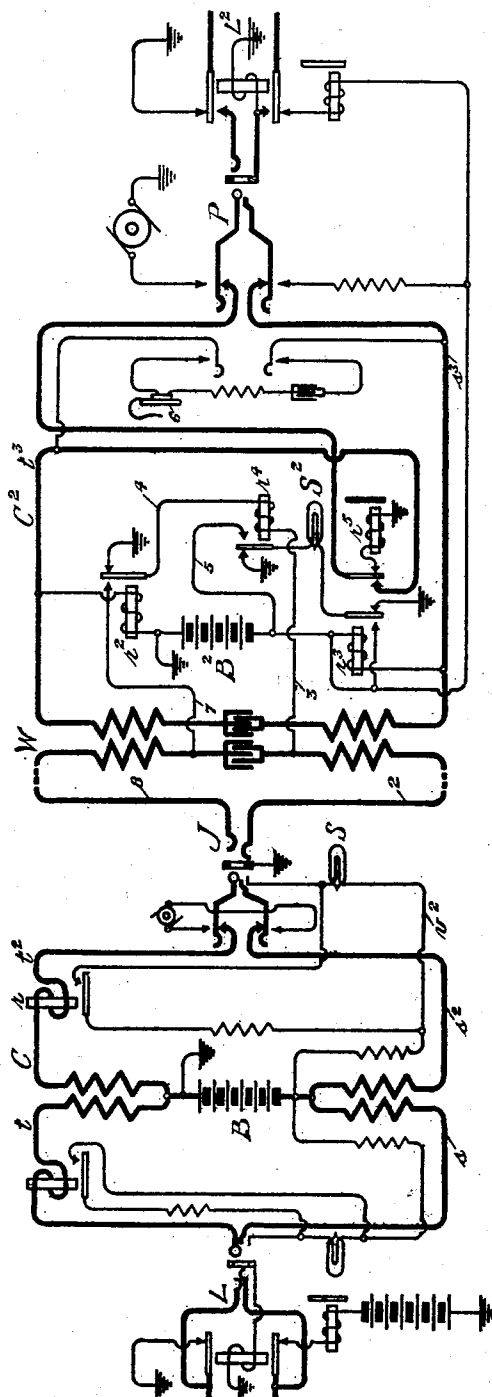


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C. S. WINSTON.
TELEPHONE TRUNK CIRCUIT.
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UNITED STATES PATENT OFFICE.

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TELEPHONE TRUNK-CIRCUIT.

No. 863,338.

Specification of Letters Patent.

Patented Aug. 13, 1907.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Trunk-Circuits, of which the following is a specification.

My invention relates to improvements in telephone trunk circuits and particularly to trunk circuits for connecting together the so called three-wire and two-wire exchanges.

In the three-wire exchanges the telephone lines are provided with three conductors extending throughout the switchboard, two of which are included in the talking circuit and the other, which is insulated from the talking circuit, is utilized for the busy test circuit and the cut-off relay circuit. The cord circuit in this system is also provided with three conductors, two for talking and the third to cooperate with the said third conductor of the lines. In the two-wire circuits only two conductors for each line extend throughout the switchboard and since both must be utilized in the talking circuit there are no extra wires for the busy test and cut-off relays; these functions therefore must be performed by said two wires, and hence the difference in the systems.

My invention of a trunk circuit to cooperate between such exchanges is arranged to be carried out with the least possible apparatus consistent with a satisfactory and efficient mode of operation.

In the accompanying drawing forming a part of this specification the figure is a diagram of a telephone system embodying my invention.

In this figure C indicates the three-wire office and C² the two-wire office; at the former L indicates a three-wire line of the type terminating at said office and at the latter L² designates a line of the two-wire type such as here terminate. The cord circuit of the office C is provided with the strands *t* and *s* and *t*² and *s*² joined by the windings of a repeating coil and a battery B. A supervisory signal S is included in the third strand *v*², a shunt of which is controlled by the supervisory relay *r*, and similar apparatus is provided for the answering end of the cord. The trunk at the outgoing end is furnished with a connecting jack J and at the incoming office with a repeating coil W, relays *r*² and *r*³ bridged across the trunk circuit together with the battery B², a third relay *r*⁴ which may be termed the trunk relay, and other apparatus necessary to establish and supervise connections between the subscribers' lines.

A call coming in over the line L, for example, is answered by the operator in the usual way, and if a line at the exchange C² is desired the calling plug of the cord is inserted in the jack J of the trunk. This results in a flow of current over strand *s*² of the cord, the sleeve

side 2 of the trunk, conductor 3 to relay *r*⁴ and thence by way of wire 4 to the spring of relay *r*² and ground. The current in this path energizes said relay *r*⁴ and causes current to flow from the live pole of battery B² over wire 5, forward contact and spring of relay *r*⁴, to and through the lamp S², and thence through the spring and back contact of relay *r*³ to ground. This lamp S² is therefore lighted and indicates to the operator that a call is made upon the trunk; whereupon the operator connects her head telephone 6 therewith and receives the order. The wanted line is tested in the usual manner, the test being made through the test relay *r*⁵ in the usual manner. If found idle the plug P of the trunk is inserted in the jack, say of the line L², and the ringing key operated. The insertion of plug P causes current from battery B² to flow through relay *r*³, over the conductor *s*³ of the trunk cord and through the cut-off relay of the line L² to ground, thus operating the latter relay to place the line in condition for conversation and prevent its line signal operating and also operating relay *r*³ to extinguish the lamp S², disconnect relay *r*⁵ and connect the two portions of the strand *t*³ for conversation. When the subscriber responds to the call, the current from battery B² circulates in the metallic line and through the relay *r*², thereby operating the latter and connecting the conductor 4 with conductor 8 so that the current in the outgoing end of the trunk now finds a return path over conductor 7, tip side 8 of the trunk strand *t*² of the cord to the other pole of battery B. This current operates supervisory relay *r* to shunt out and retire the supervisory signal S which until now was lighted over the strand *v*² and the grounded test ring of the jack J. The operator at office C is thus informed that the called subscriber has responded and that the two parties are now in conversation.

At the termination of the conversation, the return of the called subscriber's telephone to its hook opens the line circuit and deenergizes relay *r*² which in turn deenergizes relay *r* in the cord and lights the lamp S. The initiating operator seeing the signal knows the conversation is ended and withdraws the cord circuit plug from the jack J. The taking down of the cord cuts off current from the trunk relay *r*⁴ which releasing its spring grounds through its back contacts the lamp S² whose other terminal is now connected by the relay *r*³ with the live pole of the battery B². This lamp is therefore lighted to give the disconnect signal and remains so until the incoming operator noting the signal takes down the trunk plug and deenergizes relay *r*³ which restores all parts to normal condition.

I claim:

1. The combination with a trunk circuit, of a jack at the outgoing end, a cord circuit having two strands in the

- 5 talking circuit, a signal in a third strand, means associated with the jack to complete the third strand, a relay in the talking circuit responsive to current therein, a trunk cord for the incoming end; said cord having only the talking strands, a relay of the latter end responsive to current over the subscriber's line, said relay controlling the flow of current over the outgoing end to operate said cord circuit relay, substantially as described.
- 10 2. The combination with a trunk circuit, of a three strand cord circuit to connect with its outgoing end, a two-strand cord circuit permanently connected with its incoming end, a two-wire central energy signaling telephone line with which the latter cord connects, and relay mechanisms associated with the trunk to inform the outgoing
- 15 operator of the position of the two-wire subscriber's telephone, substantially as described.
- 20 3. The combination with a trunk, of the three conductor cord circuit adapted to be connected with its outgoing end, a supervisory signal in the third strand of said cord, a relay in one of the talking strands of said circuit, said trunk terminating at the incoming end in a two conductor cord adapted to be connected with similar telephone lines, a pair of relays and a battery between bridged across the latter end of the trunk, one of said pair of relays being actuated when a connection is established with the called line to place a signal in condition to operate and the other relay to be actuated when the subscriber responds, said latter relay controlling the operation of the said relay in the cord circuit, and another relay at the incoming end controlled by the connection of the cord circuit with the trunk and serving when energized to prevent the operation of the signal at the incoming end, substantially as described.
- 35 4. In a telephone system, the combination with a trunk circuit terminating at one end in a two-strand cord and plug, and at the other end in a three-point jack, of a three-strand cord circuit adapted to be connected with said latter end, and a telephone line having a central source of energy normally associated therewith for the actuation of incoming signals with which the former end may be connected, substantially as described.
- 40 5. In a telephone system, the combination with a telephone line terminating at its central office in a three-point jack, of a telephone line having a central source of current for the actuation of incoming signals terminating at its central office in a two-point jack, means to connect said lines for conversation, and means to supervise said connections, substantially as described.
- 45 6. In a telephone system, the combination with a trunk circuit terminating at one end in a two-strand cord and plug, and at the other end in a three-point jack, a three-strand cord circuit adapted to be connected with said latter end, a signal in said third strand adapted to be displayed when said cord is connected with said three-point jack, and a relay in the talking strand of said cord circuit adapted by its actuation to efface said signal, substantially as described.
- 50 7. In a telephone system, the combination with a trunk circuit terminating at one end in a two-strand cord and plug, and at the other end in a three-point jack, a three-strand cord circuit adapted to be connected with said latter end, a signal in the third conductor of said cord circuit, a relay in one of the talking strands of the cord circuit adapted to control said signal, and means at the incoming end of said trunk circuit to control the circuit through said relay, substantially as described.
- 55 8. In a telephone system, the combination with a trunk circuit terminating at one end in a two-strand cord and plug, and at the other end in a three-point jack, a three-strand cord circuit adapted to be connected with said latter or outgoing end, a relay at the incoming end adapted

to be actuated by current over one limb of said trunk when connection is made thereto at the outgoing end, and a signal adapted to be displayed by the actuation of said relay, substantially as described. 75

9. In a telephone system, the combination with a trunk circuit adapted to connect telephone lines terminating in three-point jacks with telephone lines terminating in two-point jacks, of a signal at the incoming end of said trunk line, a relay at said end permanently connected to one limb of said trunk line and adapted to control said signal, and a second relay associated with said incoming end adapted to control the circuit of said first relay, said latter relay being under the control of the subscriber whose line terminates in a two-point jack, substantially as described. 80 85

10. In a telephone system, the combination with a trunk line adapted to connect together subscribers' lines which terminate upon different switchboards, of a two-conductor cord circuit permanently connected to one end of said trunk line and a three-conductor cord circuit adapted to be temporarily connected with the other end of said trunk line, a signal associated with said two-conductor cord circuit having its circuit controlled by two relays, the actuation of either being adapted to display said signal, but the actuation of both being adapted to efface it, one of said relays being actuated by current flowing over one limb of the trunk line when said three-conductor cord is connected thereto, and the other being actuated by current flowing over one branch of the two-conductor cord circuit when said cord circuit is connected to a telephone line, substantially as described. 90 95 100

11. In a telephone system, the combination with a trunk line, of a cord circuit adapted to be connected to one end of said trunk line, and a telephone line with which the other end of said trunk is adapted to be connected, a signal associated with the incoming end of said trunk line, a relay associated with said end normally connected between ground and one of the limbs of the trunk line, said relay controlling the circuit of said signal, a second relay having its coil in a local circuit including a local battery and adapted to be closed by the connection of said trunk with said line, said second relay also controlling the circuit of said signal, a third relay adapted to be energized over said telephone line to transfer the connection of said first relay from ground to the normally open limb of said trunk line, a signal temporarily associated with the trunk line at its outgoing end and adapted to be displayed when said cord circuit is connected to said trunk, and a relay at said end adapted to be energized to efface said latter signal by current flowing over the limbs of the trunk line in series, substantially as described. 105 110 115 120

12. In a telephone system, the combination with a trunk line, of a cord circuit adapted to be connected therewith at the outgoing end of said trunk, and a telephone line with which the incoming end of said trunk is adapted to connect, a signal associated with the incoming end, two relays for the control of said signal, one relay adapted to be actuated when said cord circuit is connected with the trunk and the other to be actuated when the trunk is connected with said line, and circuit arrangements whereby the signal circuit is opened when neither relay is actuated, closed when either relay is actuated alone and again opened when both relays are actuated, substantially as described. 125 130 135

Signed by me at Chicago, county of Cook, State of Illinois, in the presence of two witnesses.

CHARLES S. WINSTON.

Witnesses:

ROBERT LEWIS AMES,
EDITH F. GRIER.