

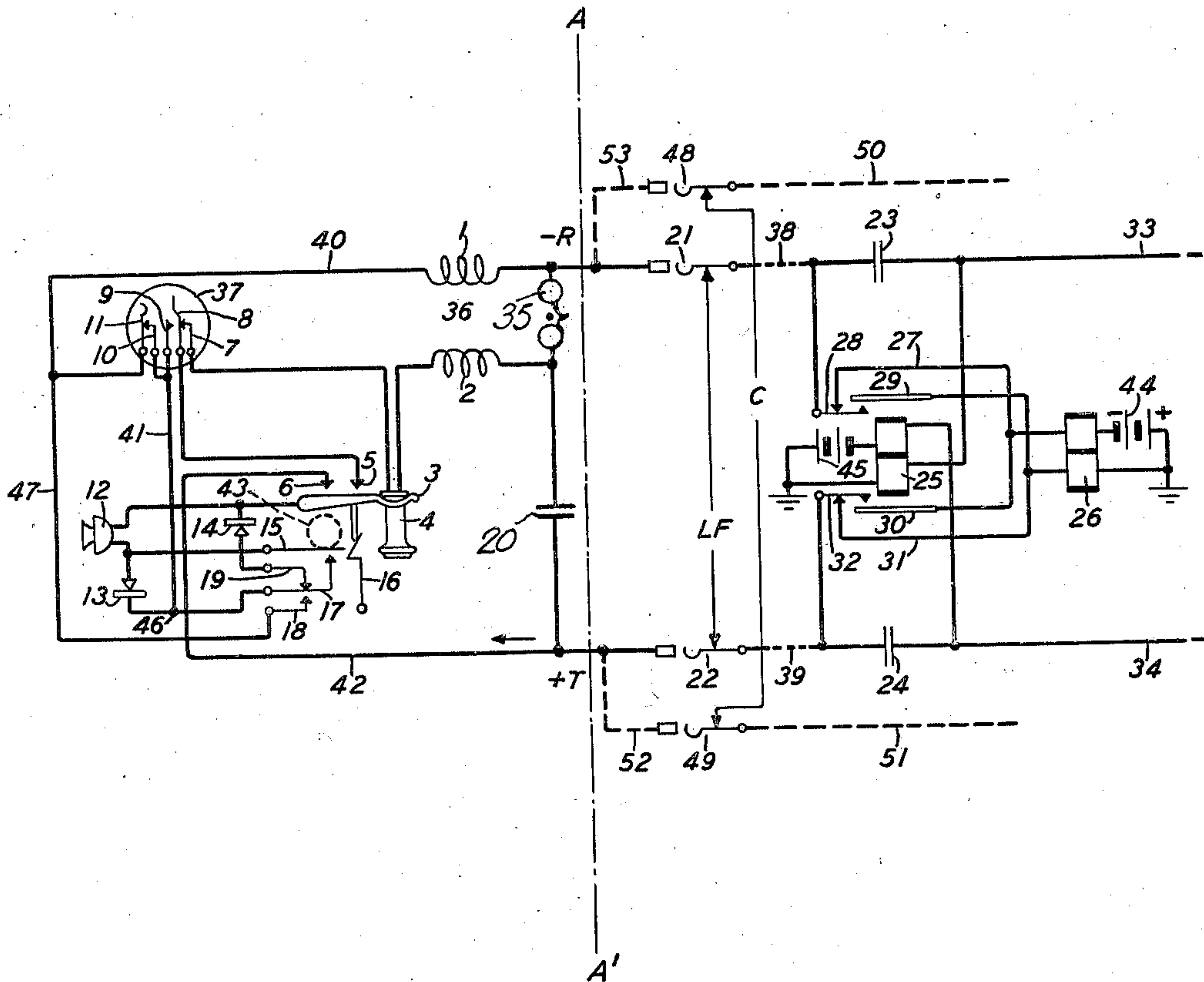
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and particularly to pay station service systems in which a calling subscriber must deposit a coin before he can converse with the called subscriber.

5 An object of this invention is to improve and simplify pay station circuits for post-payment service. Another object is to provide pay station circuits that function without any special equipment at the central office.

10 Heretofore systems have been provided in which a transmitter has been disabled during certain periods of the call in which rectifiers have been used as blocking means, one in series with the transmitter and the other in parallel with the transmitter.

15 In these systems when a calling subscriber removes his receiver from the hook, the transmitter current is such that it may pass through the transmitter and the rectifier in series therewith. 20 When the called party answers, the current reverses at the central office and the transmitter is thereby disabled as the current passes through the rectifier in shunt of the transmitter. When the called party answers the calling party can 25 hear the answer of the called party. The calling party then deposits a coin to momentarily open a connection in shunt of a resistance in the line. This causes apparatus at the central office to reverse the current and thus permit the current 30 to pass through the transmitter and rectifier in series therewith.

A feature of the present invention is a circuit arrangement of this type for pay station use in which rectifier means are employed to disable 35 the transmitter by the reversal of current prior to payment and to make the transmitter operative upon payment without again reversing the current. This feature may be embodied in an arrangement where one rectifier is placed in series with the transmitter and another is placed 40 in shunt of the transmitter and the first rectifier. Normally, the direction of current may be such that it passes through the transmitter and the rectifier in series therewith and when the called 45 party answers the current reverses. The transmitter is thereby disabled by the current passing through the shunting rectifier. The calling party, however, can hear the answer of the called party. When the calling party then deposits a 50 coin, the series rectifier is short circuited and the path for the shunting rectifier is opened so that without again reversing the current, the transmitter is made operative and without any rectifiers in the transmitter circuit. Thus, a talking 55 path is provided for the calling subscriber

without any second reversal of the current or any apparatus at the central office for providing such reversal. The apparatus at the central office for reversing the current a second time as heretofore required in the prior art is thereby 5 eliminated by the present invention and the transmitter circuit during talking is freed from all encumbrances such as the rectifier in series therewith, heretofore remaining in this circuit during talking.

10 Another feature is an arrangement in the above mentioned circuit whereby when the transmitter is made operative upon payment the dial or pulse contacts are eliminated from the established connection. For this purpose the dial contacts are 15 normally placed in series with both rectifiers and the transmitter and when a coin is deposited the dial contacts are short-circuited. This feature therefore guards the system against attempts to 20 release an established connection and then to seize another connection without depositing another coin by manipulation of the dial contacts.

This invention will be clearly understood by reference to the accompanying drawing. The 25 section to the right of the dotted line AA' shows schematically in part a line finder LF and other apparatus at a step-by-step dial office including a relay 25 arranged to control the reversal of current supplied to conductors 38 and 39 from 30 a bridged impedance battery supply in connection with coil 26. Also there is shown an abbreviated schematic representation of a connector C with contacts 48 and 49. This apparatus is 35 all well known in the art, and only that part of it necessary to explain the operation of this invention is shown. The section to the left of said line AA' illustrates a subscriber's post-payment 40 station arranged in accordance with this invention which includes a transmitter, receiver, induction coil, condenser, ringer, switchhook and dial. There are also illustrated two rectifiers, 45 one of which, designated 13, is connected in series with the transmitter 12, and the other, designated 14, in multiple with the transmitter 12 and rectifier 13. These rectifiers are poled to 50 pass current in the direction indicated by the arrows and to block current in the opposite direction. A coin switch is also shown. This operates when a coin is deposited and is arranged to be 55 locked in its operated position under control of a hook actuated by the switchhook aforementioned.

A detailed description of the operation of the arrangement shown in the drawing will now be given.

Assume that a subscriber at the post-payment station, hereinbefore mentioned, desires to establish a connection with another subscriber's station, not shown, but connected to a dial office, the apparatus of which is partly shown at the right of line AA'. To this end the subscriber removes the receiver 4 from the switchhook 3. This causes the line finder LF to function and close contacts 21 and 22. Other details of the line finder are not shown, the parts omitted being indicated by the dotted lines 38 and 39.

A circuit may now be traced through the contacts of dial 37 from the grounded positive pole of a battery connection established by the line finder, not shown, line finder contact 22, over conductor 42, through switchhook contact 6, transmitter 12, rectifier 13, conductor 41, springs 10 and 11 of dial 37, over conductor 40, winding 1 of induction coil 36, through line finder contact 21, to the negative pole of said battery. In the circuit above traced current flows in the direction of the arrow of rectifier 13, and consequently rectifier 13 permits current to pass through itself and transmitter 12. In shunt with transmitter 12 and rectifier 13 a circuit path may be traced through rectifier 14 and coin switch springs 19 and 17. Through this shunt path, however, no appreciable current can flow at this time, since the direction of flow opposes the direction of the arrow of rectifier 14. This high resistance path through rectifier 14 is only incidental at this time. However, its useful functioning will be described later in another connection. It is sufficient for the present that the path through transmitter 12 be of low resistance, as evidenced by the passage of current therethrough as described above, so that other apparatus, not shown, at the dial office may be caused to function and to extend a talking connection through connective apparatus in the dial office leading towards the line of the called subscriber, such apparatus consisting of automatic switches and relays, which are not shown here. The subscriber on receiving the usual dial tone, now operates dial 37 and dials the number of the called subscriber. This causes pulsing contacts 10 and 11 to interrupt a circuit which was in part previously traced. This circuit was hereinbefore traced from a grounded positive pole of a battery connection to switchhook contact 6. From this point the pulsing circuit proceeds through switchhook contact 5 and off normal contacts 8 and 9 (which are closed when the dial is moved from its normal position) through pulsing contacts 10 and 11 and thence over conductor 40 by the circuit previously traced to the negative pole of said battery. To avoid clicks in the receiver 4 while dialing dial contacts 7 and 8 are opened while the dial is off normal, thereby opening the circuit through winding 2 of induction coil 36 and the winding of receiver 4.

The interruptions in accordance with dial pulses of the pulsing circuit corresponding to the digits of the called number eventually effect a connection from battery 44, windings of coil 26, conductors 27 and 31, contacts 28 and 32 of relay 25, conductors 38 and 39, contacts 21 and 22 at the line finder, through the calling subscriber's loop as hereinbefore traced, and also a connection through condensers 23 and 24 and conductors 33 and 34 to the called subscriber's line, not shown. When the receiver at the called station is removed from the switchhook, a bridge not shown, is connected across conductors 33 and 34, causing the operation of relay 25, through a circuit which may be traced from grounded battery 45 through

the upper winding of relay 25 to conductor 34, thence through said bridge, over conductor 33 and through the lower winding of relay 25 to ground. Relay 25 in operating reverses the polarity of the current connected to line finder contacts 21 and 22 from battery 44 and a circuit may now be traced, in the direction of current flow from the grounded positive pole of battery 44, through the lower winding of coil 26, through contacts 29 and 28 of relay 25, conductor 38, line finder contact 21, through winding 1 of induction coil 36 conductor 40, contacts 11 and 10 of dial 37, over conductor 41 to rectifier 13, which is poled so as to prevent the passage of current through it and transmitter 12. However, from junction point 46, the circuit may be continued through contacts 17 and 19 and rectifier 14 to switchhook contact 6. Rectifier 14 is so poled that current is now passed through it, and accordingly it acts as a low resistance shunt on the series path consisting of rectifier 13 and transmitter 12. From switchhook contact 6 the circuit continues over conductor 42 through line finder contacts 22, conductor 39, contacts 32 and 30 of relay 25 and upper winding of coil 26 to negative pole of battery 44. From the circuit just traced it is seen that the reversal of current due to the answer of the called subscriber has caused the disabling of transmitter 12, since as explained hereinbefore current is now blocked by the opposing rectifier 13 from passing through transmitter 12 while the rectifier 14 is so connected as to act as a low resistance shunt on the series path including rectifier 13 and transmitter 12. Although the transmitter 12 is thus rendered ineffective receiver 4 is so connected that the subscriber at the post-payment station can hear the answer of the called subscriber over the line through the normal receiver circuit comprising condenser 20, winding 2 of induction coil 36, receiver 4, normally closed dial contacts 7 and 8, switchhook contacts 5 and 6 and conductor 42.

It is now necessary for the calling subscriber, in order to put the line in a conversational condition, to deposit a coin 43, the weight of which causes springs 15, 17 and 18 to make contact and spring 17 to break its normal contact with spring 19. The effect of this is to make the transmitter effective for conversation, as will now be seen. It was explained hereinbefore that when the called subscriber answered and the current was reversed that the passage of current through transmitter 12 was blocked by rectifier 13, and that the transmitter was further disabled by a shunting path through rectifier 14, which freely passed the shunting current under this condition. When springs 15 and 17 make contact it is seen that rectifier 13 is short-circuited over an obvious circuit and that the shunt due to rectifier 14 is opened when springs 19 and 17 break. Consequently, current can now pass through transmitter 12 over a circuit path from conductors 40 and 41, through springs 18, 17 and 15, transmitter 12, switchhook contact 6 to conductor 42, and thence over the circuit previously traced. When the subscriber at the pay station talks, current in the primary winding 1 of induction coil 36 fluctuates in accordance with the sound waves impressed on the diaphragm of transmitter 12, inducing corresponding currents in secondary winding 2, which are conducted to the line in the usual manner through condenser 20, winding 2, receiver 4, dial contacts 7 and 8, and switchhook contacts 5 and 6. When spring 15 was depressed by the deposit of coin 43 it locked in its operated position under

control of spring 16, which moved to the left when the receiver 4 was removed from the switchhook 3.

At the end of the conversation receiver 4 is restored to switchhook 3, which causes contacts 5 and 6 to open and release the apparatus at the central office, and also spring 16 to move to the right releasing spring 15. The motion of spring 16 also causes coin 43 to be removed from spring 15, thereby restoring springs 15, 17, 18 and 19 to their normal position. It will be noted that when springs 15, 17, 18 and 19 are still in their operated position before the coin 43 is removed by restoring the receiver 4 to the switchhook 3, the apparatus at the central office cannot be released by moving the dial contacts off normal, since the dial contact springs 10 and 11 are disabled over a shunt path including conductor 47, springs 18 and 17, and conductor 41. It is thus impossible to dial another number without first disposing of the deposited coin 43 by restoring the receiver 4 to the switchhook 3.

The preceding description is for a call requiring the deposit of a coin. A description will now be made for the case where the pay station subscriber wishes to call an official number, for which no charge is to be made. In this case the subscriber dials the desired number as previously described and when the called party answers there is no reversal of line current and the current passes through transmitter 12 over the circuit previously traced in connection with an outgoing call for a subscriber, before said subscriber answered and reversed the current. Consequently it is now unnecessary to deposit a coin to converse with the called party.

A call incoming from the central office will now be described. When the calling subscriber (whose station is not shown) dials the number of the pay station, connection is made to the called line over conductors 50, 53, 52 and 51 and contacts 48 and 49 of an automatic connector C, the details of which are well known in the art and consequently need not be shown here. The omitted portions are indicated by the dotted lines representing conductors 50, 53, 52 and 51. As soon as a connection is established ringing current is applied and a circuit may be traced from one terminal of the source of ringing current (not shown) over conductor 50 through contact 48, over conductor 53, through ringer 35, condenser 20, over conductor 52, through contact 49 and over conductor 51 to the other ringing terminal (not shown). Ringer 35 sounds when the subscriber in answering removes receiver 4 from the switchhook a bridge is closed, which causes the ringing current to be disconnected. This bridge is the same as that previously traced through the apparatus of the subscriber's station answered and reversed the current. After ringing has ceased, battery and ground (not shown) are connected to conductors 50 and 51, respectively. It is assumed that the battery terminal is negative and the ground terminal positive. Current will now flow through contacts 48 and 49 of connector C and over conductors 53 and 52 through a circuit at the subscriber's station, including transmitter 12 that was previously traced for a call outgoing from the pay station before current was reversed by the answer of the called subscriber. The station is now ready for conversation through contacts 48 and 49 of connector C and over conductors 50 and 51. At the end of the conversation, the

called subscriber replaces receiver 4 on the switchhook 3, and when the calling subscriber also disconnects the connection is broken down at contacts 48 and 49 of connector C, restoring all apparatus to normal.

What is claimed is:

1. A telephone set comprising a microphone, a circuit therefor, rectifier means in said circuit for short-circuiting said microphone during a certain period of a call from said set, and means for entirely eliminating said rectifier means from said circuit during other periods of said call.
2. A telephone set comprising a microphone, a circuit for said microphone, rectifiers in said circuit effective on current reversal in said circuit while making a call from said set for short-circuiting said microphone, and means thereafter operative for entirely excluding said rectifiers from said circuit to permit said reversed current to pass through the microphone.
3. A telephone set comprising a microphone, a circuit therefor, a rectifier in said circuit in series with said microphone, a rectifier in said circuit in parallel with said microphone and said first mentioned rectifier, and means operative upon payment for shunting the rectifier in series with the microphone and for opening the connection in said circuit for the rectifier in parallel with the microphone.
4. A telephone set comprising a microphone and a dial, a circuit for said microphone and dial, rectifier means in said circuit for short-circuiting said microphone during a certain period of making a call from said set, and means for eliminating said rectifier means from said circuit and short-circuiting said dial during other periods of said call.
5. A telephone set comprising a microphone and a dial, a circuit therefor, rectifiers in said circuit effective on current reversal in said circuit while making a call from said set for short-circuiting said microphone, and means thereafter operative for entirely excluding said rectifiers from said circuit to permit said reversed current to pass through the microphone.
6. A telephone set comprising a microphone and dial contacts, a circuit for said microphone and dial contacts, rectifier means in said circuit for preventing the passage of current through said microphone during a certain period of a call from said set, and means for entirely eliminating said rectifier means from said circuit to allow passage of currents through said microphone during certain other periods of said call.
7. A telephone pay station comprising a microphone and dial contacts, a circuit for said microphone and dial contacts, rectifier means in said circuit for blocking of speech current of one direction through the microphone prior to payment and means for eliminating said rectifier means and dial contacts from said circuit upon payment to permit the passage of speech current of said direction through the microphone.
8. A telephone pay station comprising a microphone, dial contacts, rectifiers, a circuit including one of said rectifiers in series with said microphone and another of said rectifiers in shunt of said microphone and said first mentioned rectifier and said dial contacts in series with said rectifiers and microphone, said first mentioned rectifier blocking current of one direction through said microphone and said second mentioned rectifier passing current of said one direction in shunt of the microphone, and means responsive upon payment for eliminating said rectifiers and said dial

contacts from said circuit to permit free passage of current of said one direction through the microphone.

9. A telephone pay station comprising a microphone, dial contacts, two rectifiers, a circuit for connecting one rectifier in series and the other in parallel with said microphone and both rectifiers in series with said dial contacts, means operative prior to payment for preventing current from passing through said microphone by the aid of said rectifiers, and means operative upon payment for permitting the passage of current through said microphone without passing through said rectifiers and said dial contacts.

10. A telephone pay station comprising a circuit, a microphone in said circuit, a rectifier in said circuit in series with said microphone, a rectifier in said circuit in parallel with said microphone and said first mentioned rectifier, dial contacts in series with one of said rectifiers, and means operative upon payment for shunting the rectifier in series with the microphone for opening said circuit for the rectifier in parallel with the microphone and for shunting the dial contacts.

11. In a telephone pay station, a microphone, two rectifiers, pulsing and off-normal dial contacts, switchhook contacts, coin operated contacts, a circuit arrangement for establishing a talking connection effective on the operation of the switchhook contacts, a circuit arrangement for establishing a dialing connection effective on the operation of the off-normal contacts, a circuit arrangement effective on the reversal of current to the pay station for preventing a current passing through the microphone, said circuit arrangement including one rectifier blocking the passage of said current through the microphone and the

other rectifier by-passing said current past the microphone and a circuit arrangement effective on the operation of the coin operated contacts for establishing a talking connection through the microphone without again reversing the current.

12. In a telephone pay station, a microphone, two rectifiers, pulsing and off-normal dial contacts, switchhook contacts, coin operated contacts, a circuit arrangement for establishing a talking connection effective on the operation of the switchhook contacts including the pulsing contacts, a first rectifier, the microphone and the switchhook contact in series, a circuit arrangement for establishing a dialing connection effective on the operation of the off-normal contacts, said connection including the dialing contacts, the off-normal contacts and the switchhook contacts in series, a circuit arrangement effective on the reversal of current to the pay station, for blocking the passage of said current through the microphone, including the pulsing contacts, certain of the coin operated contacts, the second rectifier and the switchhook contacts in series with said second rectifier in the current passing direction and the microphone and the first rectifier in series with said first rectifier in the current blocking direction, and a circuit arrangement effective on the operation of the coin operated contacts for establishing a talking connection through the microphone without again reversing the current, including the opening of the connection for the second rectifier and short-circuiting the pulsing contacts and the first rectifier and the closing of a connection through the microphone through certain of the coin operated contacts and the switchhook contacts only.

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DISCLAIMER

2,041,964.—*George Sandalls, Jr.*, North Tarrytown, N. Y. TELEPHONE SYSTEM.
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American Telephone and Telegraph Company.

Hereby enters this disclaimer to claims 3 and 11 of the above numbered patent.
[*Official Gazette, June 22, 1937.*]