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2,160,829

METHOD AND DEVICE FOR AUXILIARY TRANSMISSION FOR TELEPHONE RECEIVERS

Filed Aug. 19, 1935

3 Sheets-Sheet 1

Fig. 1.

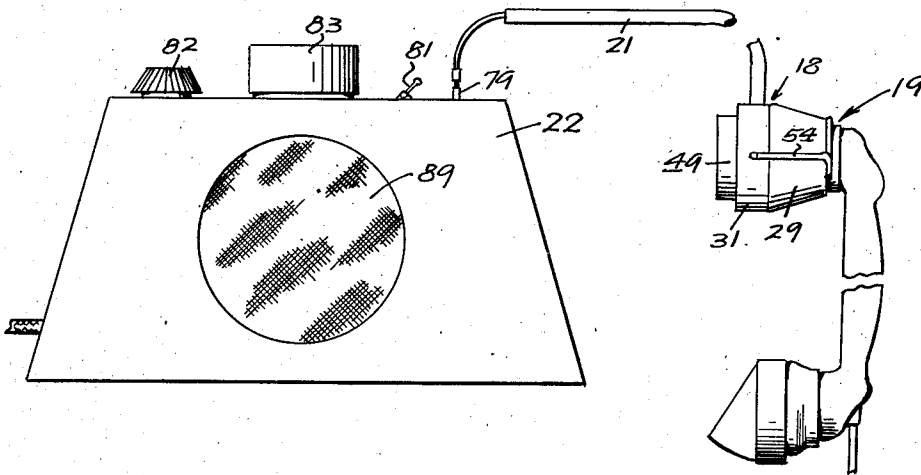


Fig. 2.

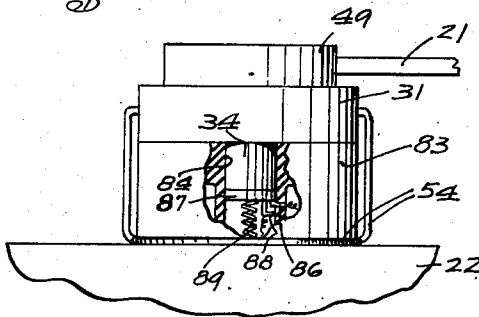


Fig. 3.

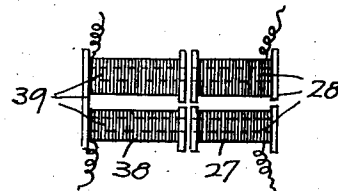
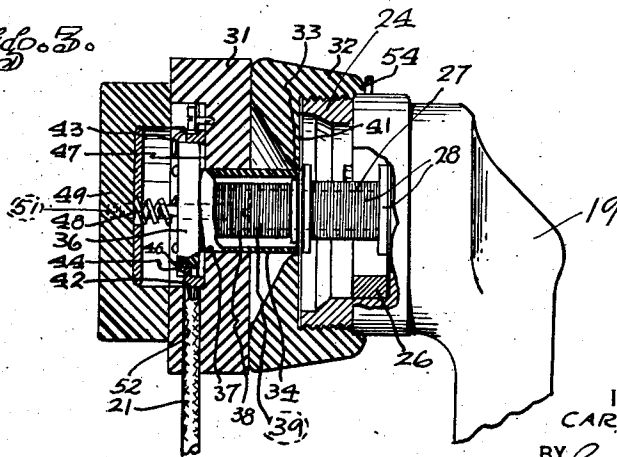


Fig. 4.



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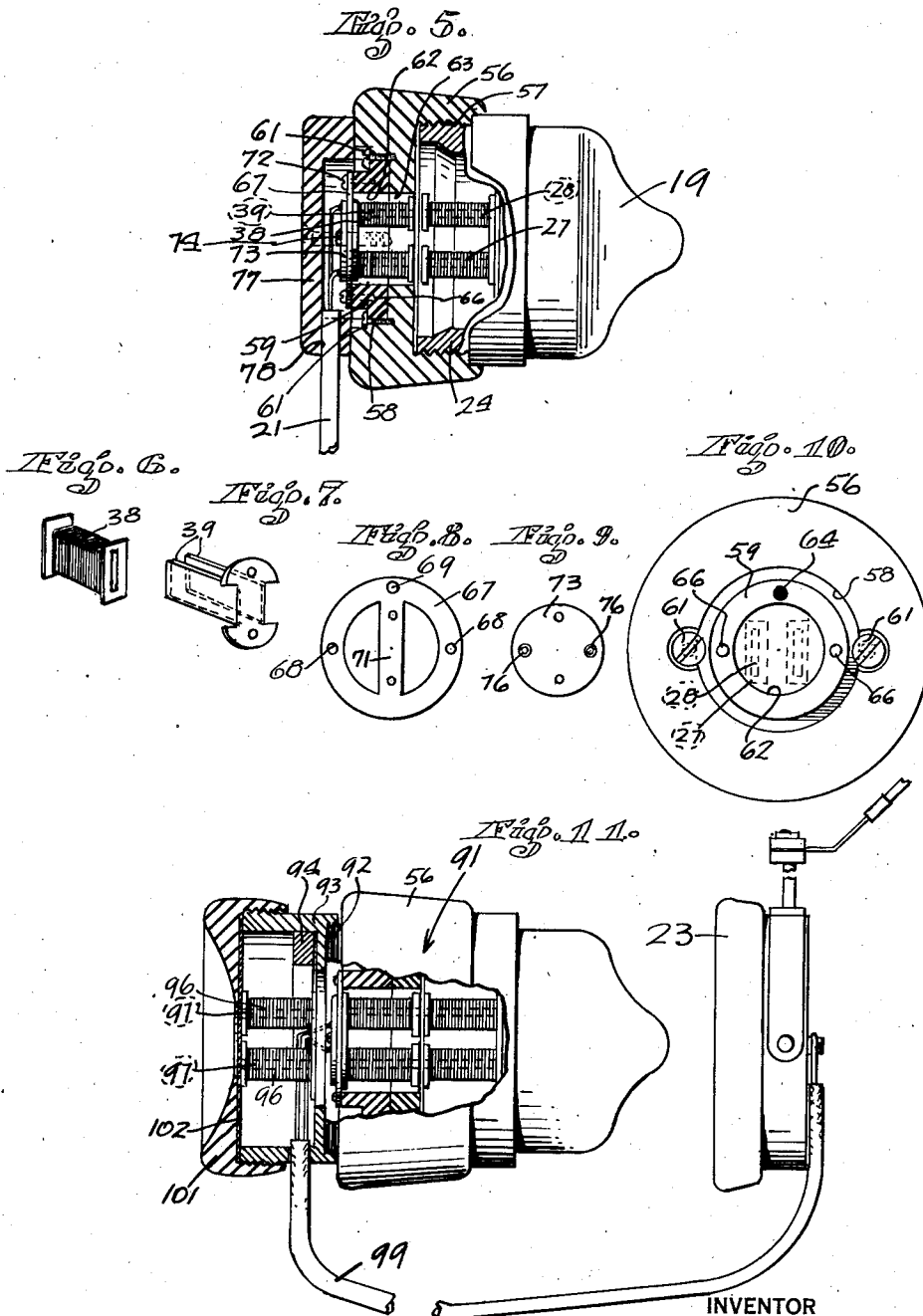
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3 Sheets-Sheet 2



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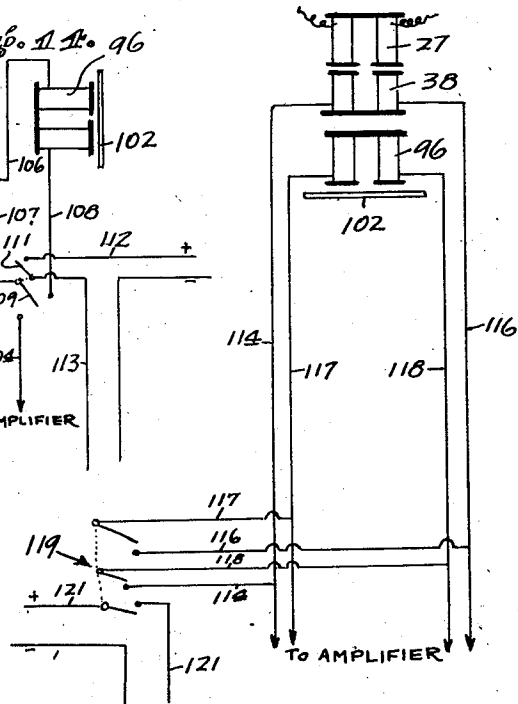
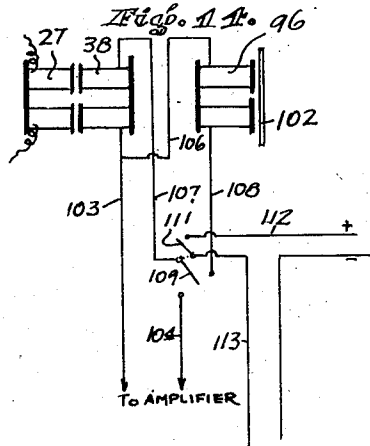
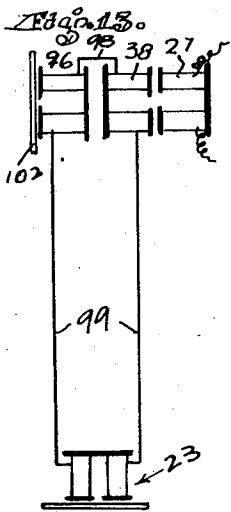
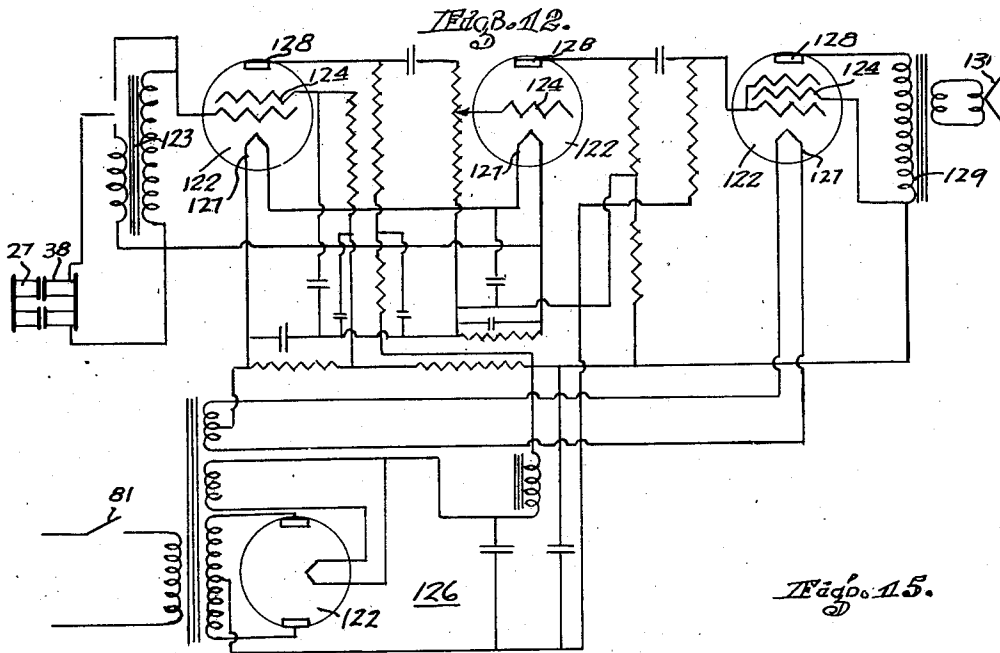
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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METHOD AND DEVICE FOR AUXILIARY
TRANSMISSION FOR TELEPHONE RE-
CEIVERS

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Application August 19, 1935, Serial No. 36,809

24 Claims. (Cl. 179—1)

This invention relates to a device and method for transmitting the signal from a usual telephone to a point outside the usual receiver.

The primary object of the invention is to provide a method whereby the signal impulses or current of a usual telephone receiver may be utilized to issue the sound through a receiver other than the usual receiver.

Another object of the invention is to provide a method for the transmission and amplifying of the diaphragm actuating impulses or current of a usual telephone receiver so as to accomplish reception in an auxiliary receiver whereby the conversation or sound can be heard by persons to whom the signals in the usual receiver would not be normally audible.

Another object of the invention is to provide an apparatus or device which can be attached to the usual telephone receiver so that the usual diaphragm-actuating current in the telephone receiver operates an auxiliary circuit and an auxiliary sound producing mechanism.

A further object of the invention is to provide a device and method which is applicable to a usual telephone receiver so as to allow the witnessing or recordation of the signal or sound transmitted through the telephone by the use of the usual diaphragm-actuating impulses of said ordinary telephone.

Another object of this invention is to provide a method and device for auxiliary transmission for telephone receivers which is highly useful and simple in construction. Convenience of arrangement, lightness and comparative inexpensive of manufacture are further objects which have been borne in mind in the production and development of the invention.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence I do not limit my invention to the exact arrangements and combinations of the said device and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the ac-

companying drawings for the illustrative embodiment of the invention, wherein,

Figure 1 is a somewhat diagrammatic view of an illustrative embodiment of my device connected to a usual telephone receiver.

Figure 2 is an enlarged view of the attachment rest on the top of the amplifier of my device, being shown partly in section.

Figure 3 is a sectional view of a clamped attachment on a telephone receiver.

Figure 4 is a detailed view of the coils of the usual telephone receiver and of my attachment in their relative operative position.

Figure 5 is an end view of a telephone receiver partly in section showing a modified embodiment of my device attached to the same.

Figure 6 is a perspective view of one of the coils used in my device.

Figure 7 is a perspective detailed view of the double core of my device.

Figure 8 is a face view of a mounting disc of my device.

Figure 9 is a face view of a mounting and connection disc of my device.

Figure 10 is an end view of the attachment part of my device, the cover and the coils being removed.

Figure 11 is an end view of a telephone receiver with an attachment, partly in section and an auxiliary attachment on said receiver connected to a remote telephone receiver.

Figure 12 is a wiring diagram of my apparatus and method showing the connection of the current of the usual telephone receiver to an auxiliary receiver.

Figure 13 is a wiring diagram of the embodiment of my invention as shown in Figure 11.

Figure 14 is a wiring diagram of another modification of my invention, and

Figure 15 is another modified embodiment of my invention.

It is frequently desirable that the signals or voice from the usual telephone be amplified or rendered audible outside of the usual telephone receiver. For example it is extremely important in many instances that there shall be a witness or witnesses to a telephone conversation. The use of an extension telephone for such purposes is impractical because the person would have to stop the conversation until the extension receiver is lifted off the hook, furthermore a click or some noise or fading is noticeable on the telephone line as soon as an extension is interconnected on the line. Another example for need of some amplification is for deaf persons.

The mere amplification of the usual sound produced by the usual diaphragm of a receiving set requires a complicated mechanism, moreover it results in marked distortion of the voice and permanent alteration of the usual telephone equipment, nor would it provide flexibility of adjustment and use to suit changing conditions and purposes of use.

In my method and device I utilize the usual diaphragm-actuating current or electric impulses, of a telephone receiver by the use of an auxiliary electric circuit which is adapted to receive and transmit the usual diaphragm-actuating electric impulses of a telephone receiver, and to modify said current so as to suit the purpose for which the received signal or sound is used. This auxiliary circuit is adapted in some embodiments to operate when the usual diaphragm is in place. In other forms the usual diaphragm may be removed and the input elements of said auxiliary circuit are substituted therefor.

In the event it is desired that a number of persons should witness the conversation at a remote point from the usual telephone receiver, then the secondary circuit is adapted to operate a loud speaker. For the purpose of recording of the conversation this secondary circuit can reproduce the sound in the dictating tube of a so-called "dictaphone" or the like. In order to allow witnesses to listen in on a conversation in private the secondary circuit can be adapted to operate on one or more auxiliary earphones. For aiding persons who are hard of hearing amplified signals can be transmitted to an auxiliary earphone. The above and other uses of this method and auxiliary device are accomplished without any interference with the usual telephone service, and without any necessity of replacement of the usual telephone equipment, excepting in some cases the removal of the usual receiving diaphragm.

In my method in general elements adapted to be impressed by an electromotive force from the electric current, and particularly the electro-magnetic flux caused by the usual diaphragm-actuating impulses of the telephone receiver, are placed opposite the outside face of the diaphragm, or in some cases the diaphragm is removed and replaced by said elements. Then the secondary current so created is transmitted and modified to operate an auxiliary sound producing device. The usual diaphragm is preferably replaced by secondary coils which coincide with and complement the usual diaphragm-actuating coils of a telephone receiver, so that the electric impulses in the usual receiver coils induce corresponding electro-motive force in the secondary coils of my attachment. Then said induced current is suitably amplified, and the amplification controlled to suit the purpose. The modified or amplified, induced current is then conducted to one or more auxiliary diaphragm-actuating devices in auxiliary telephone receivers, or in loud speakers or in sound recording instruments, as the case may be. It may be said, that by the above method, the usual diaphragm actuating coils of a telephone receiver are converted into primary coils and my device completes the magnetic circuit and supplies secondary coils of a transformer and the current so induced operates an auxiliary sound producing apparatus.

My device in general includes an attachment member 18, preferably detachably connected to the telephone receiver 19. The diaphragm is left

in place but is prevented, by means shown later, from vibrating. The mechanism in the attachment member 18 is connected by a cord 21 to an amplifier and loud speaker unit 22, as shown in Figure 1, or to auxiliary telephone receivers 23, as shown in Figure 11.

In detail the usual telephone receiver 19 includes an externally threaded housing 24, within which is mounted a magnet 26, and the usual electro-magnetic coils 27. Usually each of the coils 27 has a substantially L shaped core 28 forming a pole of the magnet 26, the legs of which cores 28 point to the usual diaphragm, which latter is normally held on the face of the housing 24 by an internally threaded hard-rubber, or composition ear piece 29 centrally apertured opposite said coils 27.

The attachment member 18 includes a base 31, made of an insulating material, such as hard rubber, or similar composition. If the earpiece 29 has the usual perforated cover over its central aperture then an auxiliary earpiece 32, with a fully open central aperture 33 is also provided with my device to replace the usual earpiece 29.

The form of the attachment illustrated in Figures 2 and 3 includes a tubular bushing 34, with a head 36. The bushing 34 is inserted through a central hole 37 in the base 31 substantially opposite the receiver coils 27. Inside the bushing 34 are induction coils 38 wound around a double, or U shaped core 39, which latter in turn is so secured in place that the legs of the core 39 point toward the aperture 33. A thin insulating disc, such as a mica-disc 41 may be placed between the coils 27 and the coils 38 when the diaphragm is removed. The bushing head 36 rests on a ring 42 and is held in place by a suitable clamp 43. The bushing is prevented from turning by a prong 44 inwardly projecting from the ring 42 into a slot 46 cut into the outer periphery of the head 36. This slot 46 is located in alignment with the center between the legs of the core 39. Therefore the legs of the core 39 can be aligned with those of the core 28 by turning the ring 42 on the shoulder 47 of the base 31, while the bushing 34 is removed, so that the prong 44 is in line centrally between the spaced legs of the core 28. Then the bushing 34 is clamped in place so that the slot 46 slides over the prong 44 thereby locating the legs of the core 39 exactly in registry with the corresponding legs of the core 28. The ring 42 is also held fixed by the same clamp 43, as the bushing head 36. The clamp 43 is slightly resilient where it engages the head 36 to allow slight axial play of the entire bushing 34. A light spring 48 bears at one end against the center of the bushing head 36 and at its other end against an insulating cover 49 to urge the bushing 34 at all times toward the coils 28, and against the usual diaphragm, to hold the latter against the coils 28 and prevent its vibration. The cover 49 is secured to the base 31 in any suitable manner such as by screws 51. It is to be noted that both the outer face of the base 31 and the inner face of the cover 49 are recessed to accommodate the head of the bushing, its holding means and suitable wiring. In addition the base 31 has a radial hole 52 leading from the side of the recess of said base 31 to accommodate a suitable cord 21, the wires of which latter are suitably connected to the ends of the respective coils 38.

The entire attachment is clamped on the earpiece 29 or 32, as the case may be, by a spring wire clamp 54, which is journaled in the sides 75

of the base 31 and is so bent as to spring over the end of the earpiece 29 or 32 and hold the attachment in place.

Another form of auxiliary attachment is illustrated in Fig. 5. In this embodiment the usual diaphragm, and also the earpiece 29 is removed from the telephone receiver. A base 56, of suitable insulating material, is internally threaded at 57 so as to fit over the receiver housing 24 in place of the earpiece 29. The other face of the base 57 is recessed at 58 to accommodate an insulating ring 59. The outer end of the ring 59 is reduced in its outer diameter and the shoulder thus produced is engaged at diametrically opposite points by the heads of retainer screws 61, which latter are threaded into the base 56 at the bottom of the recess outside the periphery of the ring 59. The central aperture 62 of the ring 59 is in alignment with a central aperture 63 in the base 56 but the ring 59 can be turned in the recess 58. The outer face of the ring 59 has a marking, such as a colored or white dot 64 thereon and a pair of threaded screw holes 66, which latter are on a diameter at right angles to the radius leading to said marker dot 64. Before the screws 61 are tightened the ring 59 is turned around so that the marker dot 64 appears exactly between the coils 27 of the telephone receiver 18. This can be observed as shown in Fig. 10. Then by tightening the screws 61 the ring 59 is fixed in its adjusted position. Then on the ring 59 is secured a unit which includes a resiliently flexible disc 67 the screw holes 68 of which are spaced to register with the screw holes 66 of the ring 59. Another aperture 69 is so located on the disc 67 that it coincides with the marker dot 64 when the screw holes 68 of the disc 67 are in registry with the respective screw holes 66 of the ring 59. The disc 67 is so apertured that a diametrical strip 71 is formed in alignment with the marker aperture 69. The base of the U-shaped core 39 of the secondary coils 38 is so mounted on the strip 71 that the legs of the core 39 are equally spaced on the opposite sides of the center line of the strip 71. Consequently when the coils 38 are inserted in the ring 59 and the disc 67 is turned so that respective screw holes 68 and 66 are in alignment then the marker dot 64 shows through the marker aperture 69 and the coils 38 are in exact registry with the coils 27 of the receiver. The disc 67 is held on the ring 59 by the usual screws 72. An insulating disc 73 is on the outer face of the disc 67 and the core 39 is secured to the strip 71 by screws 74 which extend also through the insulating disc 73. There are two small metal eyelets 76 in the disc 73 opposite the cut away portions of the disc 67 for the connecting and lead wires from the coils 38. After the unit is thus assembled it is covered by an insulating cover 77 which is suitably secured to the base 56. A hole 78 through the side of the cover 77 accommodates the usual electric cord 21.

Either one of the aforescribed attachments can be readily attached to a receiver, and once the coils 38 are properly adjusted in the attachment, to the particular receiver used, then such adjustment is permanent because the attachment is secured always in the same position on the receiver. The relative position of the coils 27 and 38 is as shown in Fig. 4, namely the cores are aligned with their open ends adjacent and opposite each other.

The cord 21 is detachably connected to the usual terminals 79 of the amplifier unit 22. It is

to be noted that the amplifier 22 has a switch 81 thereon whereby the power circuit can be opened or closed at will. The amplifier 22 also has the usual volume control 82. On the top of the amplifier 22 is a rest or bracket 83 for the attachment 18 when the latter is not in use. This rest, as shown in Fig. 2 is adapted for the type of attachment shown in Fig. 3, and it is made of insulating material. A central bore 84 therein accommodates the bushing 34. In the bore 84 is an automatic switch which includes a fixed contact 86 and an insulating plug 87 having a contact 88 thereon. The plug 87 is slidable in the bore 84 and is normally urged upwardly by a coil spring 89 so as to urge the contact 88 into engagement with the contact 86 thereby closing the amplifier circuit therethrough. When the attachment 18 is clamped onto the bracket 83 then the bushing 34 pushes the plug 84 downwardly and holds it in its down position, thereby automatically breaking the amplifier circuit. When the attachment is removed from the bracket 83 the amplifier circuit is automatically closed. The switch 81 is used in connection with other forms of the attachment.

In operation the diaphragm-actuating impulses of the coil 27 induce an electro-motive force in the coils 38. The induced current then flows through the circuit of the amplifier 22, and is audible through the usual loudspeaker opening 89. Thus the conversation can be heard by several witnesses at the same time. This does not interfere with the transmitter part of the telephone, in fact, actual practice shows that it augments the transmission so that a person may speak from a certain distance away from the transmitter yet be clearly heard at the other end of the line. If the loudspeaker is remote from the transmitter, or another loudspeaker or receiver in an entirely different room is connected into the circuit, the entire two-way conversation is audible and can be witnessed or recorded.

In order to permit the use of auxiliary receivers with substantially the normal use of the usual receiver, the attachment may be made in the form shown in Fig. 11. The part denoted by the numeral 91 is of the same construction and operation as the type of attachment shown in Fig. 5, heretofore described in detail. The only difference is that an externally threaded boss 92 is provided on the free face of the base 56 and instead of the cover 77 an auxiliary receiver housing 93 is threaded on said boss 92, back to back with respect to the base 56. In this housing is the usual permanent magnet 94, and receiver coils 96. The legs of the core 97 in the coils 96 point away from the coils 38. One of the coils 38 is connected to one of the coils 96, by a conduit 98, as shown in Fig. 13, and the other coil of each pair is connected to the wires of a cord 99, which latter leads to the usual coils of the usual earphone 23, or any other auxiliary receiver. On the housing 92 is threadedly secured a suitable, insulating earpiece 101, which holds in place the usual diaphragm 102 at the ends of the coils 96. Thus the usual receiver 19 can be used in the customary manner, yet a witness is enabled to listen in on the entire conversation and record it if necessary through the auxiliary earphone 23. If more than one auxiliary line is required a suitable amplifier may be interconnected between the coils 38 and the coils of the respective auxiliary receivers.

The attachment described in Fig. 11, may be used also for selective connection with a loud 75

speaker, or other recording device requiring an amplifier, by the connections shown in the wiring diagram in Fig. 14. In this embodiment one of the secondary coils 38 is connected by a wire 103 to a terminal of the amplifier 22. Another wire 104 leads to the other terminal of the amplifier 22. A wire 106 shunts the wire 103 directly over to one of the coils 96. Wires 107 and 108 lead respectively from the other coils 38 and 96. A switch 109 is adapted to selectively connect the wire 107 either to the amplifier lead 104, or to the other wire 108. In the former case the coils 96 are inoperative because the current flows from the coils 38 through the wires 103, 107, and 104 to the amplifier and the conversation is heard through the auxiliary speaker in the amplifier circuit. On the other hand when the switch 109 closes the circuit between the wires 107 and 108, then the auxiliary circuit flows through the coils 96 and conversation may be had in a normal way. The switch 109 is a double switch namely the second contact 111 therein breaks and makes the circuit between the power lines 112 and 113 which supply the electricity for the amplifier. The switch 109 and contact 111 operate simultaneously so that when the wire 107 is connected to wire 104, the circuit through lines 112 and 113 is also closed, and when the wires 107 and 108 are connected then the amplifier power supply circuit is also opened. Thus the conversation can be shifted to a loud speaker or the like at will.

The unit shown in Fig. 11 may be also used so as to selectively connect or disconnect an amplifier in the circuit of the coils 96. This form is especially adapted to amplify the sound only when a louder signal is required in the receiver, for instance to accommodate deaf people. As shown in the wiring diagram in Fig. 15, the wires 114 and 116 lead from the coils 38, and the wires 117 and 118 lead from the coils 96 of the auxiliary receiver. The wires 114 and 116 are at all times connected to the lead-in terminals of the usual amplifier 22, and the wires 117 and 118 are always connected to the output terminals of the amplifier 22. A triple switch 119 is adapted, however, to simultaneously close the circuit from the wire 116 to the wire 117, and from the wire 114 to the wire 118, and also simultaneously to break the circuit in the power supply line 121 of the amplifier, rendering the latter inoperative. In this position of the switch 119 the unit is used without amplification. When the switch 119 breaks the above circuit between the wires 116 and 117, and 114 and 118, it simultaneously closes the power supply circuit through the power supply line 121 and the current then flows to the wires 117 and 118 of the auxiliary coils 96 from the amplifier 22.

While the amplifier 22 may be of any suitable circuit, by way of illustration, in Figure 12, is shown the wiring diagram of an amplifier with four electron tubes 122. The coils 38 are connected to the transformer 123 of the amplifier circuit so as to impress the electric impulses flowing through the coils 38, upon the electric circuits of the grids 124 of said electron tubes. The power supply is connected through the power unit 126 to the electric circuits of the filaments 127 and plates 128 of the amplifying circuit. The impulse so amplified flows through the transformer 129 which impresses it on the coils or electromagnets of a loud speaker 131, or of any sound reproducing or recording device, so as to operate a usual diaphragm in the latter.

The method and device herein described is simple and light, it is easy to attach and detach from the usual telephone receiver, without necessitating interference or connection with the telephone circuit or equipment. It can be put into operation so that it will not be noticeable at the transmitter end of the line. After the initial adjustment of the auxiliary coils to align with the usual coils of the normal telephone receiver, there is no further adjustment required, therefore it can be easily handled, connected, and operated by the average layman.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. A device for producing amplified sound from a usual telephone receiver, comprising electro responsive means positioned in place of the usual diaphragm of said receiver so as to be actuated by the usual diaphragm-actuating current impulses of said receiver, sound producing means to be operated by said electroresponsive means, means to transmit to said sound producing means the action of said electro-responsive means, and an element to hold said electro-responsive means in the place of said diaphragm within the usual telephone receiver.

2. A device for producing amplified sound from a usual telephone receiver, comprising electro-responsive means actuated by the usual diaphragm-actuating current of said receiver to take the place of the diaphragm of said receiver so as to be acted upon by said current, means to amplify the action of said electro-responsive means, sound producing means to be operated by said electro-responsive means, means to transmit to said sound producing means the amplified action of said electro-responsive means, and an element to hold said electro-responsive means in operative relation within the usual telephone receiver, and means to detachably secure said element in place on said usual telephone receiver.

3. An auxiliary device for the usual telephone receiver, comprising induction coils positioned in extension of the ends of the usual diaphragm-actuating coils of said receiver, an auxiliary receiver adapted to convert electric current variations into sound, and means to transmit the induced current from said induction coils to said auxiliary receiver.

4. An auxiliary device for the usual telephone receiver, comprising electric conductor coils positioned opposite to and in registry with the diaphragm-actuating means on said receiver so as to supplement the same into a transformer circuit, means to hold said coils in operative relation to said diaphragm-actuating means in the place and position of the usual diaphragm of said receiver, so that said diaphragm actuating means can impress an electromotive force on said coils, an electrically actuated auxiliary diaphragm, and means to transmit said electromotive force from said coils to said electrically actuated, auxiliary diaphragm.

5. In an auxiliary device for the usual telephone receiver comprising, an electrically actuated auxiliary receiver, and means to transmit the action of the receiving current from the usual telephone receiver to said auxiliary receiver, said means including secondary coils positioned adjacent to and in alignment with the ends of the polepieces of the electromagnets of the usual receiver so that the latter impress induced electromotive force on said secondary coils, and an element to hold said secondary coils in said opera-

tive alignment within said usual telephone receiver.

6. An attachment for a usual telephone receiver, comprising a housing adapted to be attached to the receiver opposite the diaphragm-actuating coils of the receiver, induction coils held in the housing so as to be aligned with the coils of the receiver when the housing is in place and adapted to be impressed with an electromotive force according to the usual diaphragm-actuating impulses in said coils of the receiver, an auxiliary receiving device adapted to produce sound when actuated by said induced electromotive force, and means to connect said induction coils to said auxiliary receiving device.

7. The combination with a usual telephone receiver having electro-magnetic coils to actuate the usual diaphragm; of an attachment substituted into said receiver in place of said diaphragm, and comprising induction coils opposite to and aligned with said magnetic coils so as to be impressed with electromotive force by the usual diaphragm-actuating impulses of said electro-magnetic coils, means to hold said induction coils in operative relation to said electromagnets, and means connected to said induction coils to produce sound in accordance with the current in said induction coils.

8. The combination with a usual telephone receiver having electro-magnetic coils to actuate the usual diaphragm; of an attachment substituted into said receiver in place of said diaphragm, and comprising induction coils aligned with said electro-magnetic coils so as to be impressed with electromotive force by the usual diaphragm-actuating impulses of said electro-magnetic coils, means to hold said induction coils in operative relation to said electro-magnets, and means connected to said induction coils to produce sound in accordance with the current in said induction coils, said induction coils being so disposed that the cores of the induction coils when in place are in registry with the cores of the respective electromagnets in said receiver.

9. The combination with a usual telephone receiver having electro-magnetic coils to actuate the usual diaphragm; of an attachment substituted into said receiver in place of said diaphragm, and comprising induction coils aligned with and opposite to said magnetic coils so as to be impressed with electromotive force by the usual diaphragm-actuating impulses of said electro-magnetic coils, means to hold said induction coils in operative relation to said electro-magnets, a current amplifying device connected to said induction coils, and means connected to said amplifier to convert said amplified electric current into sound.

10. The combination with a usual telephone receiver which contains electro-magnetic coils to actuate a diaphragm, and means to fix the diaphragm at its periphery, of means to engage said diaphragm so as to prevent its vibration, induction coils adjacent said diaphragm opposite said electro-magnetic coils so arranged as to be impressed with induced current by said electro-magnetic coils, means to actuate the diaphragm of an auxiliary receiver, and means to convey said induced current from said induction coils to said last actuating means.

11. The combination with a usual telephone receiver having a vibratory diaphragm and electro-magnetic means at one side of the diaphragm to vibrate the latter, of means to render said diaphragm non-vibratory, induction means held on

the side of the diaphragm so as to be impressed with induced current by said electro-magnetic means, means to actuate the diaphragm of an auxiliary receiver, and means to convey said induced current from said induction means to said last actuating means.

12. The combination with a usual telephone receiver having electro-magnetic means adapted to actuate a sound producing element, and an electrically operated auxiliary sound-producing device, of induction means held in operative relation to said electro-magnetic means so as to be impressed with the ends of the pole pieces of induced current by the latter, a current amplifier, and means to selectively convey said induced current to said auxiliary sound producing device directly or through said amplifier.

13. In a device of the character described the combination with a usual telephone receiver having electro-magnetic coils adapted to actuate a vibratory sound producing element, of a housing on said receiver, induction coils held in said housing opposite to said electro-magnetic coils so as to be impressed with induced current by said electro-magnetic coils, a second set of electro-magnetic coils being in registry with the said induction coils, and a vibratory sound producing element held in operative relation to said second set of electro-magnetic coils, said second set of electro-magnetic coils being connected to said induction coils.

14. In a device of the character described the combination with a usual telephone receiver having electro-magnetic coils adapted to actuate a vibratory sound producing element, of a housing on said receiver, induction coils held in said housing opposite to said electro-magnetic coils so as to be impressed with induced current by said electro-magnetic coils, a second set of electro-magnetic coils being in registry with the said induction coils, a vibratory sound producing element held in operative relation to said second set of electro-magnetic coils, an amplifier, and means to selectively connect said induction coils to said second set of electro-magnetic coils directly or through said amplifier.

15. In a device of the character described the combination with a usual telephone receiver having electro-magnets therein adapted to actuate a diaphragm, of a housing on said receiver, aligned coils held back to back relatively to each other in said housing, one of said coils being adjacent to and aligned with said electro-magnets to be impressed with induced currents by the latter, a diaphragm held opposite the other set of coils in the housing so as to be actuated by the same, and means to operatively connect said sets of coils to each other.

16. In a device of the character described the combination with a usual telephone receiver having electro-magnets therein adapted to actuate a diaphragm, of a housing on said receiver, aligned coils held back to back relatively to each other in said housing, one of said coils being adjacent to and aligned with said electro-magnets to be impressed with induced currents by the latter, a diaphragm held opposite the other set of coils in the housing so as to be actuated by the same, an amplifier, and means to selectively connect said coils to each other directly or through said amplifier.

17. Means to connect an electrically actuated auxiliary sound producing device to a usual telephone receiver comprising, a housing attached to the telephone receiver, induction coils in the

housing being connected to said auxiliary sound producing device, and means in the housing to support said induction coils adjacent to and aligned with ends of the pole pieces of the usual

5 electromagnets of said telephone receiver.

18. Means to connect an electrically actuated auxiliary sound producing device to a usual telephone receiver comprising, a housing attached to the telephone receiver, induction coils in the

10 housing being connected to said auxiliary sound producing device, and adjustable means in the housing to support said induction coils adjacent to and aligned with the usual electro-magnets of said telephone receiver.

15 19. Means to connect an electrically actuated auxiliary sound producing device to a usual telephone receiver comprising, a housing attached to the telephone receiver, induction coils in the housing being connected to said auxiliary sound

20 producing device, a supporting element in the housing for said induction coils, said supporting element being adapted to be adjusted in said housing so as to hold said coils in alignment with the pole pieces of the usual electro-magnets of

25 said telephone receiver.

20. Means to connect an electrically actuated auxiliary sound producing device to a usual telephone receiver comprising, a housing attached to the telephone receiver, induction coils in the

30 housing being connected to said auxiliary sound producing device, a supporting element for said induction coils, the relative position of said supporting element and said induction coils being constant, and adjustable means of connection

35 between said supporting element and said housing so as to hold said coils in operative alignment with the core of the usual diaphragm actuating means of said telephone receiver.

21. Means to connect an electrically actuated

40 auxiliary sound producing device to a usual telephone receiver comprising, a housing attached to the telephone receiver, induction coils in the housing being connected to said auxiliary sound producing device, a supporting element in the

45 housing for said induction coils, the relative position of said supporting element and said induction coils being constant, and adjustable means of connection between said supporting

element and said housing so as to hold said coils in operative alignment with the core of the usual diaphragm actuating means of said telephone receiver, said supporting element being adapted for visual observation of its position relatively to said

5 diaphragm actuating means.

22. Means to connect an electrically actuated sound producing device to a usual telephone receiver, comprising a housing attached to said

10 receiver, a hollow support adjustably held in said housing and being adapted for visual observation of the position of said support relatively to the usual diaphragm actuating elements of said telephone receiver, and induction means connected

15 to said sound producing device being supported on said support in a fixed relation to said support and in operative alignment with said diaphragm actuating means.

23. Means to connect an electrically actuated sound producing device to a usual telephone receiver, comprising a housing attached to said

20 receiver, a hollow support adjustably held in said housing and being adapted for visual observation of the position of said support relatively to the usual diaphragm actuating electro-magnets of said telephone receiver, a substantially U

25 shaped core fixedly held in said support so that the open ends of said core are aligned with the core of said electro-magnet, and induction coils on said core connected to said sound producing

30 device.

24. Means to connect an electrically actuated sound producing device to a usual telephone receiver, comprising a housing attached to said

35 receiver, a hollow support adjustably held in said housing and being adapted for visual observation of the position of said support relatively to the usual diaphragm actuating electro-magnets of said telephone receiver, a substantially U

40 shaped core fixedly held in said support so that the open ends of said core are aligned with the core of said electro-magnet, and induction coils on said core connected to said sound producing

45 device, and means to resiliently urge said support and core against said diaphragm so as to prevent the vibration of the diaphragm.

CARL W. CHERRY.