

July 14, 1942.

B. E. COVER, SR

2,289,485

SYSTEM OF AIR AND WIRE RADIO COMMUNICATION AND ALARM

Filed July 14, 1941

2 Sheets-Sheet 1

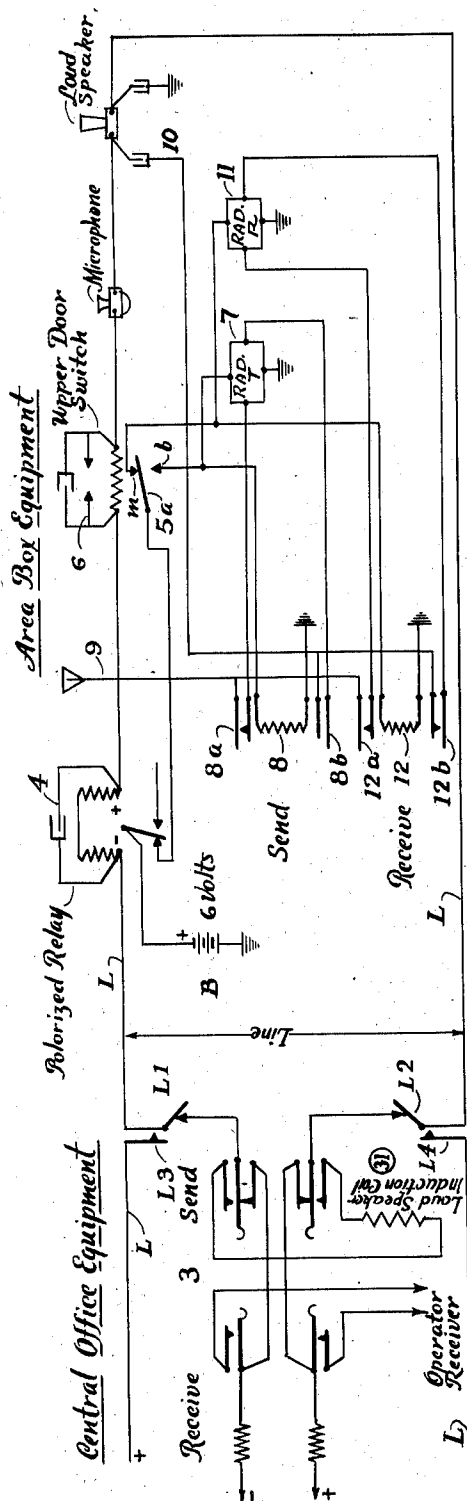


Fig. 1.

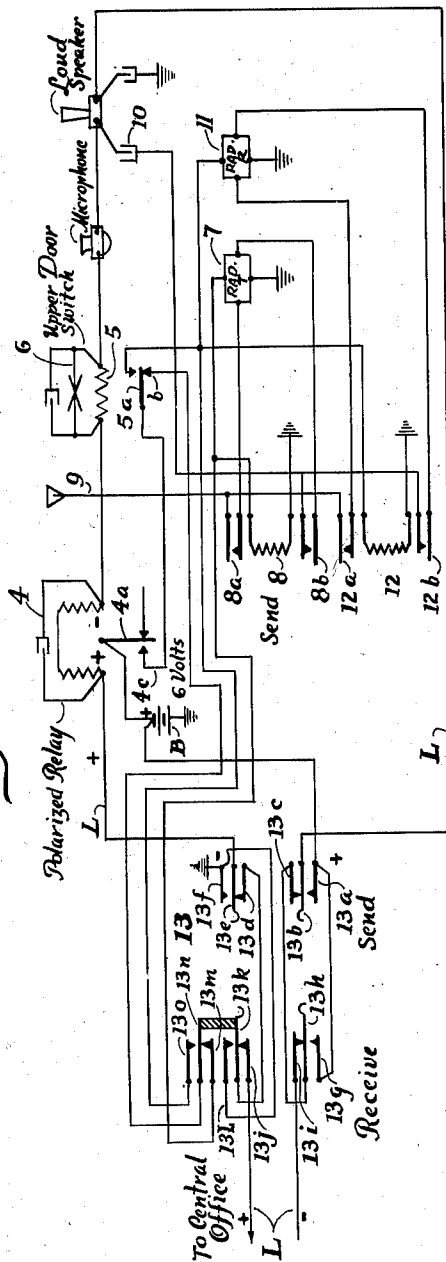


Fig. 2.

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2 Sheets-Sheet 2

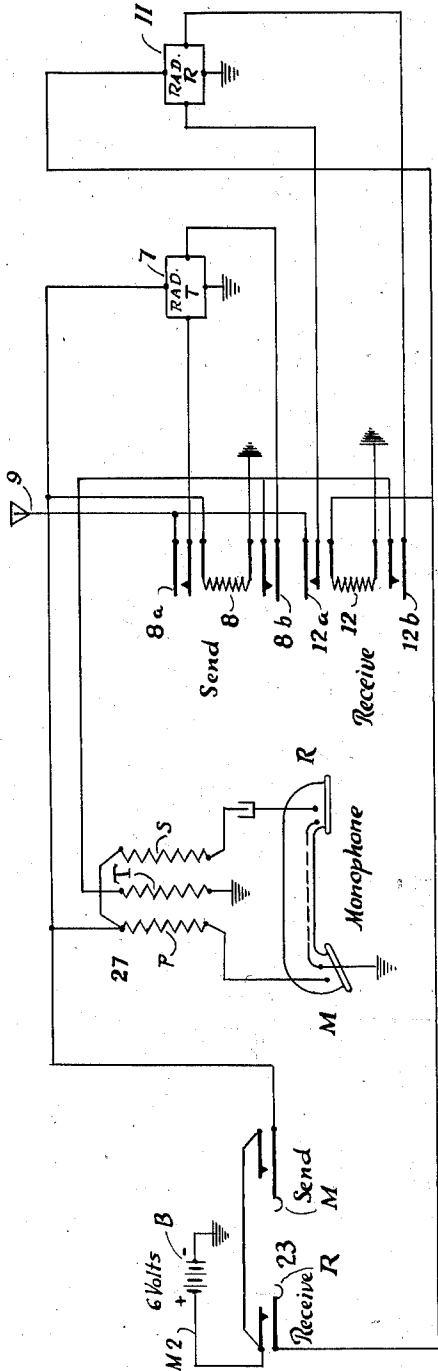


Fig. 3.

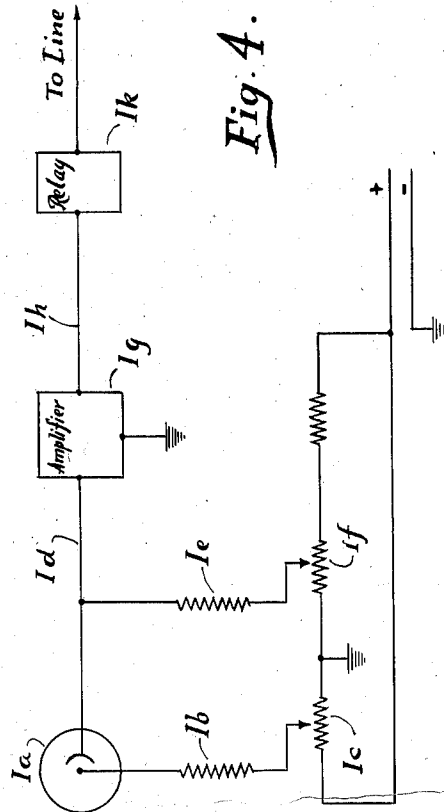


Fig. 4.

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UNITED STATES PATENT OFFICE

2,289,485

SYSTEM OF AIR AND WIRE RADIO
COMMUNICATION AND ALARM

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mesne assignments, to Electra-Voice Corpora-
tion, Wilmington, Del., a corporation of Dela-
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Application July 14, 1941, Serial No. 402,313

6 Claims. (Cl. 250—6)

My present invention has to do with improve-
ments in a system for transmitting signals,
alarms, inter-communicating messages between a
central station and a plurality of subsidiary local
stations. Patent No. 2,129,345 was issued to me
September 6, 1938, for certain improvements in
such a system which was peculiarly suitable for
handling the fire and police business of a metro-
politan or other political area and the present
invention constitutes a further extension and de-
velopment of such a system as was described in
said patent.

Radio communication is generally character-
ized by the immense distances over or between
which it can be effected, but the distances be-
tween which communication can be had with uni-
form and consistent dependability varies greatly
with the time of day and other conditions, both
known and unknown, which conditions are sub-
ject to wide variations. Generally speaking trans-
mission can be effected both day and night and
with a high degree of certainty and with simple
and low power apparatus when the distance of
transmission is but a few miles, and such trans-
mission has the great additional advantage of
causing practically no interference with other
radio transmission and reception. The arrange-
ment of a central station with subsidiary stations
located to cover separate portions of the general
area lends itself to the employment of certain
simple, low power, non-interfering radio com-
municating apparatus not only for political areas
but much less extensive properties such as fac-
tories and factory parkings and public reserva-
tions of various kinds and extents.

Among my specific objects has been to provide
instrumentalities to cause and control radio
transmission and reception at one or more of the
subsidiary stations from the central station and
also to permit radio transmission and reception
from each of the subsidiary stations. I have also
had as a further object, the association with the
equipment required for such radio service, of an
electric eye which will apprise those in control
of and operating the system, of an unauthorized
entry of the premises, should such an entry oc-
cur.

The system set forth in the heretofore men-
tioned patent involves the employment, among
other elements, of a central station, provided with
standard central station equipment, and a plu-
rality of subsidiary stations in the form of street
boxes with a metallic circuit between each of the
street boxes and the central station. Each street
box, as is not unusual, is provided with an upper

and lower compartment. The upper compart-
ment is closed by a door without a lock so that
the door may be opened and the apartment en-
tered at will by any individual of the public who
may have occasion to do so. When the door to
the upper compartment is opened, the circuit
carrying normal D. C. power from the central sta-
tion is by-passed around a relay for certain pur-
poses, but, because of the proper disposal of suit-
able inductance and capacity, alternating and
modulated currents may still pass between the
street box and central station when the direct
current is discontinued. Among other apparatus
installed in the upper compartment is a micro-
phone and a loud speaker suitable for and capable
of receiving and reproducing articulate sound.
The lower compartment of the street box is closed
by a door provided with a lock, keys for the open-
ing of which are carried by policemen and fire-
men or others charged with duties having to do
with the operation and use of the system. In the
lower locked compartment is installed a mono-
phone, preferably of the cradle variety, by means
of which messages may be sent and received with
a considerably greater degree of local privacy.

All of the above is either standard practice
or set forth in the heretofore mentioned patent.

In addition to and in combination with the
above indicated elements of standard and pat-
ented equipment, I have attained the herein men-
tioned objects by means of the elements and
organization thereof illustrated in the accom-
panying drawings in which—

Fig. 1 is a diagrammatic illustration of ele-
ments and wiring involved in sending and receiv-
ing from antenna at area-box from central sta-
tion.

Fig. 2 is a diagrammatic illustration of ele-
ments and wiring involved in sending and re-
ceiving from an area-box.

Fig. 3 is a diagrammatic illustration of elements
and wiring involved in sending and receiving by
means of monophone from locked compartment
of area-box.

Fig. 4 is a diagrammatic illustration of the as-
sociation of electric eyes with the area-boxes of
a system.

In the project of covering an area from the
point of view of radio transmission and reception
by means of a central station connected with a
series of subsidiary stations so located as to
assure dependable communication with equip-
ment of a suitable character operating with
relatively little power, the problem involves trans-
mitting and receiving at the central station from

an antenna at an area-box. The second main problem is to transmit and receive at the area-box. While the last above named problem is subsidiary, in a way, to the main problem of equipping the system shown in Patent No. 2,129,384 with radio communication, it may, nevertheless, be of great practical importance as the solution thereof provides communication between the central station and an area-box when, and if, the metallic line circuit be destroyed or otherwise interrupted.

The third problem involves the provision of simple and effective mechanism permitting radio transmission and reception by means of the monophone installed in the lower locked compartment of the street or area-box. The solution of this latter problem provides more locally confidential communication with the central station independently of, as well as with, the metallic line wire connecting these stations.

As will hereafter be seen, the arrangement I have provided for connecting at will the radio transmitter and radio receiver with the antenna and the line is substantially the same in the solution of the three separate problems except in the way in which the actions are initiated.

In addition to the instrumentalities described in Patent No. 2,129,384, I have installed in the subsidiary street or area-box a radio transmitter, a radio receiver, an antenna, two double relays and a polarized relay. It will be seen by reference to said patent that there is already installed in said subsidiary street or area-box, a local six volt battery, a relay and a switch for by-passing said relay when the door to the upper compartment of said box is open, a microphone, a loud-speaker and, of course, suitable connections for the metallic circuit or line. It will be borne in mind that the transmission of the high frequency current employed in radio communication between the central station and the area-box can be accomplished over a line connecting these points through inductive and capacity linkage and is wholly independent of the closed circuit which is required for sending battery current between these points.

In the three cases mentioned above, to wit, sending and receiving from the central station with the upper door closed, sending and receiving from the street or area-box with the upper door open and sending and receiving with the monophone as respectively shown in Figs. 1, 2, and 3, the same variety of instrumentality is employed in connecting the antenna with either the transmitting or receiving set and for connecting the set with the local loud speaker in the first two instances, and with an inductance of the monophone, in the third instance. These instrumentalities comprise besides the antenna designated by the reference numeral 9, a radio transmitter 7, a radio receiver 11, double relays 8 and 12 for connecting the radio units with the antenna and the line respectively, and a polarized relay 4.

The lower blade 8b of relay 8 connects the transmitter through capacity 10 with the loud speaker. Likewise the upper blade 12a of relay 12 connects the radio receiver 11 with the antenna 9, and the lower blade 12b of this relay connects through capacity 10 with the loud speaker.

In Fig. 3, the lower switch blades 8b and 12b of relays 8 and 12, instead of connecting the radio transmitter and radio receiver respectively with the loud speaker, connects these elements

with the central inductance winding T of the monophone.

Referring particularly to Fig. 1: the central operator places energy on switch blade 5a of relay 5 by means of reversing the polarity on the line L running between the central station and the street or area-box through the instrumentality of the polarized relay 4. It will be recollected that the upper door of the street or area-box is closed and therefore the by-passing switch 6, controlled by said door, is open, therefore, the switch blade 5a is in its upper position in which position it makes contact at m with a lead running to the radio receiver 11 and energizes the lower relay 12.

At the left of Fig. 1, is a schematic layout of the wiring of the central office equipment, so designated, in which the top and bottom lines L indicate the line or circuit between the central office and the street or area-box. I have indicated the positive and negative polarity which is normal to the circuit or line. The polarity is changed by a jack or cam-switch, as may be desired, which results, as shown in Fig. 1, in opening the contacts L3 and L4 and closing the contacts L1 and L2. The polarity is then indicated at the center left in diagram 3 of the central station, and, as heretofore described, the polarized relay 4 is operated to close contact in the street or area-box between the lead from the six volt battery B and the lead to the blade 5a of relay 5.

In order to send, or broadcast, the central office operator presses the button of the switch marked "send" which disconnects the current of reversed polarity from the line and connects the line with the central office loud speaker coil 31, so designated. The removal of all direct current energy from the line de-energizes relay 5 and permits the blade 5a to fall into contact b in which position, as heretofore described, current flows to the radio transmitter 7, and the radio transmitter 7 is connected by means of energizing relay 8, through blade 8a with the antenna, and the radio transmitter is connected by blade 8b with the loud speaker.

To receive, the central office operator releases the button designated "send" and presses the button to the left designated "receive" which connects the reversed line current with the line running to the street or area-box. The energy of this current picks up the blade 5a of relay 5 to make contact at m which, as previously described, transmits energy to the radio receiver 11 and to relay 12 which connects the radio receiver 11 through blade 12a with the antenna, and, through blade 12b, with the capacity coupling 10 to the line L which transmits over the line to the receiver at the central station. When the "receive" button is pressed the reversed line current, as shown by the diagram, is applied to the operator's receiver at the central office. It should also be noted that the polarized relay will not restore when the line current is cut off, but only operates upon a reversal of the line current.

Proceeding now to Fig. 2: this is a schematic diagram of the conditions obtaining when broadcasting and reception are had when the upper door of the street or area-box is open. It will be remembered that when the door to the upper compartment is open the by-pass 6 of the relay 5 will be continuously closed and the switch blade 5a will be continuously closed at contact b.

To the left of Fig. 2 is shown at 13 wiring of a cam-switch, the forward pull of which oper-

ates the connections at the right designated "send" and the rearward movement of which operates the switches shown in the left portion of 13, designated "receive." The wiring is as follows; the positive pole of the six volt local battery B is connected with the lower contact 13a of the "send" arrangement and the lower contact 13a of the "send" arrangement is connected with the lower contact 13g of the "receive" arrangement. The lower blade 13b of the "send" arrangement is connected with the line L which runs through the loud speaker, microphone, by-pass 6 and polarized relay 4 and terminates in the upper blade 13e of the "send" arrangement.

The normal negative line from the central office connects with the upper contact 13i of the lower switch blade 13h of the "receive" arrangement which blade, 13h, in turn, is connected with the upper contact 13c of the lower switch blade 13b of the "send" arrangement. The upper conductor from the central office connects with contact 13j of the "receive" arrangement. The blade 13k with which the last mentioned contact normally contacts, is connected with the lower contact 13d of the upper blade 13e of the "send" portion of the switch. The upper contact 13f of the upper blade 13e of the "send" arrangement is grounded or connected with a tap from the negative pole of the six volt local battery B. After the door has been opened, positive current from the central office will come in through contact 13j and will pass through blade 13k, to contact 13d and blade 13e, out around the line L in the normal manner and pass back to the central station through the lower blades 13b and 13h of respectively the "send" and "receive" arrangements and their upper contacts, respectively 13c and 13i. Contact 13l of blade 13k of the "receive" arrangement is wired to grounded contact 13f of the "send" arrangement.

Normally the contact 13m is in contact with blade 13n of the "receive" arrangement said blade being connected with contact b of blade 5a of relay 5 and contact 5m being wired to, and connected with, radio transmitter 7 and relay 8. The contact 13o of the blade 13n of the "receive" arrangement is wired to the radio receiver 11 and relay 12 whereby the radio receiver is connected respectively with the antenna and the loud speaker.

To send or broadcast, the cam-switch 13 is pulled forward which breaks contact between contact 13c and blade 13b and makes contact between said blade 13b and contact 13a, and also blade 13e breaks contact with contact 13d and makes contact with contact 13f. By reference to Fig. 2 it will be seen that the central office line circuit has been broken and the local six volt battery B has been put on the line with reverse polarity which causes the blade 4a of the polarized relay 4 to contact point 4c which is wired to blade 5a which, through its contact in released position, places energy on blade 13n and through contact 13m places energy on radio transmitter 7 and relay 8.

To receive, cam 13 is pushed rearwardly which restores the original normal condition of the "send" blades and contacts, but, through the breaking of the blade 13h from contact 13i and the making of contact between said blade 13h with contact 13g and the shifting of blade 13k to contact 13l the opening of the circuit of the central office circuit is continued and the local

battery B is connected with the line circuit in precisely the same polarity as during the sending operation. However, blade 13n has now been transferred from contact 13m to contact 13o which is wired to radio receiver 11 and relay 12.

Referring now to Fig. 3; the door of the upper compartment of the street or area-box is closed and the policeman, fireman or other authorized person having a key to said box, opens the lower locked door and removes the monophone. It will be perceived that the monophone can be operated with a much greater degree of local privacy than can be the microphone in the upper compartment. For the sake of simplicity I have omitted indicating the means of breaking the upper normal line circuit from the central station which can be done in a number of ways and have restricted myself to showing application of the power of the six volt local battery B, which is all that is employed in this operation with the monophone, radio transmitter and receiver and relays for sending and receiving. Two buttons are all that need be employed, one to receive and one to send. When the "send" button M is pressed it makes contact with the positive lead M2 from the battery B and is wired to the primary and secondary coils P and S of the monophone inductance 21, the "send" relay 8 and the radio transmitter 7, from which radio transmitter the current is returned to the central inductance T of the monophone.

When the "send" button M is released and the "receive" button R is pressed, positive local battery current is placed on relay 12 and radio receiver 11 which is likewise connected with the central inductance of the monophone.

The employment of a system comprising a central station and street or area-boxes in the transmission of messages or alarms by wire has the considerable advantage of great convenience in reaching an area-box for the purpose of transmission and reception. The extension of such a system to radio communication not only has the same advantage as with line communication but has also, in addition, the further considerable technical advantage of covering the area with vastly greater certainty by means of more economical equipment than is necessary in the employment of radio communication over longer and more varying and uncertain distances without interference.

I have availed myself of the equipment described in the heretofore mentioned patent, and, in this application have associated therewith air and wire radio communication and an electric eye alarm signal. The equipment shown in Fig. 4 is installed in the street or area-box and the apparatus for generating the ray may be located at a desired distance from the area-box and in a situation to be interrupted by a person entering the premises without authorization. The apparatus installed in the box comprises a tube or electric eye 1a which connects through suitable resistances 1b and 1c with a conductor 1d independently connected with the power through resistance 1e and 1f. The conductor 1d is connected with an amplifier 1g which both generates and amplifies a humming note which humming note goes through conductor 1h to relay 1k which operates to place the note carrying circuit across the communicating line L—L between the central station and the area-boxes. When the balance of this circuit is disturbed by a change in resistance of the tube I, the note is produced and

imparted to the line. It should be borne in mind that the hum is of such a character that it will not interfere with any of the operations which may be in progress with the street or area-boxes, but, when going, advises everyone having to do with the system, of the existence of the alarm.

Having described my invention what I claim as new and desire to obtain by Letters Patent is:

1. A system of short distance radio communication comprising a central station and a plurality of area stations positioned to cover a desired locality, said area stations being at relatively short distances from said central station, a metallic circuit extending between said central station and said area stations, each of said stations provided with antenna and transmitting and receiving radio equipment and means controlled by the polarity and continuity of current passing from said central station and area stations and at said area stations for causing selective transmission and reception from said antenna.

2. A system of radio communication comprising a central station and a plurality of area stations positioned at relatively short distances to cover a desired area, metallic circuits extending between said central station and said area stations, said area stations each being equipped with antenna and sending and receiving radio equipment and means controlled by the polarity and continuity of current passing between said central station and said area stations and at said area stations for causing radio transmission and reception from said antenna and through said metallic circuit between the central station and said area station.

3. A system of radio communication comprising a central station and a plurality of area stations positioned at relatively short distances to cover a desired area, metallic circuits extending between said central station and said area stations, said stations each being equipped with antenna and sending and receiving radio equipment and means controlled by the polarity and continuity of current passing between said central station and said area stations and at said area stations for causing radio transmission and reception from said antenna and through said me-

tallic circuit between the central station and said area station and an electric eye with a balanced circuit and a hum producing and amplifying device with a relay controlled by the balanced circuit of said electric eye for transmitting said hum on the circuits between said stations.

4. A system for the transmission of radio communication and alarm over short distances by air and wire comprising a central station, area stations, wire communication therebetween, antenna upon said stations, sending and receiving equipment provided in said area stations and means operable at said respective stations controlling the polarity and continuity of current flowing thereat for selectively transmitting or receiving from said antenna.

5. A system of radio communication comprising a central station and a plurality of street or area-boxes each connected with said central station by a metallic circuit, said metallic circuit having interposed therein capacity and inductance whereby alternating current may pass therethrough when said metallic circuit is open, radio transmitting and radio receiving sets being mounted in said street or area-boxes and means controlled by current passing between said central station and said street or area-boxes and the polarity and discontinuity of said current for selectively transmitting or receiving from the antenna of said street or area-boxes and over the circuits extending therefrom.

6. In a system of radio communication comprising a central station and a plurality of street or area-boxes, a metallic circuit connecting said central station with said area-boxes, said area-boxes having an unlocked and a locked compartment, a radio transmitting and a radio receiving set installed in said street or area-box, an antenna mounted thereon, a microphone and a loud speaker mounted in said unlocked compartment and means including the opening of the door of said unlocked compartment for selectively transmitting or receiving and a monophone disposed in said locked compartment whereby transmission and reception is had from the antenna and over the metallic circuit.

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