

April 15, 1930.

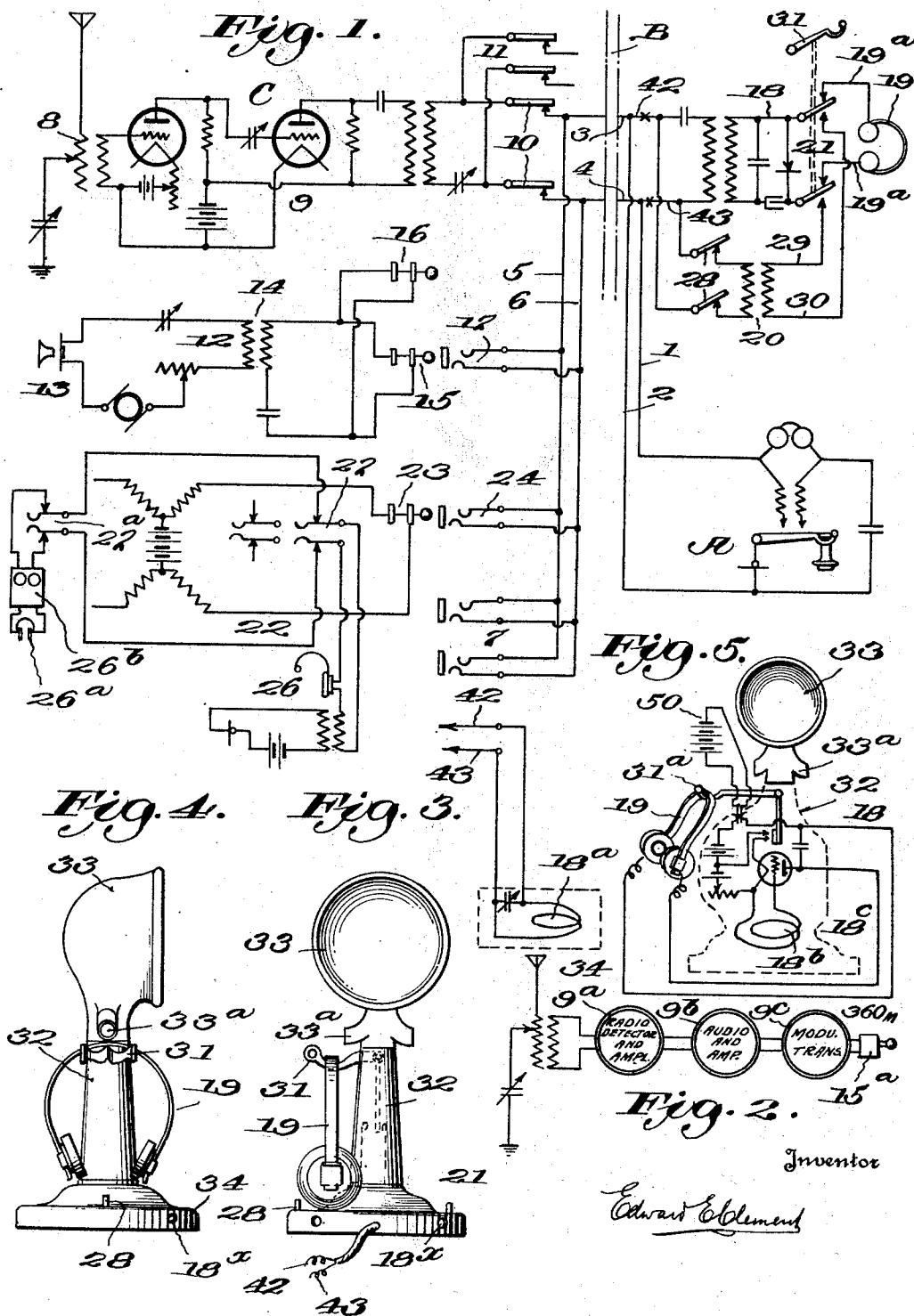
E. E. CLEMENT

1,754,880

RADIO DESK SET

Original Filed Oct. 27, 1922

2 Sheets-Sheet 1



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Fig. 5^a

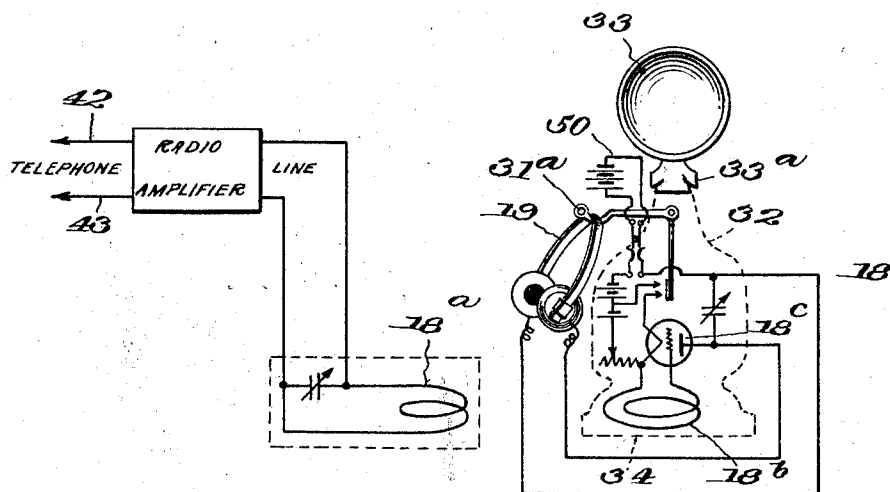
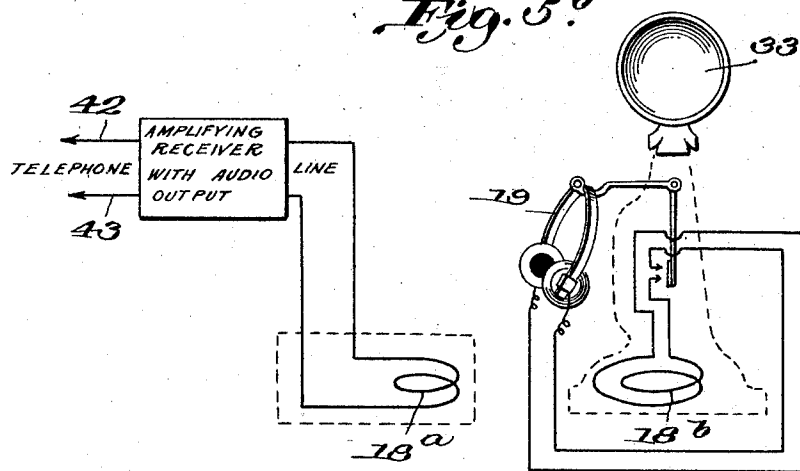


Fig. 5^b



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RADIO DESK SET

Division of application Serial No. 681,992, filed December 21, 1923, which is a division of application Serial No. 597,422, filed October 27, 1922, issued as Patent No. 1,576,308. Divided and this application filed August 1, 1925. Serial No. 47,547.

This application is a division of my co-
pending application, Serial No. 681,992, filed
December 21, 1923, which is a division of ap-
plication Serial No. 597,422, filed October 27,
1922, issued as Patent No. 1,576,308. The
present invention relates to radio systems and
more particularly to receiving sets.

The main object of the invention is to pro-
vide a light and compact receiving set, capa-
ble of being moved about, within limits, at
the convenience of the user. A further ob-
ject is to provide a set mechanically free but
electrically connected so that movement of
the same will be unhampered as by conductor
cords or similar mechanical connections.
Another object is to provide a combination
set having both loud speaker and earphone
attachments with automatic switchhook con-
trol.

Other objects of the invention will be ap-
parent from a perusal of the following spec-
ification and the drawings accompanying
the same.

In the drawings,

Fig. 1 is a schematic diagram showing a
central office and one subscriber's line with
a subscriber's station equipped with a radio
desk set receiver.

Fig. 2 is a similar diagram of a modified
form of a radio receiving apparatus for the
central office for changing the wave length
transmitted to the subscriber.

Fig. 3 is a front elevation of the subscrib-
er's desk set.

Fig. 4 is a side elevation of the same.

Fig. 5 is a modification in which the cord
connection is dispensed with.

Fig. 5^a is a modification of the form of Fig.
5 in which radio amplification is interposed
between the line and the primary coil.

Fig. 5^b is another modification of the form
of Fig. 5 using inductive transmission of
audio frequencies to the desk set.

Referring to the drawings, in Fig. 1, the
apparatus to the left of the vertical dotted
lines is situated at the central office, that to
the right is at the subscriber's station while
the connection indicated between the dotted
lines is the line connection.

The telephone exchange system assumed

therein to be used in carrying out my inven-
tion is the standard Western Electric No. 1
switchboard circuit with the usual standard
Western Electric substation apparatus.

The part of the usual telephone exchange
system here shown comprises the subscrib-
er's substation apparatus A connected by con-
ductors 1 and 2 to the conductors 3 and 4 of
the line B terminating at the central office C
through the wires 5 and 6 on multiple jacks
7. Radio broadcast from other stations is
received at the telephone central station by
the receiving or antenna circuit 8, from which
the broadcast is relayed or amplified onto the
wires 3—4 of the subscriber's line circuit B
through known or other suitable amplifying
and coupling means such as the amplifying
system indicated at 9 and the switch 10.
Other switches such as 11 are connected with
the amplifier 9 in multiple with the switch
10 for the purpose of connecting to other
subscriber's lines.

For broadcasting directly from the central
office a radio transmitting circuit of any
known or other suitable form is provided at
the central office, such as the radio trans-
mitting circuit 12 with modulating trans-
mitter 13 coupled by means of the coupling
coil 14 to multiple switching means such as
the plugs 15 and 16 through which the radio
transmitting circuit may be connected with
any subscriber's line through local broad-
cast jacks such as the jack 17 multiplied onto
the subscriber's line extension 5—6.

Either relayed or local broadcast is put
on to the subscribers' lines at radio frequency
and at sufficient amplitude to enable the audio
frequencies to be segregated or detected at
the subscribers' substations with a simple de-
tector set which may be of any known or
other suitable form such as the crystal de-
tector type, indicated at 18. The detector
circuit 18 is arranged to be connected with
either the radio head set 19 or the super-
visory coupling means 20, through a double-
pole double-throw switch 21, at the will of
the subscriber. The use of the double-throw
switch has the advantage of effecting an au-
tomatic disconnection of the head phones 19
upon connection of the detector circuit with

the test coupling so that all the energy will go into the latter, although, if desired, the head phones may be permanently connected and the test coupling simply connected in shunt when wanted.

5 To enable the reception at the subscriber's substation to be supervised from the central office, a supervisory circuit 22 is provided at the central office arranged to be connected
10 with any subscriber's line through suitable switching means such as the plug 23 adapted to engage with jacks such as 24 connected in multiple to the subscriber's line extension 5—6. The supervisory circuit 22 may be of
15 any suitable type, preferably that used with the Western Electric No. 1 switchboard system, the essentials being that it contain means for calling the subscriber such as the ringing key 25, and a listening and talking set
20 26 and listening key 27. The supervisory coupling 20 at the subscriber's substation is preferably arranged to be normally disconnected from the line and to be connected therewith at will through a suitable switch
25 such as 28. The operator may have a special radio listening set, as indicated at 26^a connected to the plug 23 through an amplifier 26^b and key 27^a of usual construction, so that the return currents through the line to
30 central will be strengthened. Such amplifiers or electron tube relays are well known and need no description. I believe this combination to be new and original with me.

In operation, broadcast is put onto the
35 subscribers' lines such as 3—4 at the central station C, either directly by means of the local set 12 or indirectly by means of the relay set 8—9 and a subscriber at substation A wishing to receive the broadcast listens in
40 by means of the detector circuit 18 and radio-phone 19. During the broadcasting if the supervisory operator desires to test the quality of reception at substation A he plugs in on the line at 23—24 and depresses the ring-
45 ing key 25 whereupon the subscriber at A is signalled in the usual manner. The subscriber at A responding is instructed to reverse switch 21 and close switch 28, which thereupon disconnects the audio circuit of
50 the detector from the receivers 9 and connects it with the line extension 1—2 by way of conductors 29—30, coupler 20 and switch 28, from whence the circuit is extended over the line conductors 3—4, line extension 5—6,
55 jack and plug connection 24—23 and listening key 27 to the supervisory operator's listening set 26. The operator now listening in on the reception at the subscriber's substation can ascertain the quality thereof and
60 finding it defective can judge of the cause of such defect. For example he can discern the effects of static, induction from power lines, cross talk from telephone lines, loose connections, etc.

65 In Fig. 2, I have shown a radio receiving

circuit 8^a, connected to usual radio amplifier and detector apparatus 9^a, which in turn is connected to an audio amplifying set 9^b, connected to a modulator and transmitting set 9^c, having its output side terminating on
70 switching means such as plugs for connection to line circuits. The principle involved herein is that of receiving at one wave length and relaying onto the subscribers' lines at a different wave length. The transmitter 9^c
75 and the receiver 8^a—9^a are capable of being separately tuned, in a manner well understood in the art, which is important as an element in this invention, because all my subscribers' instruments are standardized and
80 flat tuned, that is, all are permanently tuned on the same wave length, which is the normal transmitting wave length of the central office to which they are connected for service. The range of tuning is immaterial.

85 In Figs. 3 and 4, I have shown a form of subscriber's desk instrument embodying the elements 18, 19, 20, 21, and 28 of Fig. 1. The base 34 is hollow, and the detector set 18 with coupler 20, is arranged therein with
90 suitable circuit connections through cords 42—43 or through ordinary wiring. If cords are employed, the mutual capacity of the conductors must be neutralized or minimized so as not to interfere with reception of the high
95 frequency waves by the detector set. On base 34 is erected a column 32 carrying a switch-hook 31, controlling contacts within the column and shown in the diagram, Fig. 1, at 31. This hook when down disconnects the
100 entire set from line, and when up connects the set through wires 42—43 to line. Two manual switches 21 and 28 are mounted on the base with contacts preferably within the same, to control the listening set connection
105 to 19 and the cut-back to central at 29—30. A horn 33 is mounted on the upper end of the column, with coupling nipples 33^a arranged on opposite side of its neck for receiving the two head phones 19 when the subscriber prefers to listen in that way. Tuning handles
110 of any desired form may be also arranged on the outside of the base as shown at 18^x.

The foregoing arrangement is flexible and will lend itself to various detailed forms of
115 subscribers' instruments. For example, the cord connections of the radio set 18—19 may be dispensed with, as indicated in Figure 5. The line connections 42—43 here terminate in the primary coil 18^a, of which the second-
120 ary 18^b is carried on the instrument, conveniently in the base thereof. Coil 18^a may be enclosed in a casing as indicated in dotted lines, and the instrument adjusted with reference thereto either over it, or to one side. It
125 is to be understood that the circuit of the coil 18^a may be tuned in any desired way, as by a series variable condenser or by a fixed condenser, with taps off of the coil in accordance with well understood practice. The
130

coil 18^a constitutes a bridge across the telephone line which for best results must be tuned, as is well understood in the art. Several instruments and several secondaries may be used if desired with a single primary. In this case I have shown a tube detector 18^c with A and B batteries and tuning condenser all enclosed within the instrument body. Tubes suitable for this purpose are commercially available, and small batteries are also on the market, either storage cells or dry batteries. Where more ample battery capacity is desired, separate batteries may be connected to the desk set through a cord of usual type as indicated at 50 in Fig. 5. In any case the receiver 19 is connected to the instrument circuits through a cord, which for simplicity of illustration is omitted in Figs. 3 and 4, but is indicated in Fig. 5. The mechanical parts are numbered the same in Fig. 5 as in Figs. 3 and 4, the outline only of the desk stand or casing being shown in dotted lines.

It is to be understood that radio or audio amplifying means, or both may be added to the receiving set without departing from the scope of my invention. Where the detached or loose coupled form of instrument is employed the arrangement of Fig. 5^a may be used, where the radio amplification may be between the line connections 42—43 and the primary winding 18^a, and audio amplification means may be mounted on or in the instrument unit. A further modification is that indicated in Fig. 5^b, which is accomplished by connecting to the line wires 42—43 a complete detector set including radio and audio amplifying tubes, detector coils and tuning devices, with the primary winding of an audio transformer or inductorium of any suitable form arranged the same as coil 18^a. The instrument would then carry the secondary 18^b of said inductorium, the receiver, and a wire connection to the receiver, only. Various other modifications will suggest themselves to those skilled in the art, and it is to be understood that I contemplate all such non-essential changes or modifications as fall fairly within the scope of the appended claims.

Having thus described my invention, which I claim is:

1. In combination with a wire circuit carrying modulated superaudio waves and terminating in a tuned and mechanically fixed primary coupling coil, a mechanically detached, movable and self-contained radiophone receiving set comprising a unitary standard and base, a detector therein, an amplifying horn thereon, a secondary coupling coil therein, in a plane normally parallel with that of said primary coupling coil, circuit wires and connections mounted therein, an audio frequency receiver carried thereon and adapted to be connected with said

amplifying horn, and a switch also carried thereon and having contacts included in said circuits, together with a source of current for the detector, the arrangement being such that the coil, detector, receiver, and horn are controlled as to their proper operative relations by the movement of said switch.

2. In combination with a wire circuit carrying modulated superaudio waves and terminating in a tuned primary coil mechanically fixed in a horizontal plane, a mechanically detached, freely movable, and self-contained radiophone desk set receiver comprising a hollow base or support, a vertical hollow standard thereon, a detector in said standard, an amplifier horn mounted on said standard, an audio frequency receiver cooperating with said horn at the upper end of said standard, a secondary receiving loop or coupler coil in said hollow base, normally held horizontal and thereby adapted to receive from said fixed horizontal primary coil electromagnetic waves having a vertical magnetic component, a circuit connection between said coil and said audio frequency receiver, extending through said standard, and a switch thereon controlling said circuit.

In testimony whereof I hereunto affix my signature.

EDWARD E. CLEMENT.