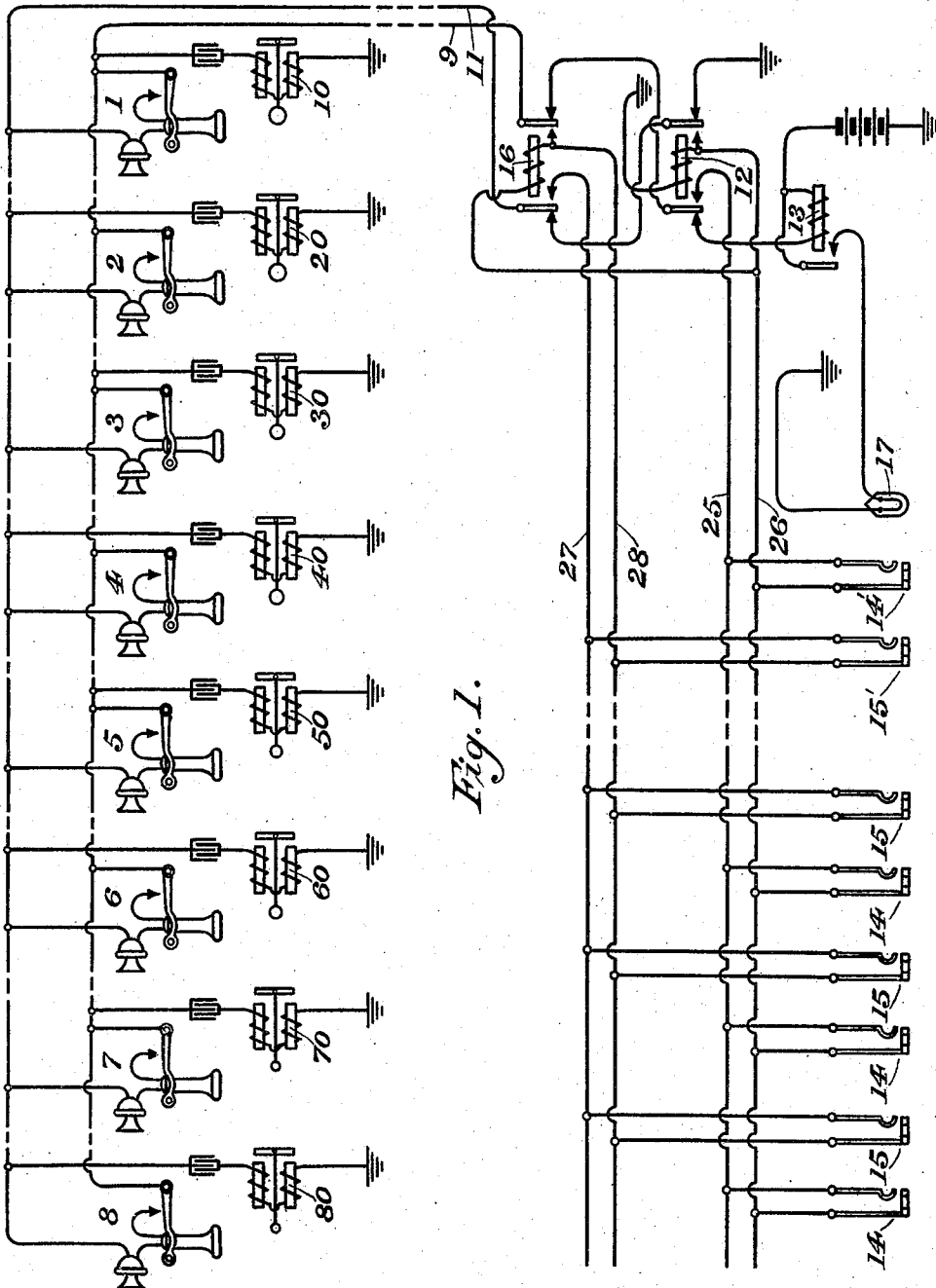


Fig. 1.

Witnesses:

Harold C. Prado

David S. Bulfish

J. M. Storkerson,  
Inventor.

by Kempster B. Miller,  
Attorney.

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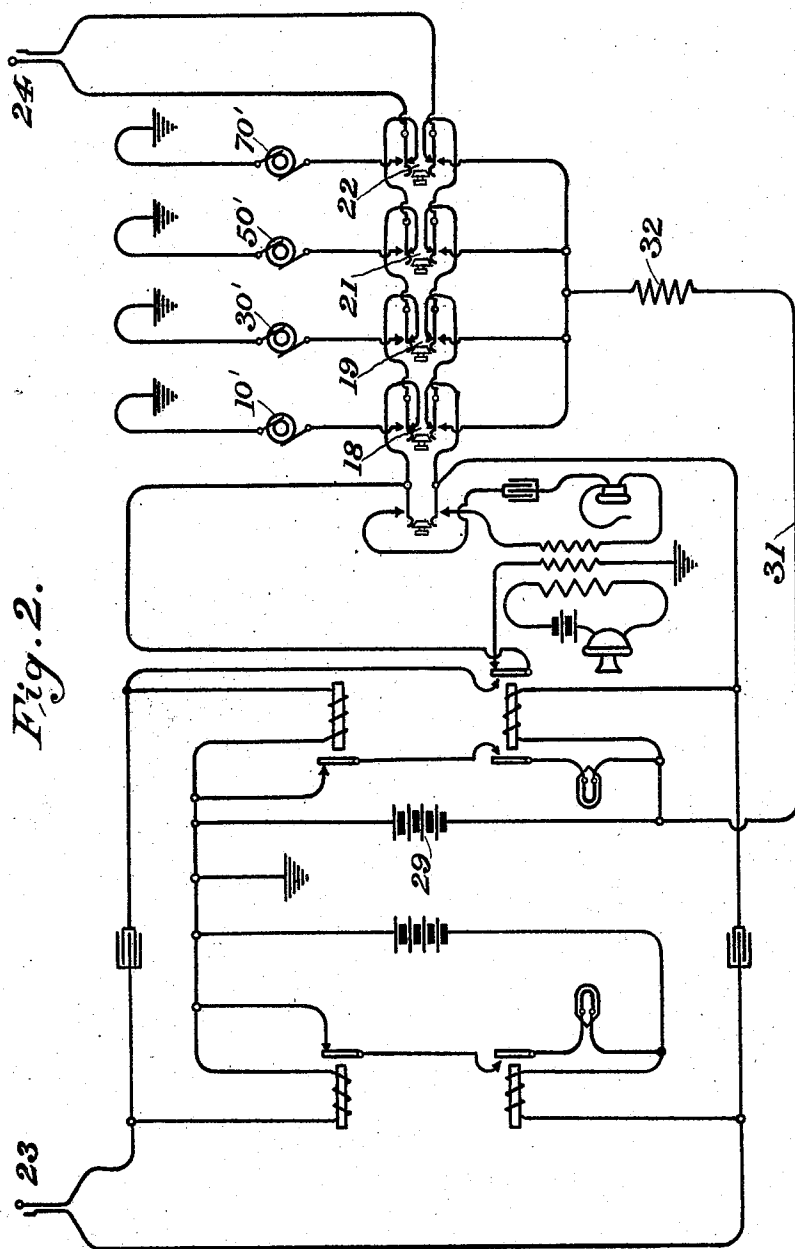
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Harold C. Prado  
David S. Hulphish

J. M. Storkerson,  
Inventor.  
by Kempster B. Miller,  
Attorney.

# UNITED STATES PATENT OFFICE.

JULIUS M. STORKERSON, OF LA CROSSE, WISCONSIN.

## SYSTEM FOR PARTY-LINES IN TELEPHONE-EXCHANGES.

No. 858,767.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed April 25, 1906. Serial No. 313,549.

*To all whom it may concern:*

Be it known that I, JULIUS M. STORKERSON, a citizen of the United States of America, and a resident of La Crosse, county of La Crosse, and State of Wisconsin, have invented a new and useful Improvement in Systems for Party-Lines in Telephone-Exchanges, of which the following is a specification.

My invention pertains to the operation of party lines in telephone exchanges.

By my invention, I divide the subscribers connected with any party line into two groups, the selection of a group on any line being determined by plugging into either one of two jacks, and then the selection between the different stations of the group after having plugged into the jack is accomplished by the operation of ringing keys adapted to send to the line a current of proper character or a proper combination of currents to ring the desired signal bell, to the exclusion of all the others.

In my invention as herein illustrated and described, I show a system of operating party-lines from a two-wire multiple, common-battery switchboard, the system being applicable to many of the existing types of party-line or so-called selective bells, the novelty of my invention residing in the manner in which such bells are connected at the substation equipments, and in the manner in which the lines serving those substations are connected and operated at the central office switchboard. My system is equally applicable to a three-wire multiple switchboard.

Two figures accompany this description, in which,—

Figure 1 shows the circuits of the substation telephones, line, multiple jacks, relays, and answering jack, and Fig. 2 shows the circuits of a typical cord-pair.

The substation telephones of Fig. 1 are similar in their telephonic speech-transmission elements, but differ in their signal-receiving elements, the differences being of two kinds, first in the nature of the ringer or call-receiving device itself, and second in the manner in which that device is connected to the telephone line. In a line where but two substation telephones are served, the first difference may be dispensed with, the call-receiving devices being alike, but differently connected.

The call-receiving devices, 10, 30, 50, 70, at stations 1, 3, 5, 7, differ from each other and may so differ among themselves as to conform to any known method of selective signaling over a single path; a harmonic system of selective signaling is shown, the differences in the devices being indicated by the difference in the size of the tapper attached to the armature of the ringer; in this system, the four devices, 10, 30, 50, 70, all receive current from a ringing generator, such as 10', when such a generator is connected between the line limb 11 and earth, but only one of the devices will produce a signal in response to the generator current,

that device responding to the current being the one which is attuned to the frequency of the generator so connected; other generators are employed to cause the response of other signaling devices, the difference in the generators being the speed of alternation of the ringing current, the differences of speeds in the ringing currents being directly proportioned to the tuning of the different devices to be signaled. Four such generators are shown, at 10', 30', 50', 70', the generator 10' being adapted to signal the devices 10 and 20, the generator 30' being adapted to signal the devices 30 and 40, the generator 50' being adapted to signal the devices 50 and 60, and the generator 70' being adapted to signal the devices 70 and 80.

Of the call-receiving devices, there are connected between the line limb 9 and ground one for each of the generators, 10', 30', 50', 70', and between the line limb 11 and ground a similar set of call-receiving devices for the same ringing generators.

The line limbs 9 and 11 connect the substation telephone equipments to the central office, where they terminate upon the two armatures of cut-off relay 16, thence being extended by the back contacts of those armatures to the armatures of cut-off relay 12; it will be noted that in this connection between the two cut-off relays the line conductors are reversed, or "twisted", the conductor from the back contact of the lefthand armature of relay 16 being connected to the righthand armature of relay 12, and the conductor from the back contact of the righthand armature of relay 16 being connected to lefthand armature of relay 12. Thus, with a predetermined order of connection between the limbs of the line and the first relay, there would result a reversed order of connection between the limbs of the line and the second relay.

From the inner contacts of the armatures of the relay 16, two conductors extend through the multiple switchboard, the inner contact of the righthand armature of relay 16 being connected to the bodies of a series of multiple jacks, 15, 15, 15, and being connected also to the body of an answering jack, 15', although the latter jack is not necessary in my system; the inner contact of the lefthand armature of relay 16 is connected to the springs of those jacks. From the inner contacts of the armatures of relay 12, two conductors extend through the multiple switchboard, the inner contact of the righthand armature of relay 12 being connected to the bodies of a series of multiple jacks, 14, 14, 14, and being connected also to the body of the answering jack, 14', associated with a calling lamp, 17; the inner contact of the lefthand armature of relay 12 is connected to the springs of those jacks.

It will be noted that from the bodies of jacks 14, circuit extends through the winding of relay 12 to earth, and that when that relay is operated circuit also extends from the bodies of jacks 14 to line limb 11, while

circuit extends from the springs of those jacks to line limb 9. It will be noted also that from the bodies of jacks 15 circuit extends through the winding of relay 16 and thence through the winding of relay 12 in series with the winding of relay 16 and to earth, and that when relay 16 is operated circuit also extends from the bodies of jacks 15 to the line limb 9, while circuit also extends from the springs of those jacks to line limb 11; with the operation of relay 16 by current received over a circuit from the body of one of the jacks 15, some energization of the core of relay 12 will occur, but the circuits from the jack elements to the line limbs will exist, regardless of whether the energization of the core of relay 12 is sufficient to operate its armatures, or not.

Removing any receiver from its hook when no plug is in any jack will energize the line relay 13, causing the lamp 17 to glow as a signal; by the insertion into any of the jacks, but presumably into jack 14', because it is associated with the lamp 17, of a plug 23, giving current to ground from the body of the jack, one or both of the cut-off relays, 12 and 16, will be operated, and the circuits of the line relay 13 will be broken, extinguishing the lamp 17, all in a manner quite usual in the art.

In Fig. 2 is shown a cord-pair of well known type, which is equipped with four ringing keys, 18, 19, 21, 22, the operation of any one of which will connect the body of the ringing plug 24 with a grounded battery and the tip of the ringing plug 24 with the associated one of the ringing generators, 10', 30', 50', 70'.

In calling any of the substation telephones, in Fig. 1, the ringing plug 24 and the ringing keys, 18, 19, 21, 22, are used as follows, it being borne in mind that so far as the telephone operator is concerned, the jacks 14, 14, 14, and the jacks 15, 15, 15, pertain to different lines: Substation 1, ring line 14 key 18, generator 10'; station 2, ring line 15 key 18, generator 10'; station 3, ring line 14 key 19, generator 30'; station 4, ring line 15 key 19, generator 30'; station 5, ring line 14 key 21, generator 50'; station 6, ring line 15 key 21, generator 50'; station 7, ring line 14, key 22, generator 70'; station 8, ring line 15 key 22, generator 70'.

Tracing the current for ringing station 1, with plug 24 in any jack 14, we find circuit from earth, through generator 10', key 18, tip of plug 24, spring of jack 14, conductor 25 of the switchboard cabling, contact of relay 12 operated, contact of relay 16 not operated, line limb 9, ringing device 10 and earth; relay 12 is held operated meanwhile by circuit from earth through battery 29, conductor 31, coil 32, key 18, body of plug 24, body of jack 14, switchboard cable conductor 26, winding of relay 12, and earth.

Tracing the current for ringing station 2, with plug 24 in any jack 15, we find circuit from earth, through generator 10', key 18, tip of plug 24, spring of jack 15, switchboard cable conductor 27, inner contact of relay 16 operated, line limb 11, ringing device 20, and earth; relay 16 is held operated meanwhile by circuit from earth through battery 29, conductor 31, coil 32, key 18, body of plug 24, switchboard cable conductor 28, winding of relay 16, winding of relay 12, and earth.

It will be noted that if the party line had but two substations, say stations 1 and 2, the two telephones would be rung selectively with but one ringing key

and with but one ringing generator, a special selective bell not being required, and the entire selection of substations depending upon the selection of the proper jack by the operator; the two series of jacks in the multiple therefore would bear the directory numbers of the two substations upon the line, and the operation of ringing those stations so far as the work of the switchboard operator is concerned would be identical with the work of ringing independent telephone lines.

The busy test condition required by the cord pair of Fig. 2 is that the jack of a busy line shall have a potential above the earth by which current may flow from jack body through plug tip and to earth when testing. This is provided for in the following manner: With a plug in jack 14', current flows from the body of the plug to conductor 26 and through relay 12 to earth, whence test is made directly upon conductor 26 by jacks 14, and test is made by jacks 15 to conductor 28 and thence through the winding of relay 16 to conductor 26. With a plug in jack 15', current flows from the body of the plug through conductor 28, winding of relay 16 and winding of relay 12 to earth, jacks 15 testing directly upon the conductor 28, and jacks 14 testing upon conductor 26 which now gives a busy test due to the fall of potential upon the winding of the relay 12.

I do not wish to limit myself in all respects to the exact circuits, details and description here given, as I understand that many modifications might be made without departing from the spirit or scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a telephone system, a telephone line; a plurality of series of multiple jacks; a relay; a second relay; and signal-receiving means; said first relay having contacts adapted to connect said line to said second relay, said second relay having contacts adapted to connect said line to said signal-receiving means, said first relay having contacts adapted to connect said line to one of said series of multiple jacks, and said second relay having contacts adapted to connect said line to another of said series of multiple jacks, substantially as described.
2. In a telephone system, a telephone line; a plurality of series of multiple jacks; and two relays associated with said telephone line, one of said relays having contacts adapted to connect said line to said second relay and having contacts adapted to connect said line to one of said series of multiple jacks, and the other of said relays having contacts adapted to connect said line to another of said series of multiple jacks, substantially as described.
3. In a telephone system, a telephone line; a plurality of series of multiple jacks; a relay; a second relay; and signal-receiving means; said first relay having contacts adapted to connect said line alternatively to one of said series of multiple jacks or to said second relay, and said second relay having contacts adapted to connect said line alternatively to another of said series of multiple jacks or to said signal-receiving means, substantially as described.
4. In a telephone system, a telephone line; a plurality of series of multiple jacks; and two relays; one of said relays having contacts to connect said line alternatively to one of said series of multiple jacks or to the other of said two relays, and the other of said two relays having contacts adapted to connect said line to another of said series of multiple jacks, substantially as described.
5. In a telephone system, a telephone line; a plurality of series of multiple jacks; a relay associated with said line and with one of said series of multiple jacks and adapted when actuated to connect one of said series of multiple jacks to said telephone line; and a second relay associated with said telephone line and with another one

of said series of multiple jacks and adapted when actuated to connect its associated series of multiple jacks with said telephone line, substantially as described.

6. In a telephone system, a telephone line; a plurality of series of multiple jacks all normally disconnected from said telephone line; a relay associated with said telephone line and with one of said series of multiple jacks and adapted when actuated to connect said series of multiple jacks to said telephone line; and a second relay associated with said telephone line and with another of said series of multiple jacks and adapted when actuated to connect its associated series of multiple jacks with said telephone line, substantially as described.

7. In a telephone system, a telephone line; a plurality of series of multiple jacks; a relay associated with said telephone line and with one of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its said associated series of multiple jacks to said telephone line; and a second relay associated with said telephone line and with another of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its said associated series of multiple jacks with said telephone line, substantially as described.

8. In a telephone system, a telephone line; a plurality of series of multiple jacks all normally disconnected from said telephone line; a relay associated with said telephone line and with one of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its associated series of multiple jacks to said telephone line; and a second relay associated with said telephone line and with another of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its said associated series of multiple jacks to said telephone line, substantially as described.

9. In a telephone system, a telephone line; a plurality of series of multiple jacks; signal-receiving means; and two relays, one of said relays being associated with said telephone line and with one of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its said associated series of multiple jacks to said telephone line and adapted when not actuated to connect said telephone line to the other of said two relays, and the other of said relays being associated with said telephone line and with another of said series of multiple jacks and adapted to be actuated when one of its associated jacks is connected with and adapted when actuated to connect its said associated series of multiple jacks to said telephone line and adapted when not actuated to connect said telephone line to said signal-receiving means, substantially as described.

10. In a telephone system; a plurality of series of multiple jacks; a relay; a second relay; signal-receiving means; and a telephone line normally connected to contacts of said first relay, to contacts of said second relay and to said signal-receiving means; said first relay having contacts adapted to connect said line to one of said series of multiple jacks, and said second relay having contacts adapted to connect said line to another of said series of multiple jacks, substantially as described.

11. In a telephone system, a telephone line; a plurality of series of multiple jacks; a relay; a second relay; signal-receiving means; said first relay having contacts adapted

to connect said line alternatively to one of said series of multiple jacks or to said second relay, and said second relay having contacts adapted to connect said line alternatively to another of said series of multiple jacks or to said signal-receiving means; and means for operating said second relay independently of said first relay, substantially as described.

12. In a telephone system, a telephone line of two limbs; a plurality of series of multiple jacks; a relay, and a second relay; said first relay having contacts adapted to connect said line limbs to one of said series of multiple jacks with a predetermined order of connection between the line limbs and the jack parts, and said second relay having contacts adapted to connect said line limbs to another of said series of multiple jacks with an order of connection between the line limbs and the jack parts the reverse of the order determined for said first relay's operation, substantially as described.

13. In a telephone system, a telephone line of two limbs; a plurality of series of multiple jacks; a relay; a second relay; said first relay having contacts adapted to connect said line limbs to one of said series of multiple jacks with a predetermined order of connection between the line limbs and the jack parts, and said second relay having contacts adapted to connect said line limbs to another of said series of multiple jacks with an order of connection between the line limbs and the jack parts the reverse of the order determined for said first relay's operation; a switch plug adapted to connect with any of said multiple jacks; means for operating said first relay when said switch plug is connected with one of said first series of multiple jacks; and means for operating said second relay when said switch plug is connected to one of said second series of multiple jacks, substantially as described.

14. In a telephone system, two series of multiple jacks; two cut-off relays; a circuit extending from the bodies of the jacks of one of said series of multiple jacks to and through the winding of one of said cut-off relays and to earth; and another circuit extending from the bodies of the jacks of the other of said two series of multiple jacks to and through the winding of the second of said cut-off relays and thence to and through the winding of said first of said cut-off relays and to earth, whereby a connecting plug inserted in a jack of either series of multiple jacks will give busy test upon the jacks of both series, substantially as described.

15. In a telephone system, a telephone line of two limbs; two cut-off relays associated with said line; connections between said line and the first of said cut-off relays; connections between said line and the second of said cut-off relays; two series of multiple jacks; connections between said first cut-off relay and one of said series of multiple jacks; connections between said second cut-off relay and the second series of said series of multiple jacks; the connections between the relays and the multiple jacks being homologous for both relays and the connections between the line limbs and the second relay being the reverse of the connection between the line limbs and the first relay, substantially as described.

Signed by me at La Crosse, county of La Crosse and State of Wisconsin, this 21 day of April, 1907.

JULIUS M. STORKERSON.

Witnesses:

I. W. GOSNELL,  
M. K. RICHMOND.