

H. O. KABITZSCH.
TELEPHONE INSTALLATION.
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1,030,308.

Patented June 25, 1912.

3 SHEETS-SHEET 1.

Fig. 1.

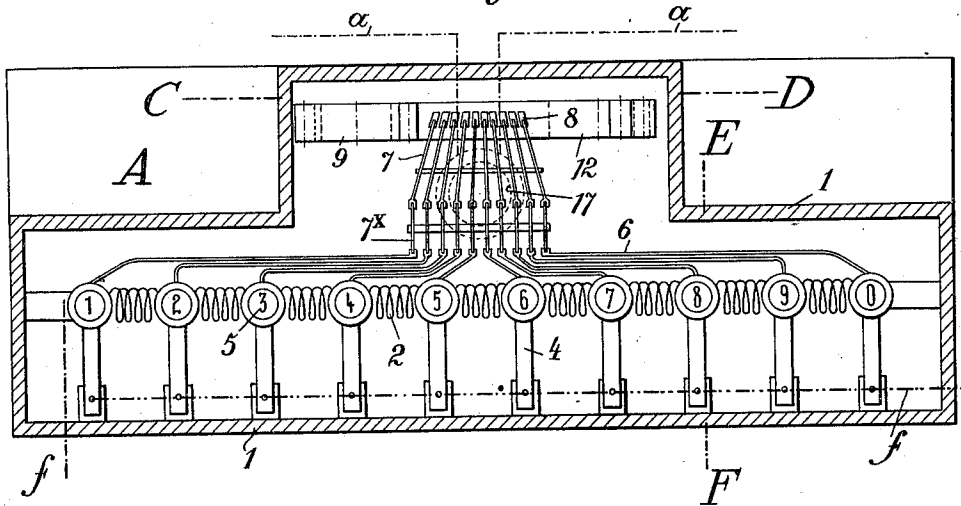


Fig. 3.

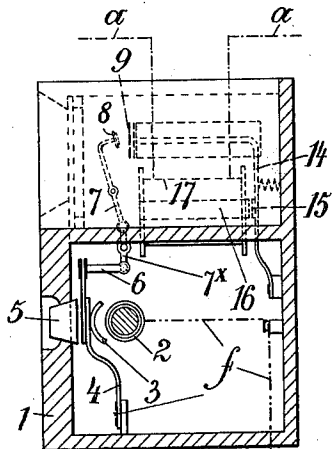


Fig. 2.

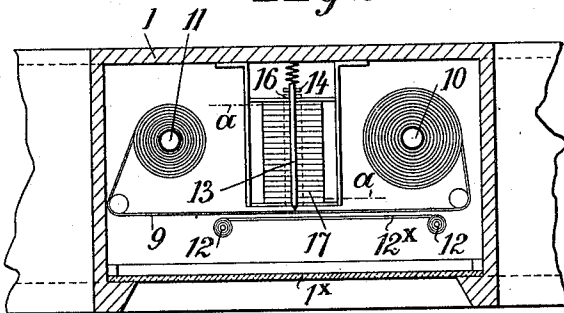


Fig. 6 a.

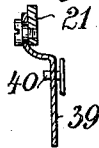
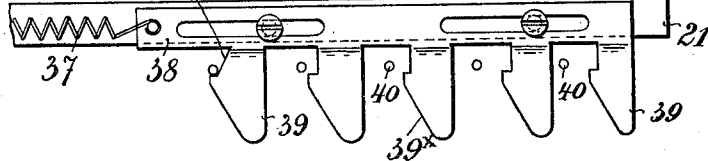


Fig. 6 b.



Witnesses:
A. Smith
K. O'Hara

Inventor:
H. O. KabitZsch
per
Lawrence Langner
Attorney.

UNITED STATES PATENT OFFICE.

HERMANN OSWALD KABITZSCH, OF HAMBURG, GERMANY, ASSIGNOR TO THE FIRM OF
GUSTAV A. MEYER-HENNIGER, OF HAMBURG, GERMANY.

TELEPHONE INSTALLATION.

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To all whom it may concern:

Be it known that I, HERMANN OSWALD KABITZSCH, a subject of the German Emperor, and resident of Hamburg, Germany, have invented certain new and useful Improvements in and Relating to Telephone Installations, of which the following is a specification.

The invention relates to an apparatus for telephone installations in which by means of a keyboard coöperating with various resistances at the call station according to the key depressed the number or the like in question is reproduced at the receiving station by causing a voltmeter to oscillate more or less and the invention relates in particular to means and the construction of the device for reproducing at the receiving station the number wanted by the subscriber corresponding to the keys depressed. In accordance with the invention the number wanted is reproduced owing to the fact that the pointer of the voltmeter when oscillating by means of a suitable operating device such for example as a resilient hook bar or the like displaces or adjusts segmental bars marked with numerals and carried by rotatably mounted yokes or bars in succession according to its oscillation in order to render visible in suitable spy holes or openings of the receiving apparatus the numbers on the segmental bars corresponding to the keys depressed at the call station the operated segmental numeral bars being retained in these positions by means of suitable locking devices until they are released, whereupon they automatically return to their initial position. The calling-up device of the originating or transmitting station and the receiving device of the receiving station or exchange are also provided with means rendering it possible to give to the calling-up subscriber on his notifying his call and before he depresses the keys corresponding to the desired number, a visible sign by actuating an electromagnet provided at the subscriber's station upon the checking strip of paper of a writing apparatus connected with the calling-up apparatus. This sign or mark is produced by actuating an electromagnet provided at the caller's station from the exchange and serves to notify that the desired number can be transmitted and may also serve for showing him after the transmission of the number that

the desired connection cannot be established for some reason, or has not been established on the demand of the subscriber. By means of the apparatus by which the caller is notified by the exchange an electromagnet is simultaneously actuated at the receiving station which releases the locking device for the segmental numeral bars of the receiving device in order to prepare it for the next caller.

An embodiment of the invention is illustrated by way of example in the accompanying sheets of drawings in which:

Figure 1 is a front elevation partly in section of the call device provided at the subscriber's station. Fig. 2 is a horizontal section on the line C—D. Fig. 3 is a vertical section on the line E—F in Fig. 1. Fig. 4 is a front elevation of the receiving device provided at the receiving station or exchange. Fig. 5 is a rear elevation thereof. Fig. 6 is a section on the line G—H in Fig. 4. Figs. 6^a and 6^b are detail views to a larger scale of the operating device on the pointer of the voltmeter of the receiving device and Fig. 7 explains the system of connections between the transmitting and receiving devices.

As shown in Figs. 1 to 3 the transmitting or call signal device A consists of a casing 1 in which a spiral wire resistance 2 is arranged. In front of this spiral 2 ten metal contact terminals 3 are arranged at equal intervals (Fig. 3). These metal terminals 3 are secured to resilient upright arms or yokes 4 fixed in the casing 1. By means of the press buttons 5 arranged in corresponding recesses in the front wall of the casing and provided with the serial numbers 1 . . . 9, 0 the yokes 4 arranged behind these buttons can be acted upon and the terminals 3 thereby pressed against the resistance spiral 2. Arms 6 are rotatably connected with the resilient yokes 4, the lower ends of type levers 7, 7^{*} being jointed to these arms. A strip of paper 9 runs in front of types 8 which are conveyed from the delivery roller 10 to the receiving roller 11. An inking ribbon 12^{*} also passes between the strip of paper 9 and the types 8; said ribbon 12^{*} is wound upon two spools 12. Both the inking ribbon and the strip of paper which is visible through a glass plate 1^{*} are fed in the known manner as in writing machines. Behind the strip of paper 9 a horizontal metal

pin 13 carried by a resilient arm 14 is arranged; said arm 14 carries a small armature 15 arranged in front of the iron core 16 of an electromagnet 17. The current is supplied to this electromagnet through the circuit *a* in which it is inserted, its circuit being adapted to be closed by a press button *d* (Fig. 7) of the receiving station or exchange.

The receiving device B provided at the receiving station consists of a casing *b* with a voltmeter 19 (Figs. 4 to 6) inserted in the line circuit *f* (Fig. 7); this voltmeter imparts a larger or smaller oscillation to the pointer or index 21 mounted on the shaft 20 according as fewer or more sections of the resistance coil 2 are thrown in the conductor *f* by depressing the press buttons of the call signal device. Immediately behind the pointer 21 a fixed wall 22 is arranged. On the inner side or face of this wall 22 a plate 25 is movably mounted on pin guides 23 against springs 24; this plate is adapted to be displaced on its pin guides on the fixed wall 22 by means of an electromagnet 26 inserted in the circuit *a* and arranged on the fixed wall 22 and able to act on an armature 27 fixed to the movable plate 25. The fixed wall and the displaceable plate are provided with segmental slots 28 and 29 (Fig. 6) running concentrically with the axis 20 of the voltmeter index 21 and approximately registering. The inner edges of the slots 29 are provided with locking teeth 30 (Fig. 5). Five wire yokes or bars 32 are loosely mounted on a shaft 31 concentrically with the shaft 20 in such a manner that they are able to work on the shaft 31 entirely independently of each other. The free ends of the yokes 32 extend through the slots 29 and 28 and each of them carries a segmental bar 33 on the front side of the wall 22. These bars 33 which are marked with the numerals 0, 9 . . . 1 on their front sides uncover the concentric slots 28 or move when they are swung upward or allowed to drop in the path of these slots; they are guided between concentric flanges 34 and lower webs 35.

Easily acting pawls 36 are provided on the yokes 32 inside the slots 29 (Fig. 5) their center of gravity being located so that the point of the pawl always assumes the correct locking position relatively to the locking teeth 30 of the corresponding slot 29 in each position of the bar 33 and the bar 33 carried upward is thus locked and retained in its upper end position so that it is unable to swing downward or back automatically.

A slide bar 38 subjected to the action of a sensitive spring 37 is arranged on the free end of the index 21 of the voltmeter and is provided with a number of hooks 39 corresponding to the number of bars 33. These hooks are bent toward the bars 33 in such a

manner that when the index 21 swings upward the hooks engage beneath projecting pins 40 on the bars (which pins can be formed by the ends of the yokes 32) and carry the bars 33 upward when they are retained in the upper end position by the locking pawls 36 when the index 21 again rocks downward. The interval between the hooks 39 is calculated in such a manner that when the pin of the first or innermost bar 33 is seized by the first hook 39 the four other or outer hooks are able to pass freely past the pins 40 of the four outer bars without carrying the latter upward with them. Now as owing to the first depression of a key on the call signal device A the innermost bar 33 is rocked upward to the desired height by the first oscillation of the index and retained in this raised position so that the desired number of the bar remains visible in the spy hole or inspection opening 41 in the front wall of the casing *b*, when the energizing of the voltmeter ceases the index 21 falls back into its lower end position. The chamfered front edge 39* of the second hook 39 then encounters the pin 40 of the second bar 33 and in forcing the slide bar 38 outward snaps behind the pin of this second bar 33. Upon the second oscillation of the index of the voltmeter the second bar 33 is moved upward and locked in position whereupon the same operation is repeated until all the bars 33 have been moved upward and adjusted, that is to say, until the number of the subscriber to whom the caller desires to speak, is visible in the inspection apertures 41.

The release of the adjusted numeral bars 33 is effected by closing the circuit *a* (Fig. 7) by means of the press button *d* at the receiving station. The electromagnet 26 is thereby energized and attracts the armature 27 thus displacing the plate 25 so that the teeth 30 release the pawls 36. The bars 33 which are no longer locked then all slide down into their initial position, the pin 40 of the first bar 33 resting on the first hook 39 after it has slid along the chamfer 39* of the shank of the first hook and forces the slide bar 38 outward to such an extent that the four outer hooks are unable to seize the pin 40. The receiving device is then ready for further use.

The operation of the two devices or apparatus described above is as follows:—If a subscriber wishes to establish connection with another subscriber he removes the receiver *h* at his station (Fig. 7); this closes the call signal circuit *w f* and causes the corresponding white call lamp I at the exchange to glow. If the receiving device B is free the press button *d* is closed for a moment at the exchange thus energizing the electromagnet 17 of the call signal device A and attracting the yoke 14, the metal pin 13

of which produces an impression (a point) on or in the strip of paper 9. This serves as a sign for the calling subscriber to make the desired call number which he does by depressing the keys corresponding to the numerals of this number in succession on the device A whereby the index 21 of the voltmeter 19 inserted in the circuit *f* rocks upward and adjusts the numeral bars 33 of the receiving device B in succession beginning from the left hand in correspondence with the switched in sections of the resistance coil of the call signal device A until the desired numerals appear in their proper order in the inspection apertures 41 and when read from left to right give the desired subscriber's number. Simultaneously with this depression of the keys after the permissive signal has been given by the exchange the desired number has also been impressed by the type levers 7 on the strip of paper 9 for checking purposes. If the subscriber's number thus rendered visible in the receiving device B should be engaged the press button *d* is quickly pressed twice in succession at the exchange thus energizing the electromagnet 17 twice in succession and by means of the pin 13 producing two marks in the displaced paper strip thus notifying the calling subscriber that the desired number is engaged. These two marks also annul or register the call made as void. If the calling subscriber has made a mistake in depressing the keys or in some other way caused an incorrect number to appear at the receiving device when he notices this mistake and before the connection has been effected by the exchange by immediately hanging up the receiver *h* he can extinguish the call lamp I at the exchange and thus notify the exchange that for some reason he does not wish to speak with the subscriber of the number notified. The exchange then by acting twice on the press button *d* returns the receiving device B to its initial position and by simultaneously actuating the electromagnet 17 produces two marks on the strip of paper indicating that the connection previously recorded on the strip by one mark was not wished and should not be counted, exactly in the same manner as when the called number has been engaged. By pressing the press button *d* the electromagnets 17 and 26 are simultaneously energized. This simultaneous energizing of the two electromagnets does not, however, give rise to any misunderstanding or error because the exchange only notifies that the desired number is to be indicated by depressing the keys when the receiving device is free and consequently an idle actuation of the releasing plate 25 does no harm while on the other hand the transmission of the permissive signal to the calling subscriber which takes place simultaneously with the release of the plate 25 econo-

mizes time as regards the duration of the time for effecting the connection.

A switch *s* inserted in the circuit line *f* (Fig. 7) enables the receiving device B to be cut out when working is interrupted.

A three-way switch *u* (Fig. 7) at the caller's station in conjunction with the lines *r* and *t* permits of lighting a green lamp II for the trunk call office or a red lamp III for the inquiry office of the exchange merely by removing the receiver *h*. Thus no time is lost in speaking to the operator at the exchange requesting these particular connections. In installations comprising a head exchange and sub-exchanges other suitable switches provided at the subscriber's station permit of notifying the head exchange by means of lamps whether a sub-exchange inquiry office or a trunk call is desired and if so which. The head exchange then calls up the desired station which notifies the calling subscriber this being effected by the sub-exchange by making a suitable sign on the strip of checking paper 9 (as already described) and by the trunk call office and the inquiry office by making verbal reply.

I claim:

1. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots, a plurality of segmental numeral bars adapted to be successively adjusted in said slots by the successive oscillations of the index of said voltmeter and means for locking said numeral bars in their adjusted position to give visible indication of the number required.

2. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots arranged concentrically with the axis of the voltmeter index, a plurality of rotatable yoke pieces loosely mounted on a shaft concentric with the axis of said voltmeter index and passing through said slots a plurality of segmental numeral bars adapted to be successively adjusted in said slots by the successive oscillations of said voltmeter index and means for locking said numeral bars in their adjusted position to give visible indication of the number required.

3. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit

a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots arranged concentrically with the axis of the voltmeter index, a plurality of rotatable yoke pieces loosely mounted on a shaft concentric with the axis of said voltmeter index and passing through said slots a resilient hook bar arranged on the free end of said voltmeter index a plurality of segmental numeral bars carried by said yoke pieces and adapted to be successively adjusted in said slots by the successive oscillations of said voltmeter index and means for locking said numeral bars in their adjusted position to give visible indication of the number required.

4. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots arranged concentrically with the axis of the voltmeter index, a plurality of rotatable yoke pieces loosely mounted on a shaft concentric with the axis of said voltmeter index and passing through said slots a resilient hook bar arranged on the free end of said voltmeter index a plurality of segmental numeral bars carried by said yoke pieces and adapted to be successively adjusted in said slots by the successive oscillations of said voltmeter index and means for locking said numeral bars in their adjusted position to give visible indication of the number required and means for releasing said bars.

5. In a telephone system a transmitting apparatus a receiving apparatus and means for giving visible indication at the exchange of the number required and means under the control of the exchange for giving a subscriber a visible signal of permission to notify the number required or a visible sign that the desired connection cannot be made.

6. In a telephone system a transmitting apparatus a receiving apparatus, means for giving visible indication at the exchange of the number required a press button located at the exchange and adapted to close a circuit an electromagnet at the transmitting station adapted to be energized by the operation of said press button and means adapted upon the energizing of said electromagnet to give a subscriber a visible signal of permission to notify the number required or a visible sign that the desired connection cannot be made.

7. In a telephone system a transmitting apparatus a receiving apparatus means for giving visible indication at the exchange of the number required a press button located at the exchange and adapted to close a circuit an electromagnet at the transmitting

station adapted to be energized by the operation of said press button a pair of spools, a paper strip winding from one of said spools on the other, a yoke, a metal pin attached to said yoke and adapted upon the energizing of said electromagnet to perforate said paper strip and thus give the subscriber a visible signal of permission to notify the number required or a visible sign that the desired connection cannot be made.

8. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit, a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots arranged concentrically with the axis of the voltmeter index, a plurality of rotatable yoke pieces loosely mounted on a shaft concentric with the axis of said voltmeter index and passing through said slots a resilient hook bar arranged on the free end of said voltmeter index a plurality of segmental numeral bars carried by said yoke pieces and adapted to be successively adjusted in said slots by the successive oscillations of said voltmeter index means for locking said numeral bars in their adjusted position to give visible indication of the number required means for releasing said bars a press button located at the exchange and adapted to close a circuit an electromagnet at the transmitting station adapted to be energized by the operation of said press button, a pair of spools, a paper strip winding from one of said spools on the other, a yoke, a metal pin attached to said yoke and adapted upon the energizing of said electromagnet to perforate said paper strip and thus give the subscriber a visible signal of permission to notify the number required or a visible sign that the desired connection cannot be made.

9. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance means under the control of said keys for giving visible indication of the number required a paper strip an inking ribbon a resilient yoke arranged behind and adapted to be engaged by each of said keys, lever arms connected with said yokes, type bars connected to said arms and adapted to print upon the paper strip the numbers of the keys operated.

10. In a telephone system a transmitting apparatus a receiving apparatus an adjustable resistance a plurality of numbered keys at the transmitting station adapted to vary said resistance a voltmeter in the line circuit a fixed wall and a displaceable plate in the receiving apparatus each provided with a plurality of segmental slots, a plu-

rality of segmental numeral bars adapted
 to be successively adjusted in said slots by
 the successive oscillations of the index of
 said voltmeter and means for locking said
 5 numeral bars in their adjusted position to
 give visible indication of the number re-
 quired, a paper strip an inking ribbon a
 resilient yoke arranged behind and adapted
 to be engaged by each of said keys, lever
 10 arms connected with said yokes, type bars
 connected to said arms and adapted to print
 upon the paper strip the numbers of the
 keys operated.

11. In a telephone system a transmitting
 15 apparatus a receiving apparatus an adjust-
 able resistance a plurality of numbered keys
 at the transmitting station adapted to vary
 said resistance a voltmeter in the line cir-
 cuit a fixed wall and a displaceable plate in
 20 the receiving apparatus each provided with
 a plurality of segmental slots arranged con-
 centrically with the axis of the voltmeter
 index, a plurality of rotatable yoke pieces
 loosely mounted on a shaft concentric with
 25 the axis of said voltmeter index and passing
 through said slots a resilient hook bar ar-
 ranged on the free end of said voltmeter in-
 dex a plurality of segmental numeral bars
 carried by said yoke pieces and adapted to
 30 be successively adjusted in said slots by the
 successive oscillations of said voltmeter in-
 dex means for locking said numeral bars
 in their adjusted position to give visible in-
 dication of the number required a paper
 35 strip, an inking ribbon a resilient yoke ar-
 ranged behind and adapted to be engaged
 by each of said keys, lever arms connected
 with said yokes, and type bars connected to
 said arms and adapted to print upon the
 40 paper strip the numbers of the keys oper-
 ated.

12. In a telephone system a transmitting
 apparatus a receiving apparatus means situ-
 ated at the transmitting station for giving
 45 visible indication at the exchange of the

number required, means for simultaneously
 rendering said number visible at the sub-
 scriber's station and means under the con-
 trol of the exchange for giving a sub-
 scriber a visible signal of permission to 50
 notify the number required or a visible sign
 that the desired connection cannot be made.

13. In a telephone system a transmitting
 apparatus a receiving apparatus an adjust-
 able resistance a plurality of numbered keys 55
 at the transmitting apparatus adapted to
 vary said resistance a voltmeter in the line
 circuit a fixed wall and a displaceable plate
 in the receiving apparatus each provided
 with a plurality of segmental slots, a plu- 60
 rality of segmental numeral bars adapted
 to be successively adjusted in said slots by
 the successive oscillations of the index of
 said voltmeter means for locking said nu-
 meral bars in their adjusted position to 65
 give visible indication of the number re-
 quired, a paper strip an inking ribbon a
 resilient yoke arranged behind and adapted
 to be engaged by each of said keys, lever
 arms connected with said yokes, type bars 70
 connected to said arms and adapted to print
 upon the paper strip the numbers of the
 keys operated, a press button located at the
 exchange and adapted to close a circuit
 an electromagnet at the transmitting sta- 75
 tion adapted to be energized by the opera-
 tion of said press button a pair of spools
 a paper strip winding from one of said
 spools to the other, a yoke, a metal pin at-
 tached to said yoke and adapted upon the 80
 energizing of said electromagnet to per-
 forate said paper strip and thus give the
 subscriber a visible signal of permission to
 notify the number required or a visible sign
 that the desired connection cannot be made. 85

HERMANN OSWALD KABITZSCH.

Witnesses:

MAX A. G. LEMCKE,

ERNEST H. L. MUMMENHOFF.