

1,308,539.

Patented July 1, 1919.

2 SHEETS—SHEET 1.

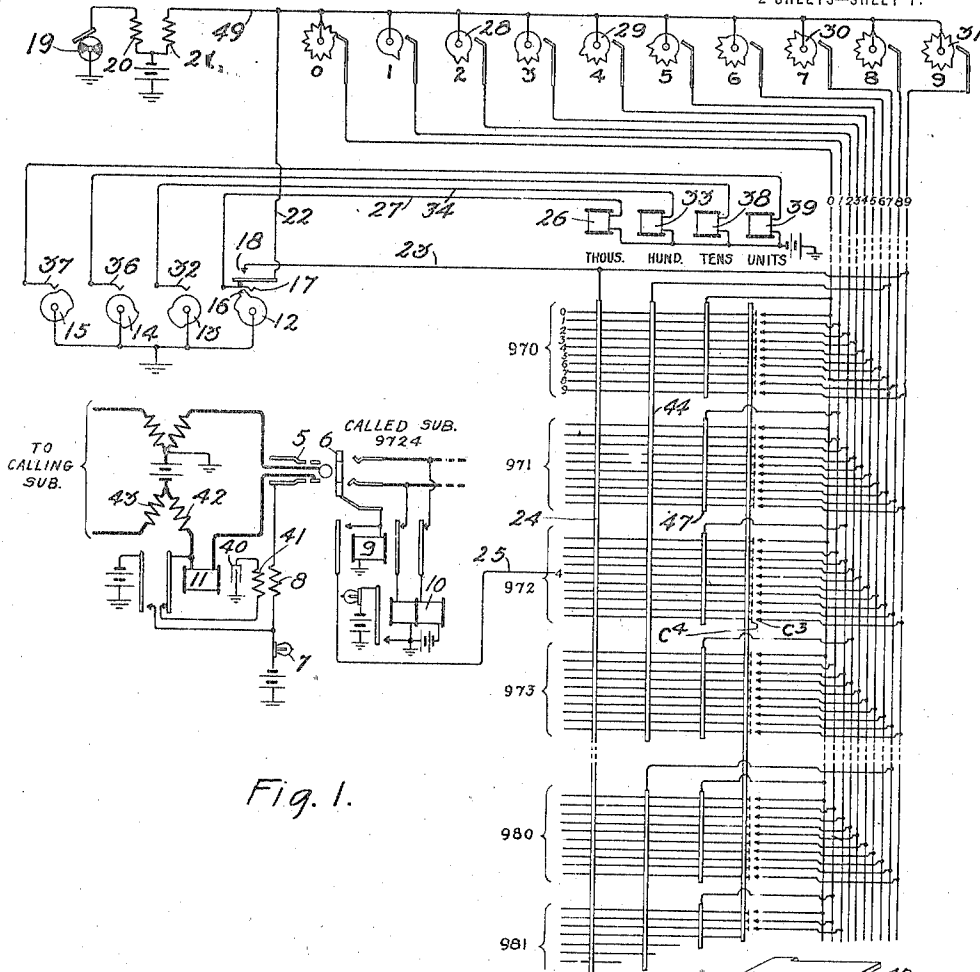


Fig. 1.

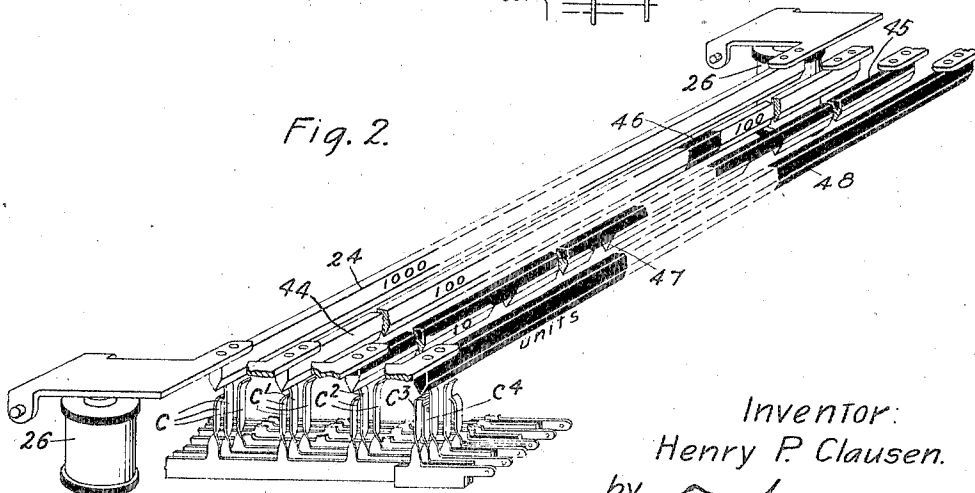


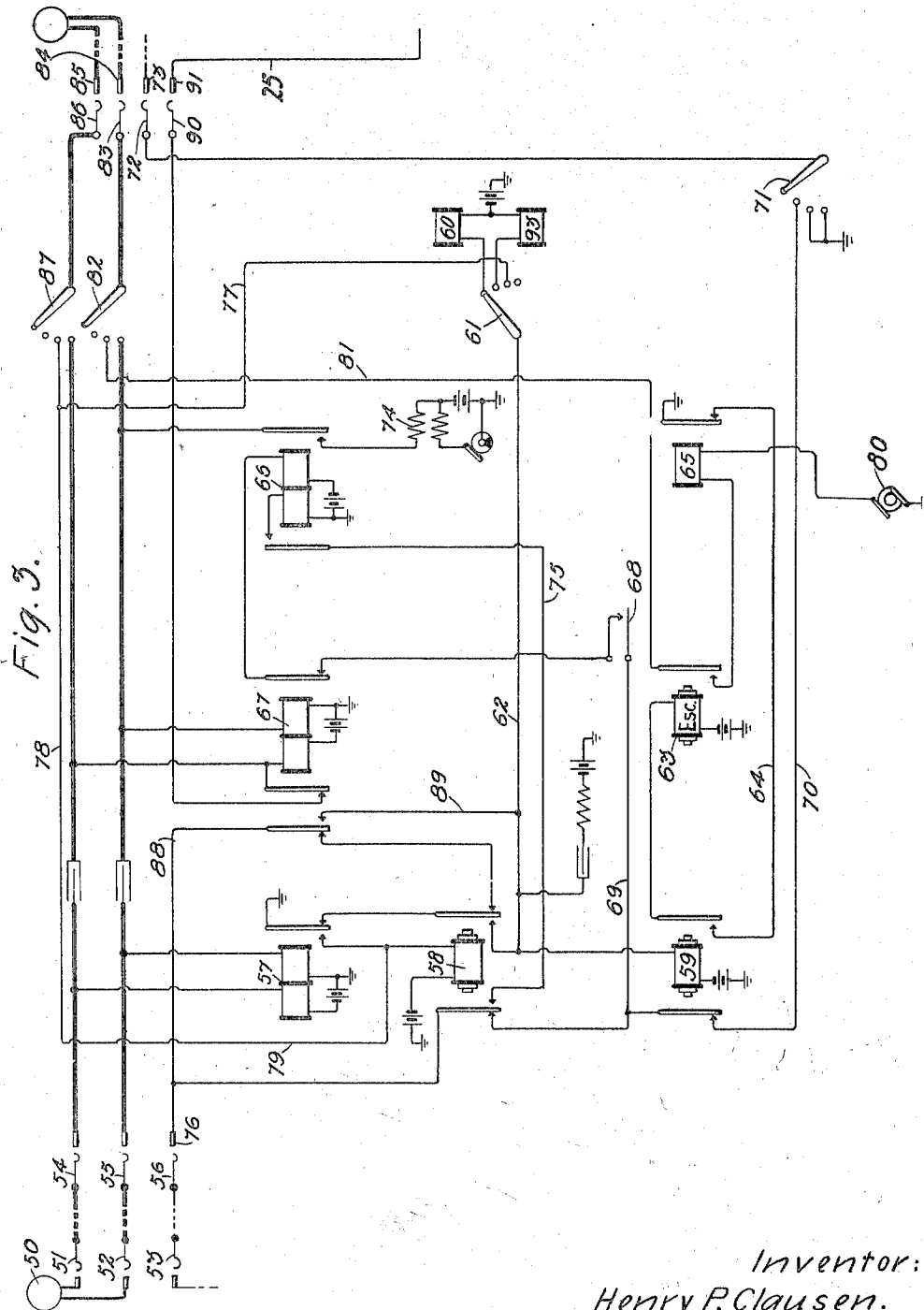
Fig. 2.

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H. P. CLAUSEN.
NUMBER INDICATING MEANS.
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Patented July 1, 1919.
2 SHEETS—SHEET 2.



Inventor:
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UNITED STATES PATENT OFFICE.

HENRY P. CLAUSEN, OF MOUNT VERNON, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

NUMBER-INDICATING MEANS.

1,308,539.

Specification of Letters Patent.

Patented July 1, 1919.

Application filed November 21, 1916. Serial No. 132,559.

To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States, residing at Mount Vernon, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Number-Indicating Means, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone systems, and more particularly to number indicating means employed in such systems.

In automatic telephone systems it is particularly desirable to inform the calling party of the number of the called line to which his sub-station apparatus has been connected. In this way the calling party is quickly informed of any wrong connection due to any error in operating his impulse transmitter, or due to the failure of any of the switching devices by reason of their inaccurate operation.

In the so-called manual telephone system, it is essential that the A operator be informed of the connection set up by the B operator without the necessity of asking the B operator the number of the called line to which the connection has been extended.

This invention has for its purpose the provision of means associated with the called line which will transmit impulses or other characterizations designating the called line, to inform the calling party or connecting operator of the number of the line connected with.

It is further the object of this invention to provide a number indicating means common to a plurality of lines of the system in which it is employed.

Referring to the drawings, Figure 1 diagrammatically illustrates a portion of a connecting operator's cord circuit and a number indicating means which is common to a plurality of lines in the system;

Fig. 2 is a perspective view partially broken away, of means for connecting the number indicating devices to the calling party's telephone line or connecting operator's cord circuit; and

Fig. 3 diagrammatically illustrates an automatic telephone system employing the present invention. Only the connector circuit arrangement has been fully shown. The circuit arrangement of the line finder

and first selector are schematically indicated in this disclosure.

The number indicating means employed in this invention consists of a plurality of impulsers or numeral wheels adapted to make and break a predetermined number of times a signal circuit associated with the called line. A tone normally imposed on the signal circuit, is transmitted to the calling station as impulses, the number of which is determined by the impulser employed. It will be understood, however, that phonographs or other means may be employed to speak the number of the called line, instead of using numeral wheels to transmit impulses as herein disclosed. All the lines in this system are arranged in groups with a thousand lines in a group, those lines having the same thousands digit being included in the same group. The thousands groups are divided into groups of one hundred lines and these hundreds groups in turn divided into sub-groups of ten. All the lines of a particular thousands group or a particular hundreds group or a particular tens group are adapted to be connected together in succession by the mechanism to be herein later described. All the lines of whatever group having the same numerals for their thousands, hundreds, tens or units digit, are arranged to be connected to the same impulser or number wheel. For example, the called line herein shown, No. 9724, is successively connected to the No. 9 impulse wheel, the No. 7 impulse wheel, the No. 2 impulse wheel and the No. 4 impulse wheel.

A plurality of cams 12, 13, 14 and 15 and ten impulsers or number wheels are mounted on a constantly rotating shaft (not shown). These cams have projections so positioned and timed that the thousands, hundreds, tens and units digit signals will be connected to the signal circuit of the called line, in the proper sequence. Cams 12, 13, 14 and 15 successively close circuits for energizing the thousands magnet 26, hundreds magnet 33, tens magnet 38 and the units magnet 39. The thousands magnet 26 operates a bar 24 attached to its armature to connect through sets of contacts C all the calling lines of a particular thousands group together, and also to connect these lines to the same impulser or number wheel. The hundreds magnet 33 operates a bar 44 attached to its

armature, which bar similarly connects together through contacts C', all the lines of a particular hundreds group, and this bar also serves to connect all these lines of the group to the same impulser or number wheel. The tens magnet 38 operates a bar 45 to connect together through sets of contacts C² the lines of a particular tens group, and also connects these lines to the same impulser or number wheel. The bars controlled by the thousands, hundreds and tens magnets are preferably of the same length. The bar of the hundreds magnet may be divided by suitable insulating blocks 46 into ten conducting portions of lengths sufficient to connect together the lines of a particular hundreds group. The tens bar is similarly divided into one hundred conducting portions 47 of lengths sufficient to interconnect the lines of a particular tens group. The armature of the units magnet 39 is provided with a non-conducting bar 48 preferably of the same length as the bars mentioned which operates sets of contacts C³ and C⁴ to close a break point in the signaling circuit associated with the called line, and thereby connect the proper units number wheel to this signaling circuit.

As soon as the projection 16 of the cam 12 engages the spring 17, it closes contact 18 to inductively connect an interrupter 19 to the conductor 25 associated with the called subscriber's line. The tone generated by this interrupter informs the calling party that the number signals are about to be transmitted over the line. The circuit of this interrupter may be traced from grounded battery, primary winding 20 of the induction coil, interrupter 19 to ground. The tone thus generated is imposed on the following circuit: grounded battery, secondary winding 21 of the induction coil, conductor 22, contact 18, conductor 23, thousands conducting bar 24, conductor 25 connected to the jack of the called subscriber. When the projection 16 has disengaged the spring 17, the characteristic tone is then transmitted as impulses to the calling line. The number of impulses transmitted is determined by the impulser connected to conductor 25. The thousands cam wheel 12, however, maintains the thousands magnet 26 energized over a circuit extending from grounded battery, magnet 26, conductor 27, spring 17, cam 12, to ground. The thousands magnet while energized, attracts its bar 24 to connect the number wheel of a particular thousands digit to all the lines of that group. In the present instance, the number wheel 31 which interrupts the signal circuit nine times, is connected to all the lines in the nine thousands group. As soon as the cam 13 is rotated to engage the spring 32, a circuit is closed from grounded battery, winding of the hundreds magnet 33, conductor 34,

spring 32, cam 13, to ground. The hundreds magnet 33 is energized and actuates its armature and the bar 44 carried thereby to connect all the lines in the seven hundreds sub-group of the ninth thousands group to the No. 7 number wheel 30. In the proper sequence the cam wheel 14 closes the spring 36 to energize the tens magnet 38 to connect the No. 2 number wheel 28 to the lines in that group, and the spring 37 closes to energize the units relay 39 to connect the particular contact individual to the called line to the No. 4 number wheel 29.

After the connecting operator has inserted her answering plug into the calling jack (not shown) and ascertained the number of the desired line, she thereupon inserts the plug 5 into the jack 6. This completes a circuit extending from grounded battery, lamp 7, primary winding 8 of an induction coil, sleeve 5 of the plug, sleeve 6 of the jack, cut-off relay 9, to ground. The cut-off relay 9 attracts its armatures and at its right-hand armatures disconnects the line relay 10 from the called line. As soon as the cut-off relay 9 attracts its left-hand armature, a break point in the signal conductor 25 is closed to successively connect the impulsers or number wheels corresponding to the digits of the called subscriber's line to the sleeve of the jack of this line under the control of magnets 26, 33, 38 and 39. The circuit from the called subscriber's jack, it will be remembered, extends to the sleeve of the plug, primary winding 8 of the induction coil, lamp signal 7 to ground. From this point the signals are inductively transmitted to the telephone set of the calling party from ground, condenser 40, secondary winding 41 of the induction coil, back contact and inner armature of supervisory relay 11, repeating coil 42 to free pole of battery. By means of the repeating coil 43 these impulse signals are induced in the trunk line with which the calling party's line is connected. The impulse signals are transmitted to the calling station until the supervisory relay 11 is actuated when the called party answers. When the supervisory relay 11 is actuated it completes a circuit to shunt out the lamp signal 7, which circuit extends from grounded battery, outer armature and front contact of supervisory relay 11, over the circuit previously described to ground at cut-off relay 9. At the inner armature and back contact of supervisory relay 11, the impulse transmitting circuit is broken.

Referring to Fig. 3, there is shown in detail a connector circuit in which the present invention is employed. The connector is provided with an additional or fourth contact, which contact is connected in the signal circuit having the digit wheels corresponding to the number of the called party's line. In this system, when the calling sub-

scriber whose substation is indicated at 50 removes his receiver from the switchhook, the brushes 51, 52 and 53 of the non-numerical switch seize the terminals of the calling line. The calling line is thus extended to the brushes 54, 55 and 56 of a selecting switch schematically shown. This switch in the well-known manner operates to extend the calling subscriber's line to the connector switch. As soon as this operation has taken place, line relay 57 is energized over a circuit extending from free pole of battery, left-hand winding of line relay 57, upper side of the line, selector brush 54, finder brush 51, substation apparatus 50, finder brush 52, selector brush 55, right-hand winding of line relay 57 to the grounded pole of battery. The line relay 57 attracts its armature and thereby completes a circuit to energize the first slow-releasing relay 58. This energizing circuit extends from ground, armature and front contacts of relay 57, winding of relay 58 to grounded battery. The relay 58 attracts its armatures and at its right-hand armature closes a break point in the energizing circuit of the second slow-releasing relay 59. When the calling party transmits impulses corresponding to the tens digit of the desired number, the relay 57 vibrates its armature and at its back contact completes an energizing circuit for the relay 59, which circuit extends from grounded battery, winding of relay 59, front contact and right-hand armature of relay 58, back contact and armature of relay 57, to ground. An operating circuit for the primary motor magnet 60 in parallel with the circuit just described is established from grounded battery, winding of primary magnet 60, side-switch wiper 61 in its first position, conductor 62, front contact and right-hand armature of relay 58, back contact and armature of relay 57, to ground. As soon as the relay 59 attracts its right-hand armature, an energizing circuit for the escape magnet 63 is completed from grounded battery, winding of escape magnet 63, right-hand armature and front contact of relay 59, conductor 64, front contact and armature of ringing trip relay 65, to ground. At the close of the tens series of impulses, relay 57 attracts its armature for a relatively long interval and thereby interrupts at its armature and back contact the energizing circuit for the relay 59. The relay 59 retracts its armatures, and at its front contact and right-hand armature interrupts the energizing circuit for the escape magnet 63, which moves the side switch into its second position. The connector switch is now in condition to receive the units series of impulses. When the line relay 57 vibrates its armatures in response to the units series of impulses, it reestablishes the energizing circuit for the relay 59, which extended from

grounded battery, winding of relay 59, front contact and right-hand armature of relay 58, back contact and armature of relay 57, to ground. The relay 59 again attracts its armatures and at its right-hand armature and front contact again establishes the energizing circuit for escape magnet 63, until the line relay 57 attracts its armature for a relatively long interval at the close of the units series of impulses. Simultaneously with this energization of relay 59, secondary motor magnet 93 is actuated to move the connector brushes into engagement with the terminals of the called line. This operating circuit extends from grounded battery, magnet 93, side-switch wiper 61 in its second position, to ground at the armature and back contact of relay 57.

In accordance with the present invention, this connector switch is supplied with an additional brush 90, and the called line with additional terminals 91. The terminal 91 through conductor 25 is connected to a number indicating device similar to that disclosed in Fig. 1. As soon as the brush 90 engages terminal 91, the number of the line which the connector has seized will be transmitted through the receiver of the substation apparatus shown. The called number will be repeated to the calling party until the called party answers. As soon as the called party removes his receiver from the switchhook, the relay 67 is energized, and when it attracts its left-hand armature, it interrupts the communicating circuit just described.

In the present system the test terminals of busy lines are characterized by the presence of ground. If the desired line is busy, a circuit for the release magnet 66 will be established from grounded battery, right-hand winding of release magnet 66, right-hand armature and back contact of relay 67, off-normal contact 68, conductor 69, left-hand armature and back contact of relay 59, now deenergized, conductor 70, side-switch wiper 71 in its second position, test brush 72, to the test terminal 73 connected to ground through a side-switch wiper similar to 71 in its fourth position to another connector which has seized this line. The release magnet 66 is energized and at its right-hand armature closes a circuit which operates to connect the busy-tone device to the lower side of the trunk to which the calling line has been connected. At the left-hand armature and front contact of release magnet 66, a locking circuit is established from ground through the left-hand high-resistance winding, left-hand armature and front contact of release magnet 66, conductor 75, left-hand armature and front contact of relay 58, test contact 76, test brush 56, to grounded battery at the selector.

If the desired line is idle, this condition will be indicated by the absence of ground

on the test terminal 73. The release magnet 66 is not energized, and the escape magnet 63, whose energizing circuit was interrupted at the right-hand armature and front contact of relay 59, was deenergized when the relay 59 retracts its armatures at the close of the units series of impulses. The escape magnet thereupon moves its side-switch wipers into their third position. In position 3 of the side switch, the circuit for the relay 59 is closed preliminary to the ringing operation. This circuit extends as follows: grounded battery, relay 59, conductor 62, side-switch wiper 61 in its third position, conductors 77, 78, 79, the front contact and armature of relay 57, to ground. Relay 59 attracts its armatures and at its front contact and right-hand armature reestablishes the operating circuit for the escape magnet which circuit was previously described. The energization of the escape magnet 66 prepares a circuit for the application of ringing current to the called line. This circuit extends from grounded generator 80, ringing trip relay 65, front contact and armature of escape magnet 63, conductor 81, side-switch wiper 82 in its third position, connector brush 83, terminal 84 of the subscriber's line through the called party's substation apparatus to terminal 85, connector brush 86, side-switch wiper 87 in its third position, conductors 78 and 79 to ground at the front contact and armature of relay 57. The ringing trip relay 65 is marginal and does not operate until the called subscriber removes his receiver from the switchhook, whereupon the relay 65 attracts its armature and interrupts the energizing circuit of the escape magnet 63. The escape magnet thereupon moves the side-switch wipers into their fourth or talking position. At the close of the conversation, if the calling party is the first to replace the receiver on the switchhook, the line relay 57 deenergizes and retracts its armature. This completes an operating circuit for the release magnets of the line finder and selector switches which extend through test brush 56, test terminal 76, conductor 88, outer left-hand armature and front contact of relay 67, conductor 89, front contact and right-hand armature of relay 58, back contact and armature of relay 57 to ground. When the called party replaces his receiver on the switchhook, the relay 67 deenergizes and retracts its armatures. This completes the operating circuit for the release magnet 66, which may be traced from the free pole of battery, right-hand winding of release magnet 66, right-hand armature and back contact of relay 67, off-normal contact 68, conductor 69, back contact and armature of relay 58, conductor 88, outer left-hand armature and back contact of relay 67, back contact and right-hand armature of relay 58,

back contact and armature of relay 57, to ground. The talking battery for the calling subscriber is supplied through the winding of line relay 57, while the talking battery for the called subscriber is supplied through the winding of relay 67.

It will be understood that the connecting operator's cord circuit and the connecting operator's position (not shown) are regarded as the equivalent of the calling line and calling telephone station.

What is claimed is:

1. In a telephone system, a switch, an incoming line and a group of outgoing lines terminating at said switch, means at said switch for connecting said incoming line to any of said outgoing lines, and means common to said outgoing lines for signaling the number of the line to which the connection is established over said incoming line.
2. In a telephone system, an exchange, a calling line and called lines terminating thereat, means for interconnecting said lines, and signaling means at said exchange associated with said called line for signaling the number of said called line over said calling line.
3. In a telephone system, a calling line and a called line, means for interconnecting said lines, signaling means associated with said called line and arranged to be connected to said calling line, and means actuated over said called line for disconnecting said signaling means from the called line.
4. In a telephone system, calling line, and called lines, means for interconnecting a calling line and any of said called lines, signaling means associated with and common to a plurality of called lines for transmitting the number of any selected called line over the calling line.
5. In a telephone system, calling lines, called lines, means for interconnecting said lines, number indicating means associated with and common to a plurality of called lines for telephonically communicating the number of any selected called line over the calling line.
6. In a telephone system, calling lines, called lines, means for interconnecting any of said calling lines to a selected called line, signaling means associated with and common to a plurality of called lines for transmitting the number of any selected called line over the calling line with which it is in engagement, and means actuated over the selected called line for disconnecting said signaling means from any calling line with which it is in engagement.
7. In a telephone system, a calling line, a plurality of called lines arranged in groups and sub-groups, means for connecting said calling line to any called line, signaling devices, and means actuated upon the extension of the calling line to any called line

for connecting any of said signaling devices first to the group and then to the sub-group.

8. In combination, a calling line, a plurality of called lines arranged in groups and sub-groups, means for interconnecting said calling line with any of said called lines, signaling devices, a signaling conductor for each of said called lines, means for simultaneously connecting the signaling conductors of each of said groups to a signaling device, and means for simultaneously connecting the signaling conductors of the sub-groups to signaling devices.

9. In combination, a calling line, a plurality of called lines arranged in groups and sub-groups, a signaling conductor for each of said called lines, mechanism for interconnecting said calling line with any of said called lines, means for simultaneously connecting together the signaling conductors of a group, means for connecting together the signaling conductors of a sub-group, and signaling devices connected to said connecting means.

10. In combination, a calling line, a plurality of called lines, mechanism for interconnecting said calling line with any of said called lines, said called lines being arranged in groups of a thousand, the lines of a group

being further divided into sub-groups of a hundred lines, the lines of this sub-group being further divided into sub-groups of ten, a signaling conductor for each of said called lines, means simultaneously connecting the signaling conductors of a group, means for simultaneously connecting the signaling conductors of each of said sub-groups, and signaling devices connected to said connecting means.

11. In combination, a calling line, a plurality of called lines arranged in groups and sub-groups, a signaling conductor for each of said called lines, mechanism for interconnecting said calling line with any of said called lines, means for conductively connecting the signaling conductors of a group simultaneously, means for conductively connecting the signaling conductors of a sub-group simultaneously, and means arranged to operate each of said connecting means to conductively connect together the signaling conductors of the group and the sub-groups in proper succession.

In witness whereof, I hereunto subscribe my name this 20th day of November A. D. 1916.

HENRY P. CLAUSEN.