

Sept. 10, 1940.

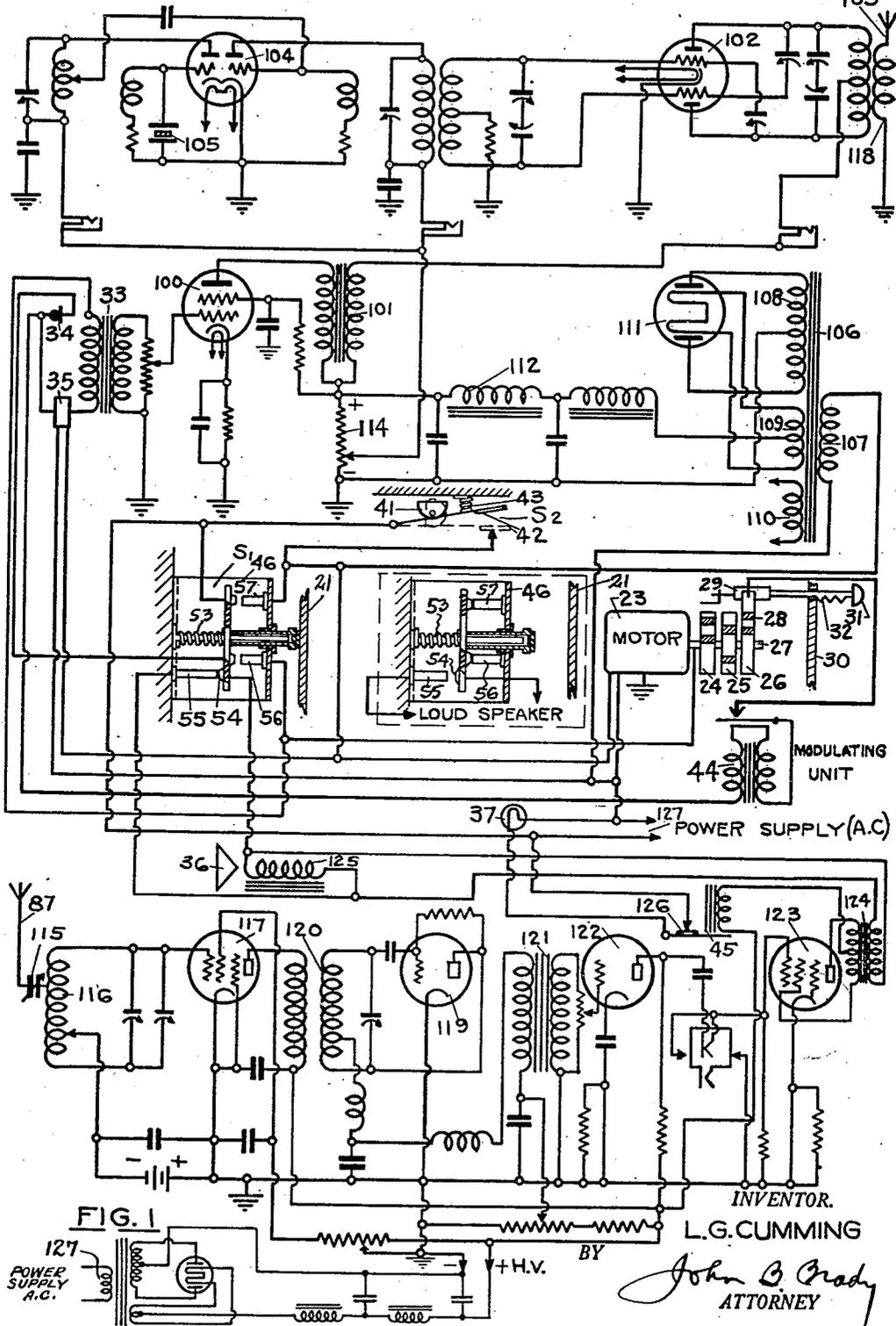
L. G. CUMMING

2,214,101

RADIO CALL BOX SYSTEM

Filed May 27, 1938

5 Sheets-Sheet 1



Sept. 10, 1940.

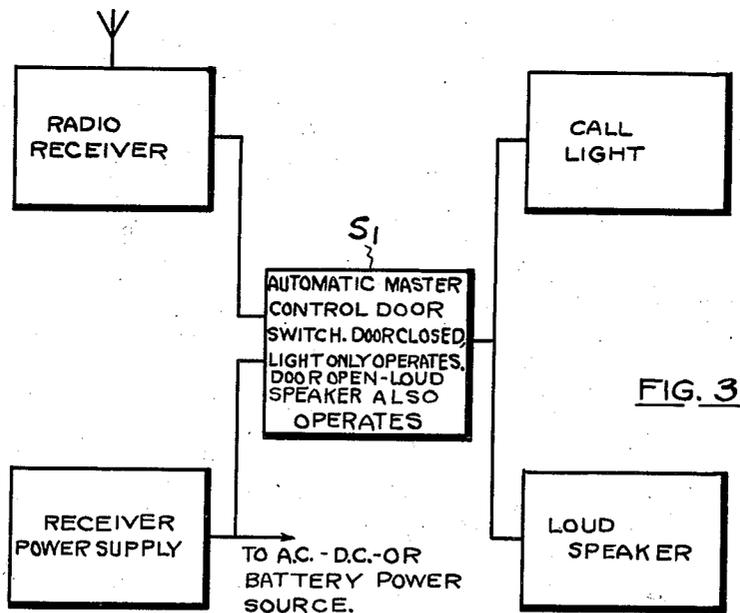
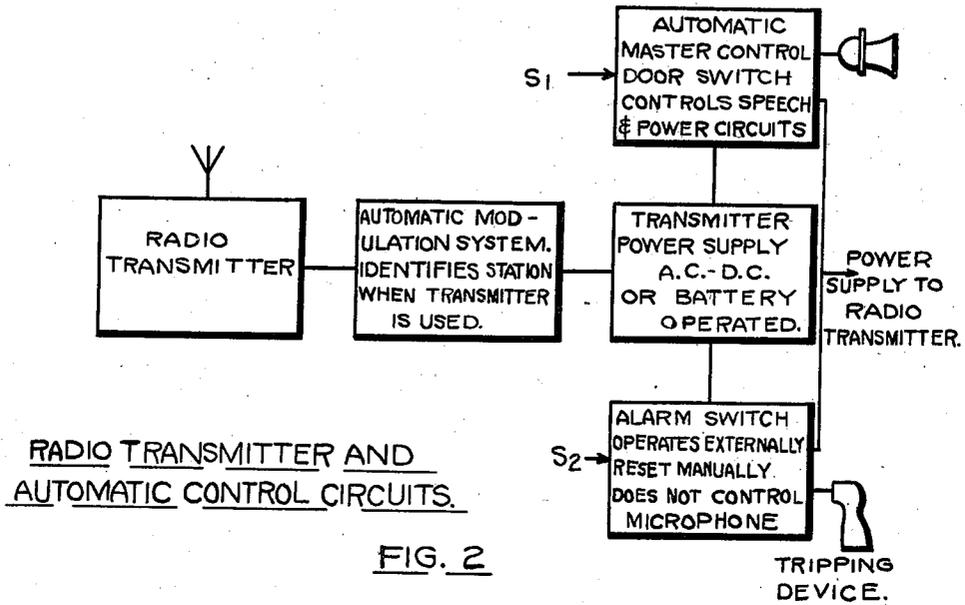
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RADIO CALL BOX SYSTEM

Filed May 27, 1938

5 Sheets-Sheet 2



RADIO RECEIVER AND AUTOMATIC CONTROL CIRCUITS

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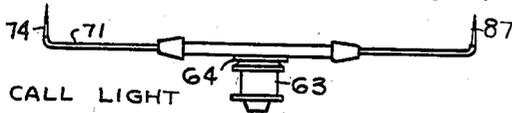
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RADIO CALL BOX SYSTEM

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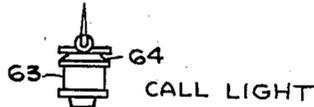


CALL LIGHT

62

20

FIG. 4



CALL LIGHT

S<sub>2</sub>  
20

FIG. 5

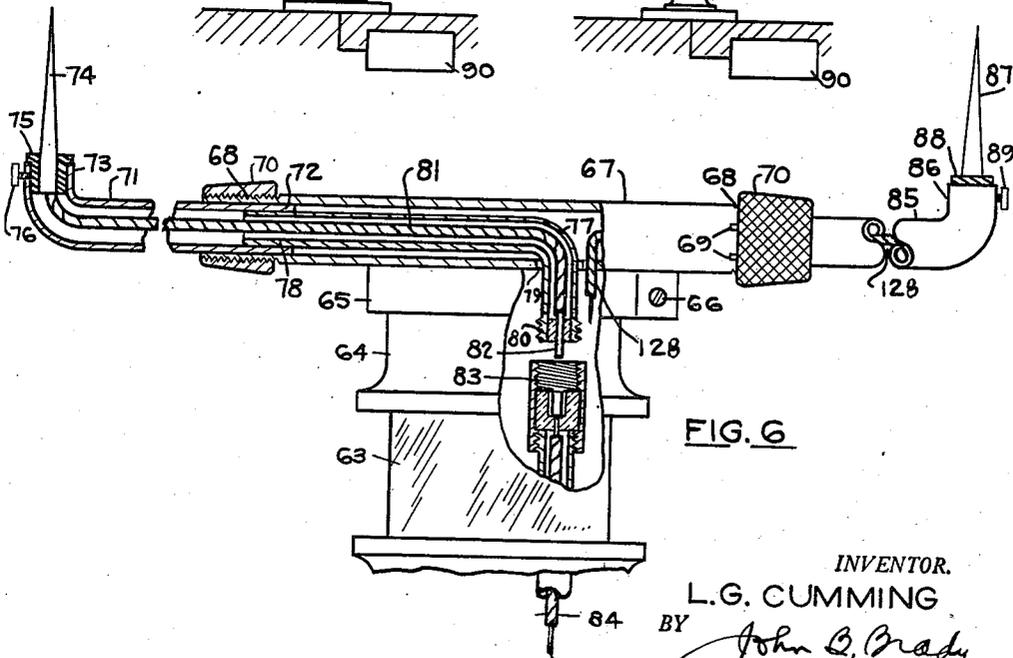


FIG. 6

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RADIO CALL BOX SYSTEM

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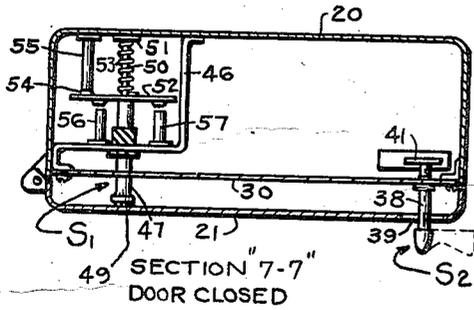


FIG. 7

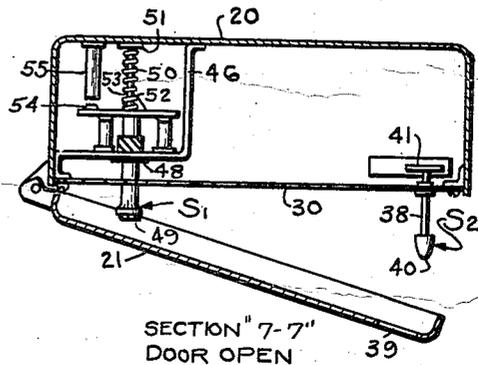
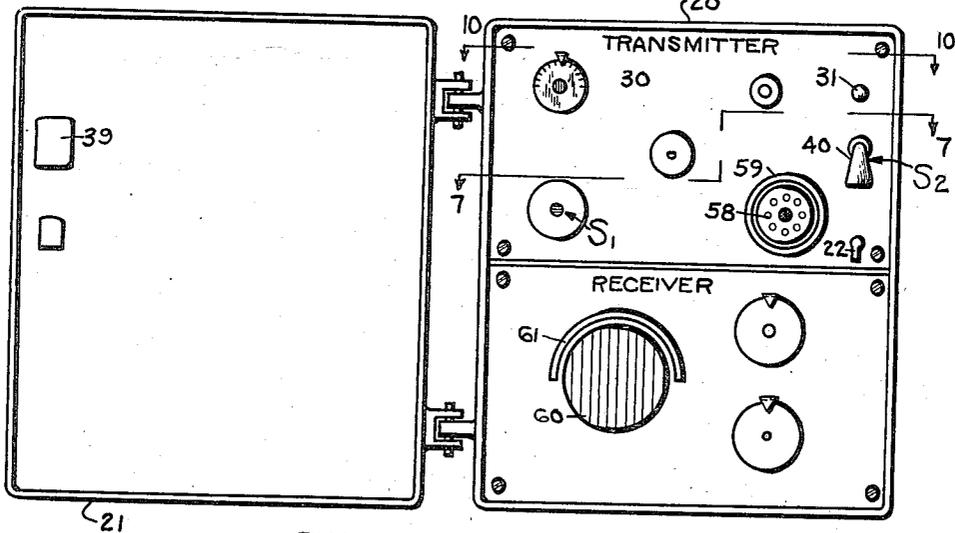
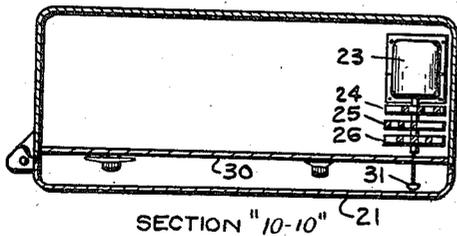


FIG. 8



PANEL ARRANGEMENT

FIG. 9



SECTION "10-10"

FIG. 10

AUTOMATIC SIGNAL  
SELECTOR AND  
CONTROL.

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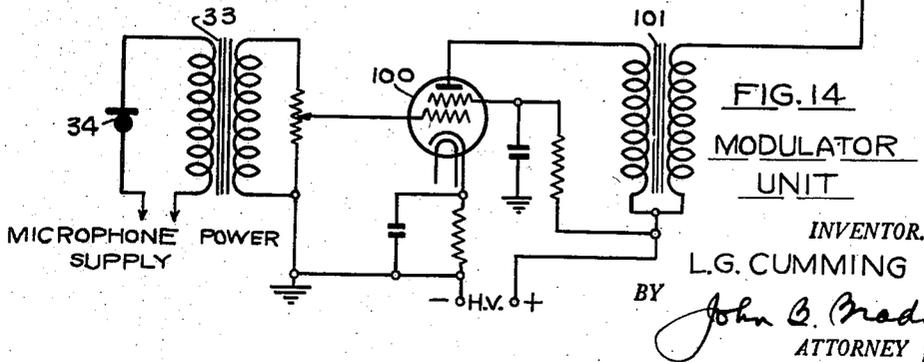
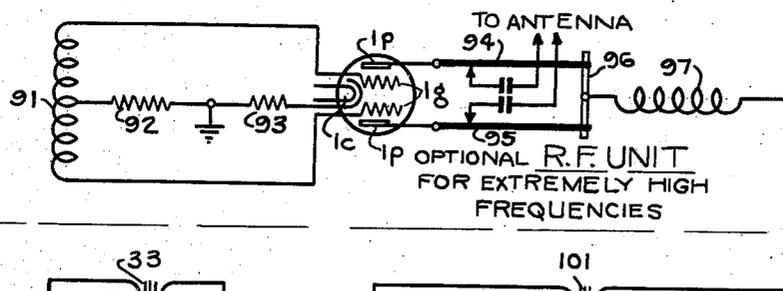
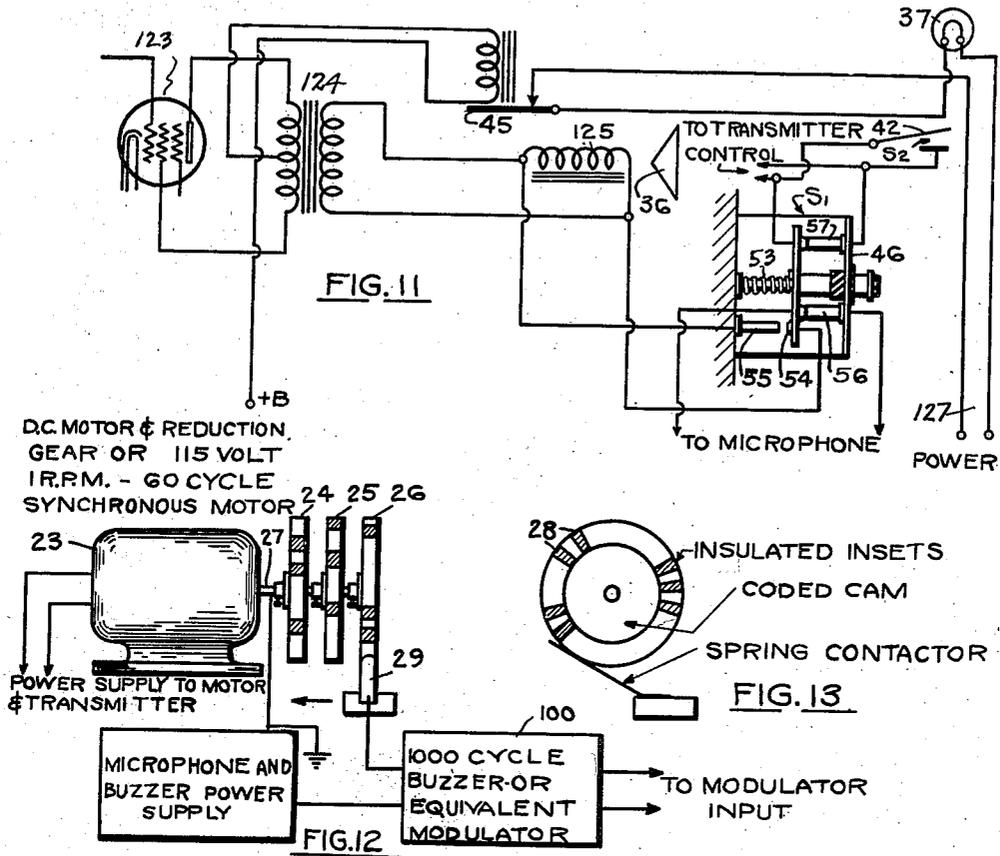
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RADIO CALL BOX SYSTEM

Filed May 27, 1938

5 Sheets-Sheet 5



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# UNITED STATES PATENT OFFICE

2,214,101

## RADIO CALL BOX SYSTEM

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R. I.

Application May 27, 1938, Serial No. 210,475

12 Claims. (Cl. 250-6)

My invention relates broadly to radio signal systems, and more particularly to a radio signaling system for intercommunication between a plurality of public service boxes and a central control station.

One of the objects of my invention is to supplement existing cable connected police or fire boxes with relatively inexpensive transmitter-receiver assemblies that are practicable for installation within the appropriations generally available in small municipalities.

Another object of my invention is to provide means for permitting a citizen or person to readily effect the transmission of a signal to a central station in cases of emergency from a public service box.

Still another object of my invention is to provide an automatic call means for identifying any particular box for effecting the transmission of radio signals from public service boxes to a central station.

A further object of my invention is to provide a radio transmission system for public service boxes that is initiated in operation when the housing door of the public service box is opened, and which will be automatically de-energized when the housing door is closed.

A still further object of my invention is to provide a construction of public service box having means for automatically rendering operative a radio transmitter and simultaneously and selectively actuating an automatic periodic identifying call or modulating system and radiating a signal to a central station.

Another object of my invention is to provide a signaling system for intercommunication between a plurality of both mobile and fixed radio transmitting and receiving stations by which voice signals, identifying code signals and combinations of such voice and identifying code signals may be transmitted to a central station.

Still another object of my invention is to provide an arrangement of antenna structure adapted to be mounted on public service boxes over the area of a community for directionally transmitting radio signals to a central station with minimum mutual interference.

A further object of my invention is to provide an arrangement of signal receiving system for public service boxes in which a signal light is energized adjacent the box when a radio signal is incident upon the box for attracting the attention of a patrolman who may then open the box thus automatically placing in operation a

loud speaker sound reproducer for delivering the message being transmitted.

Other objects and advantages of my invention will be apparent during the course of the following specification.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the several views:

Figure 1 is a schematic diagram of the arrangement of my invention, comprising an ultra high frequency transmitter and receiving assembly and diagrammatically showing the position of the automatic master control switch in opposite extreme positions, the citizens control switch and the selective signal transmission control; Fig. 2 is a block diagram showing the arrangement of the transmitter and automatic control circuits; Fig. 3 is a block diagram of the arrangement of the receiver and automatic control circuits; Fig. 4 is a front elevation of a public service box, signal light, and pedestal mounting illustrating the antenna arranged thereon; Fig. 5 is a side elevation of the public service box, signal light, antenna structure and pedestal mounting shown in Fig. 4; Fig. 6 is a fragmentary front elevation, shown partially in section of the ultra high frequency directional antenna-reflector and call-light unit used in combination with the public service box; Fig. 7 is a transverse horizontal section taken on the line 7-7 of Fig. 9, but showing the door of the public service box closed and illustrating the corresponding position of the master control switch that conditions the transmitter; Fig. 8 is a transverse horizontal section taken on line 7-7 of Fig. 9, but showing the door of the public service box open and the master control switch in a position to render the transmitter operative by voice modulation; Fig. 9 is a front elevation of the public service box showing the door open, and illustrating the panel arrangement of the radio transmitter and receiver; Fig. 10 is a transverse horizontal section through the public service box taken on the line 10-10 of Fig. 9; Fig. 11 is a schematic diagram in somewhat larger form of the arrangement of the automatic call-light circuit, citizens switch and master switch for the public service box; Fig. 12 is a side elevation of the synchronous motor and coded cam arrangement and selective connecting means employed for controlling the modulating circuits of the transmitter of my invention; Fig. 13 is a front elevation of the coded cam and selective spring contactor ar-

rangement as employed in Fig. 12 of my invention; and Fig. 14 is a schematic diagram of a modified form of oscillator and ultra high frequency radio transmitter circuit embodying my invention.

While I have disclosed preferred embodiments of my invention in the specification hereinafter following it will be understood that various modifications are contemplated within the scope of my invention, and I do not intend that my invention shall be limited to the particular form shown.

My invention is directed to a public service system for municipalities employing radio as a means of communication, to supplement existing cable connected public service boxes. My system also eliminates the necessity of metallic circuits between public service boxes and division stations, or other radio headquarters, thereby greatly decreasing installation costs and facilitating installation of public service systems in municipalities. The system of my invention supplies a definite need in present day police, fire and public service communications.

The system of my invention enables the installation of the "Radio-Box" which is a term I have coined in lieu of the heretofore existing public service box, to be made with but few changes in existing systems. The "Radio-Box" is designed to replace and supplement the various types of wired boxes in general use at present.

Where this equipment is installed in wire connected boxes at present employing the "call light," the "call light" mounting is replaced by a modification which acts as an antenna system mounting, as well.

In remotely located boxes which do not usually incorporate the "call light" it is not necessary to install the aforementioned combination light and antenna mounting. Remote boxes are usually devoid of any commercial power supply, and in such cases it will be necessary to construct a weather and tamper proof storage battery housing near the "Radio-Box."

The entire transmitter-receiver assembly is designed to be removed from the box as a unit. The radio assembly is secured in the housing by six or more wings, or knurled studs to facilitate quick replacement when service is necessary.

Every effort has been made to standardize both radio components, and complete assembly sizes. This assures the lowest possible maintenance cost and renders the system conversion cost, from wire to radio, so low that it is within reach of the small municipalities. This principle of low cost procurement materially assists the smaller communities, which are unable to have the necessary number of police or fire box installations, due to the prohibitive cost of equipment and lines, and budgetary limitations.

The antenna system consists of a one-quarter wave vertical antenna. A parasitic reflector spaced on the same adjustable mounting which carries the antenna is located one-eighth to three-eighths wave lengths behind the antenna. The antenna and reflector assembly is adjustable for directional characteristics and may be locked in position when adjusted, by a collar and set screw device on the box housing.

An indispensable function of modern police, fire or public service communication is that the radio channel or system, may be made available for citizen emergency use. I provide a "Citizen's Alarm" as part of the regular police box equipment in the "Radio-Box." For this purpose a

glass covered trip switch, or the equivalent, capable of being reset, is included as part of the "Radio-Box" equipment. This switch is connected in multiple across the transmitter master control spring switch and employed by the citizenry for emergency use only. The tripping of this switch puts the transmitter on the air, and automatically broadcasts the box number once or more a minute. It does not open the voice channel to the citizen, as the housing box door is still closed. The reception of a series of box number calls at the division station, when no answer can be obtained from the box, will constitute an alarm sufficient immediately to dispatch cars to the scene.

An electric induction motor or equivalent type of synchronous clock motor, is employed to operate a cam device having the police, fire box or other identification. This cam, revolving at one revolution per minute actuates a contactor, which in turn operates an audio frequency tone modulation system. An inverse feedback arrangement, or a buzzer, in the modulator tube grid circuit, is employed as the source of modulation. This modulating circuit is controlled by the revolving cam, which automatically broadcasts the box number once or more every minute, while the transmitter is in use. By this means it is possible to record each box number at the receiving point, or precinct station-house.

It is considered that the application of this automatic call identification system, (the synchronous clock operated cam) fills a definite need in police, fire or similar types of radio services in use at present.

Near the left edge of the transmitter panel is mounted a master control, door type spring switch. The purpose of this switch is to automatically turn off the transmitter when the outside door of the box mounting is closed. When the latter door is opened, this spring switch closes and turns on the power supply to the transmitter. Thus the transmitter is in operation only when the housing door is opened, and is automatically turned off, when the door is closed, unless turned on by the use of the "Citizen's Alarm" switch, when it must be reset by the officer or service department.

As several low powered ultra high frequency transmitters will be operating on the same or contiguous frequencies, it is considered necessary to employ a crystal controlled oscillator circuit. At the present stage of development of the radio art it is not practical to employ crystals having a fundamental frequency in excess of 15 megacycles. Crystals of this frequency produce sufficient power and stability to permit satisfactory doubling, or quadrupling to the desired frequency in two, or at the most, three tubes. The antenna-reflector type of directive radiation system employed is depended upon to reduce interference on the same or contiguous frequencies.

As the receiver functions twenty-four hours a day, semi-automatic operation is obtained. An important part of modern police work is the quick response obtained through the modern communication systems. One of the most effective developments for "calling" is the red "call light" provided in the "Radio-Box." It is necessary to employ a single pole single throw relay, or the equivalent, operating from the receiver output. The purpose of this relay is to normally function with the receiver, when the box is not in use, as the control switch for the red "call light."

When the box housing door is opened, a switch

similar in type to the transmitter control switch, will throw the output power operating this relay from the "call light" relay control circuit to a loud speaker, which is an integral part of the receiver. When the box housing door is closed, the "call light" responds to impulses from the receiver output. When this door is open, the receiver output is automatically transferred to the loud speaker for voice or modulated signal reception. Special removable cams or manual key operation may be employed at the headquarters station transmitter to send out emergency flash groups, riot calls or a particular box number.

These flash groups, box numbers or code signals are received by the "Radio-Box" as either light flashes, when the "Radio-Box" is not in use, before the officer arrives, or as modulated code signals when the receiver loud speaker is in use.

This automatic interchangeable use of the radio receiver to operate either the light flashing relay or the loud speaker insures secrecy when the "Radio-Box" is not in actual use, as the loud speaker is cut out of circuit, and does not respond to voice reception until the door is opened by an authorized person.

The "Radio-Box" design permits the employment of frequencies recently assigned to General Experimental, Police, Fire and Forestry Services by the Federal Communications Commission. Among those frequencies are the ones chosen for the initial tests and are between approximately 128 megacycles and 141 megacycles.

The transmitting and receiving apparatus is compactly assembled within a standard type of a public service call box such as a fire or police box adapted to be mounted on the usual pedestal support on the sidewalk or building structure or in any other box such as on board a train or fire truck, or police or fire boat. The transmitter and receiver have the circuits thereof powered from the available source of alternating current power supply or battery. While the transmitting range of the transmitter is not critical, I have successfully communicated distances of five miles or more using the circuits of my invention at ground levels. At elevated positions, the transmitting range of the equipment is substantially greater. The transmitter includes a high frequency oscillator and frequency multiplier connected to a power amplifier which in turn connects to a special form of directive radiating system. A modulator circuit is employed for controlling the high frequency energy supplied to the radiating system. The modulating circuit is unique in its arrangement as the modulator may be voice controlled, or modulated by prearranged audio frequency signals, or at successive repeating time intervals a combination of voice controlled and prearranged signals may be employed.

The prearranged audio frequency modulation is effected by means of a motor controlled audio frequency oscillator. The audio frequency oscillator is rendered effective on the modulation circuit of the transmitter in accordance with prearranged code signals under control of a suitably calibrated disc or cam device driven by the motor. In direct current installations, the driving motor may be a simple series wound direct current motor associated with a suitable reduction gear operating the code transmitting device. When alternating current is available, a synchronous motor is used for driving the trans-

mitter device. The driving motor for the automatic modulation system continuously drives the transmitter disc or code cam so long as the transmitter is energized. Accordingly, a repeated audio frequency identifying signal is transmitted successively during the voice modulation of the transmitter. This repeated signal serves as an identification of the transmitting station and does not offer serious interference with the voice modulation as the voice modulation is intelligible through the spaced successive interruptions offered by the code signals. This call when received more than five or six times without an accompanying voice modulated signal, automatically constitutes an alarm at the central station. This immediately dispatches mobile or portable units to the scene of the original box to determine the reason for the lack of voice communication, or response.

The transmitter disc or cam containing the prearranged contactors for closing the signal modulation circuit may be supplemented by a transmitter disc or cam contactors arranged to effect the transmission of riot or fire calls and the like. This extension of my invention is possible by adding on the drive shaft of the driving motor a supplemental transmitter disc or cam carrying prearranged signal contactors thereon capable of transmitting the alarm signals. These transmitter discs or cams may be selected by means operative interiorly of the call box when the call box door is opened by a mechanical contrivance to shift a brush member from one transmitting disc or cam to another. A number of such transmitter discs or cams may be provided with a brush control member capable of being shifted to any one of the several positions for effecting transmission of a particular group of signals.

As heretofore noted, the transmitting and receiving apparatus is compactly assembled within the call box and the warning light mounted above the call box on a suitable support adapted to carry the transmitting and receiving antenna.

In order to render the equipment universal in character and capable of being readily installed in various locations about a central station, the antenna structure is capable of being angularly adjusted in position on the support above the call box. Moreover, the antenna structure is equipped with an emitting portion and a reflecting portion capable of adjustable spacial relation one with respect to the other. Because of the many differences in directional characteristics encountered in installations embodying my invention, the antenna structure must be capable of different angular arrangement in various planes so that I provide for the adjustment of the antenna structure in different angular positions with respect to the vertical as well as various positions with respect to the transverse spacial relation of the emitting portion with respect to the reflecting portion. Such changes in angular position are particularly valuable where obstructions to the radiation of high frequency energy may occur. The antenna reflector type of radiation system which I employ is depended upon to reduce interference on the same or contiguous frequencies when a plurality of stations are used. The adjustable arrangement of the antenna structure of my invention is advantageous in arranging the antennas on different call boxes in various directions to coact with a central station without mutual interference. One call box station has negligible effect upon another call box

station for the antenna arrangement at each call box station is so devised as to emit the high frequency energy in that plane of polarization which will be received at the central station irrespective of energy being simultaneously emitted from other call box stations in the area about the central station. The antenna structure herein disclosed is the subject matter of a divisional application, Serial No. 274,255, filed May 17, 1939, for Antenna system.

I am not unmindful of the problems which arise in multiple systems of transmission where-in a number of permutations and combinations of transmissions may occur at the same frequency for signals transmitted to the same central station, whether the system be for purposes of fire, police, general communication, traffic control, marine, aviation or mobile systems generally. However, the central station may be readily equipped with directional receiving means capable of discriminating against signals in certain areas while allowing reinforced reception of signals in other areas and consequent increase in signal to noise ratio. Moreover, I contemplate in my system the employment of sequence transmission in cases of emergency so that an authorized agent at any one of the call boxes may be informed from a central station to stand by pending the clearance of an emergency call or priority message from some other call box station.

The receiving apparatus employed within the call box is continuously energized and maintained in operative condition prepared for the reception of signals. A relay operated from the output circuit of the last stage of power amplification is functioned so long as a modulated signal is received by the receiving apparatus to close a power supply circuit to an indicator light visible from the exterior of the call box. This provides a signal for attracting the attention of a patrolman to the call box whereby the patrolman will be informed of the fact that a modulated signal is being received and will utilize the receiver at the call box for audibly receiving the signal. While the receiving apparatus is maintained in operative condition at all times, the loud speaker winding is normally shunted for preventing reproduction of sound when the call box is closed.

The call box is provided with special forms of control switches, one of which I have designated as the citizens alarm switch  $S_2$  operative from the exterior of the call box and the master control switch  $S_1$  operative automatically upon the opening of the call box for conditioning the transmitter, the microphone circuit and the automatic modulation means. The citizens alarm switch comprises a suitable tumbler member which may be angularly displaced under control of a control member operative from the exterior of the case to close an electrical contactor against the tension of a spring. The contactor is normally held open by spring tension but upon angular displacement of the tumbler by operation of the control member from the exterior of the case the contactor constituting the citizens alarm switch  $S_2$  is closed, energizing the transmitter circuit and starting the automatic modulation system. The fact that the call box has been operated immediately results in the automatic transmission of repeat signals identifying the particular call box. This signal capable of being received by the central station (or by cruising police cars and other stations) immediately informs the cen-

tral station of conditions existing at the particular call box so that the central station is enabled to dispatch police to the calling location. As noted, any person can operate the alarm by operating the citizens alarm switch from the exterior of the call box. An authorized person carrying a key to the call box is enabled to open the call box and in doing so, the spring actuated master control switch  $S_1$  is automatically operated, closing the microphone circuit, insuring the completion of the voice input circuit to the transmitter and disconnecting the shunt path to the loud speaker winding of the receiver. It will be noted that the citizens alarm switch  $S_2$  is connected in parallel with the power circuit contacts of the master control switch  $S_1$  so that the transmitter may be conditioned for operation either from the exterior of the call box by operation of switch  $S_2$  or automatically conditioned upon opening of the call box by operation of switch  $S_1$ . If, for example, the citizens alarm switch  $S_2$  has not been actuated from the exterior of the call box, the transmitter is placed in operative condition upon opening the door of the call box.

Reference character 20 designates the public service or police or fire box having a door 21 and locking means 22 therefor. Within the box 20 there is contained a radio transmitter and receiver system. The transmitting apparatus includes a synchronous motor 23 which controls through a contact system an audio frequency tone generator such as a buzzer of 1000 cycle frequency shown at 44. The buzzer 44 and modulator 100 are rendered effective on the modulation circuit of the transmitter in accordance with prearranged code signals under control of a plurality of coded cams 24, 25, 26, rotatably driven by the shaft 27 of motor 23. The cams are made of metal such as brass and carry a plurality of insulated insets 28 at their outer periphery. A spring contactor 29 is slidably and adjustably mounted axially of the motor shaft and selectively engageable with a selected one of the cams 24, 25, and 26. The spring contactor 29 is operable from a position exteriorly of the panel 30 by means of control handle 31, said handle being provided on one side with a plurality of notches 32 for maintaining the spring contactor 29 in selected relation with a selected one of the coded cams 24, 25, 26.

The transmitter system includes a voice modulation circuit comprising transformer 33, microphone 34, and a source of potential such as rectifier 35, and the audio frequency modulator 44 is connectible in shunt with the microphone 34. The transformer 33 has the secondary winding thereof connected with the input of modulator tube 100. The output of the modulator tube 100 includes transformer 101 which connects to the power amplifier system 102 for controlling the transmission of high frequency signaling energy from the radiation circuit 103. The transmission circuit is energized from the high frequency oscillator circuit constituted at tube 104. The oscillator circuit is controlled by constant frequency by means of electric mechanical vibrator or piezo-electric crystal 105. The power supply circuits are energized from transformer 106 having a primary winding 107 connected with the power supply system for a plurality of secondary windings indicated at 108, 109, 110. Secondary winding 108 supplies plate potential for the full wave rectifier 111. Secondary winding 109 supplies cathode heating po-

tential for the full wave rectifier 111. Secondary winding 110 supplies cathode heating potential for all of the tubes of the transmitter. The full wave rectifier 111 delivers rectified current to the filter circuit 112 across which potentiometer 114 is connected and from which suitable potentials are supplied for the plate circuit of the several tubes of the transmitter.

Operable from without the box 20 is the citizens control switch indicated at S<sub>2</sub>. The switch S<sub>2</sub> comprises a shaft 38 extending outwardly through the opening 39 disposed in the door 21. A handle 40 is arranged on the outer end of the shaft 38. The inner end of the shaft 38 projects through the panel 30 and carries a cam 41. Cam 41 serves to actuate a contactor 42 against the tension of spring 43. The action of turning the handle 40, closes the contactor 42 and automatically energizes the transmitter, and automatically starts the motor 23, thereby operating the transmitter for radiating a series of code signals under control of the coded cam 26. The operation of the switch S<sub>2</sub> does not connect the loud speaker 36 to the receiver circuit and therefore the voice channel is not closed by the citizen.

The circuits of the receiving system are energized from the same power supply system which supplies energy to the transmission system. The receiving circuit comprises a connection to the antenna system which may be the reflector 87 shown more particularly in Figs. 4, 5 and 6 connected through series condenser 115 to inductance 116 which connects to the tuned input circuit of amplifier 117. The amplifier 117 delivers energy to the regenerative detector circuit 119 through suitable transformer 120. The output of detector circuit 119 connects through audio frequency transformer 121 to the input of the first stage of audio frequency amplification designated at 122. A second stage of audio frequency amplification may be employed as indicated at 123. The output circuit of the second stage of audio frequency amplification connects through output transformer 124 to the winding 125 of the loud speaker 36 so that the winding 125 is normally energized continuously by the receiving system except that it is rendered ineffective by reason of the shunt circuit effected by contacts 54 and 55 of the master control door switch S<sub>1</sub>. The output circuit of the last stage of audio frequency amplification indicated at 123 contains the winding of control relay 45 having contacts 126 which connect with the call light 37. Thereby, the call light is illuminated from energy supplied from power supply circuit 127 when the signal is incident upon the receiving circuit.

The master control switch S<sub>1</sub> comprises a supporting frame 46 which serves to mount a tubular member 47. Frame 46 carries an insulated grommet or bushing 48 through which tubular member 47 is adapted to move. The numeral 49 designates a resilient plug adapted to fit into and project slightly beyond the outer end of the tubular member 27 and engageable by the door 21 of the box. Pin member 50 is fixed at its rear end 51 to the back of the box 20 and extends into the hollow tubular member 47. Insulated plate member 52 is carried by pin member 50 and serves to support contacts on both the rear and front thereof as shown. A spring 53 is interposed between plate member 52 and the back of the box 20. The plug 49 ordinarily projects slightly beyond the inner surface of the

door 21, so that when the door is closed the tubular member 47 and consequently the plate 52 is rearwardly displaced against the tension of the spring 53. This action closes a pair of contacts 54 and 55. The contact 54 is carried by the plate member 52 and the contact 55 is insulatingly supported from the rear of the box 20. Contacts 54 and 55 are connected in parallel with the winding of loud speaker 36 and consequently maintains the same shunted and inoperative when the door 21 is closed. The numbers 56 and 57 designate dual contacts arranged between the frame 46 and the plate member 52. When the door 21 is closed and the plate member 52 retracted against the tension of spring 50 the dual contacts 56 and 57 are broken. The contact 57 and the coacting contact carried by plate member 52 are connected in shunt with the citizens' switch S<sub>2</sub>. The contact 56 and its associated contact on plate member 52 are connected in series with the voice modulation circuit containing the primary winding of transformer 33. When the door 21 is opened the contacts 56 and 57 and their coacting contacts on plate member 52 are closed by the action of the spring 53 closing the microphone circuit and insuring the completion of the voice input circuit to the transmitter. The contact 54 and its coacting contact 55 are broken, disconnecting the shunt path to the loud speaker 36.

The numeral 58 designates the position of the microphone in the transmitting panel. The microphone is surrounded and protected by a suitable guard 59.

The numeral 60 designates the loud speaker opening in the receiving panel, said opening being protected acoustically from the microphone by the semi-circular guard 61. The purposes of the guards 59 and 61 are twofold, to protect the instrumentalities from the weather, and to reduce tendency of feedback from the loud speaker into the microphone.

Referring to Figs. 4, 5 and 6, the numeral 62 designates a pedestal projecting above the box 20 and carrying at its top a cylindrical glass prism 63 which encloses a suitable call light or lighting means contained within the prism 63. Above the prism 63 there is a circular cap 64 carrying a clamp 65, the clamp 65 being adjustable in selected angular position throughout a range of 360° by means of screw device 66. Firmly connected to the clamp 65, I provide a tubular antenna arm 67 forming a frame for mounting the antenna structure. The screw 66 permits the entire frame carrying the tubular antenna arm to be selectively adjusted in position. The ends of the arm 67 are provided with taper threads 68 and slots 69 therein, permitting the nuts 70 to grip very tightly for securing the extension members 71 and 85 in selected positions. The extension member 71 has its one end 72 fitting into arm 67 and its other end 73 bent at substantially right angles with respect to the end 72. Projecting upwardly from the end 73 of the extension 71 and protected therefrom by insulating grommet or bushing 75 there is a transmitting antenna 74. The grommet or bushing 75 serves as an insulated support for the antenna 74. The antenna 74 is held firmly in place by virtue of pressure exerted upon the mounting means 75 by the screw 76 through the grommet or bushing 75.

The numeral 77 designates a conduit having its outer end 78 fitting into the end 72 of the tubular extension 71. The conduit 77 passes

through but is spaced away from the inner walls of arm 67 and emerges from the arm through opening 79 and projects downwardly through the prism 63. An electrical connection 81 passes through conduit 77 and tubular extension 71 and connects with antenna 74 as shown. Arranged on the downwardly projecting end of the tube 71, I provide a plug member 80 with connecting stud 82 projecting therefrom. A detachable connection is provided for interconnecting plug member 80 with a socket member 83 as shown. A connecting wire 84 extends from socket member 83 through a suitable conduit to the transmitter in the call box.

Arranged in the end of the arm 67 opposite that end containing the transmitting antenna there is another extension tube designated at 85. Extension tube 85 is disposed in a substantially horizontal plane in alignment with extension 71. Extension tube 85 is provided at its extremity with an upwardly extending end 86 carrying a parasitic or power fed reflector 87, said reflector being separated from said extension tube 85 by means of insulating grommet or bushing 88. The insulating grommet or bushing 88 is held firmly in place by means of pressure exerted by set screw 89 upon grommet 88. The reflector is shown at 87 in parallel alignment with the antenna 74. The reflector 87 is connected through a cable 128 which may extend in a conduit similar to conduit 77 through arm 67 and through the call light housing to the equipment within the call box 20. For purposes of explaining my invention, I have merely indicated the connecting cable 128 in Fig. 6. It will be understood that cable 128 is well insulated from the structure of the pedestal mounting and that a detachable coupling similar to the coupling 80, 83, heretofore described, may be employed in establishing connection with the equipment within box 20. It will be understood that the coupling indicated generally as pin and socket connections 80 and 83 are well insulated from the structure of pedestal support and maintain a high degree of electrical efficiency, allowing the use of reflector 87 as a receiving antenna if desired independently of its use in coaction with the directive antenna 74 during transmission. Because of the wide range of adjustability of the antenna 74 and reflector 87 and the adjustability provided by angularly shiftable support 65 with respect to the pedestal mounting, a high degree of precision in the directive transmission and receiving characteristics of the antenna and reflector system is insured. This makes it possible to adjust and set each of the antenna-reflector combinations on each of the public service boxes with respect to the central station with which the public service box coacts. The numeral 90 designates generally the location of battery housings for low voltage direct current operated boxes.

The antenna 74 and reflector system 87 are so constructed that simultaneous operation of both the radio transmitter and receiver may be effected where the receiver utilizes the reflector as the receiving antenna provided that the receiver is tuned to a different frequency than that at which the transmitter operates. To permit such simultaneous operation, I tune the receiving circuit 87—115—116 so connected to reflector 87 that it does not respond to the emitted frequency of the transmitting circuit 103—118 connected to antenna 74.

Another form of my invention which I find extremely satisfactory on frequencies above 100

megacycles is shown in Fig. 14. In this feedback oscillator type of circuit inductance coil 91 supplies current to the grids 1g of the main oscillator circuit. The ballast resistor 92 and bias resistor 93 are connected in series to the heater type cathode 1c and to a midpoint in inductance coil 91 which completes the oscillator circuit. The plates 1p of the oscillator tube have a pair of parallel busses 94 and 95 connected therewith. The busses are spaced approximately 1 to 2 inches apart for best results. Transversely across the ends of the busses 94 and 95, I provide an adjustable short-circuiting bar 96 to which radio frequency choke 97 is connected. The modulation circuit for the modified form of my invention illustrated in Fig. 14 is similar to the modulation circuit employed in the system illustrated in Fig. 1. That is, microphone 34 connects through microphone transformer 33 to the input of the modulated tube 100, the output of which connects through transformer 101 to the control circuit of the high frequency oscillator system.

The "Radio-Box" design permits the employment of frequencies assigned to General Experimental, Police, Fire, Forestry and Other Public Services by the Federal Communications Commission. Among these frequencies were the ones chosen for the initial tests between one hundred and twenty-eight and one hundred and forty-five megacycles. The basic design of the "Box" permits its use at frequencies up to six hundred megacycles.

Some of the applications for which this device, in its fixed, mobile or portable forms, has been developed and which are embraced by my invention, are as follows:

- A. All public services such as:
  1. Fire signal boxes.
  2. Police signal boxes.
  3. Mobile fire and police equipment, including boats, trucks, aircraft, trailers, etc.
  4. Municipal, state and federal forestry fire control uses.
  5. Electric power, gas, oil, water, and communication service uses.
- B. All inter, intra-system traffic control and right of way applications.
- C. All marine uses such as ship to shore or ship to ship applications by individuals, private organizations or public services of any description.
- D. All aviation uses such as airport traffic control, dispatching, landing, clearing, or emergency applications.
- E. All uses of this system of directional rotatable antenna-reflector design when applied to any of the foregoing applications.

I have described my invention in certain of its preferred embodiments but I fully realize that modifications may be made and no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In a radio call box system, in combination, a box having a cover and locking means therefor, radio transmitting and receiving means within said box including a modulating system having an automatic keying circuit and a voice modulation circuit, said receiving means including a sound reproducer and signal light means, said light means being visible exteriorly of said box; switching means manually controllable

from the exterior of said box for rendering said automatic keying circuit effective in the modulating system, and a cover actuated switch having a set of contacts operative with the cover closed for maintaining said sound reproducer inoperative and said signal light means operative; said cover actuated switch having dual sets of contacts operative with the cover open, one set of said contacts being connected in shunt with the aforesaid switching means, and the other set of said contacts being connected in said voice modulation circuit.

2. In a radio call box system, in combination, a box having a cover, radio transmitting and receiving means within said box, said transmitting means including a modulating system having an automatic keying circuit and a voice modulation circuit, said receiving means including a sound reproducer and signal light means, said light means being visible exteriorly of said box, means operative with said box closed for maintaining said modulating system and said sound reproducer inoperative, and switching means operable from the exterior of said box for operating said keying circuit in the modulating system independently of the last said means.

3. In a radio call box system, a call box comprising a casing having a hinged cover member, radio transmitting apparatus and receiving apparatus including a sound reproducer mounted within said casing and having control means operatively connected with said cover member, said radio receiving apparatus being maintained normally in energized condition and having signal means cooperative therewith, and said transmitting apparatus being maintained normally in deenergized condition, with said cover member in closed position, said control means being operated upon the opening of said hinged cover member for conditioning said transmitting apparatus for the transmission of signaling energy and said sound reproducer for the translation of signaling energy received by said receiving apparatus.

4. A radio call box system comprising in combination, a call box including a casing having a cover member hinged with respect thereto, radio transmitting and receiving apparatus mounted within said call box, the transmitting apparatus including a voice modulation circuit and a telegraphic control circuit, said receiving apparatus including a sound reproducing circuit, means actuated by said hinged cover member when in closed position for rendering said modulation circuit and said sound reproducing apparatus inoperative, said telegraphic control circuit being operable independently of said modulation circuit, and means actuated upon the opening of said hinged cover member with respect to said casing for rendering said sound reproducing apparatus operative and said modulation circuit operative in conjunction with said control circuit for controlling said transmitting apparatus.

5. A radio call box comprising a call box including a casing and a closure member therefor, radio receiving and transmitting apparatus mounted with said casing, a sound reproducer connected with said radio receiving apparatus, said radio transmitting apparatus including a modulation circuit and a keying circuit, means within said casing actuated by the closure member when in closed position for maintaining said sound reproducing apparatus and said transmitting apparatus inoperative, means operative exteriorly of said casing when said closure member is in closed position for energizing said trans-

mitting apparatus and operating said keying circuit, and means operative upon the opening of said closure member with respect to said casing for rendering said sound reproducing apparatus operative and said modulation circuit operative for controlling said transmitting apparatus.

6. A call box system comprising a call box including a casing and a hinged cover member therefor, a radio transmitter and a radio receiver mounted within said casing, sound reproducing apparatus connected with said radio receiver, means for normally energizing said radio receiver, a modulation circuit and a keying circuit for controlling said radio transmitter, separate circuit controllers, one of said circuit controllers being operative from the exterior of said casing when said cover member is in closed position, and the other of said circuit controllers being operative interiorly of said casing by said cover member in open and closed position, means operated by the last said circuit controller with said cover member in closed position for maintaining said sound reproducing apparatus inoperative, means controlled by the circuit controller which is operative from the exterior of said casing when said cover member is in closed position for energizing said transmitter and actuating said keying circuit thereof, and means controlled by the circuit controller interiorly of said casing when the hinged cover thereof is open for rendering said sound reproducing apparatus operative and said modulation circuit operative in conjunction with said keying circuit.

7. In a radio call box system, a call box including a casing and a cover member movable to either a closed or open position with respect to said casing, signal receiving apparatus mounted within said casing and including a signal receiving circuit, a sound reproducer, and a visual signal control circuit within said casing, visual means mounted exteriorly of said casing and controlled by said visual signal control circuit, a circuit controller mounted interiorly of said casing and operative under control of the movement of said cover member for rendering said sound reproducer inoperative when said cover member is closed while maintaining said signal receiving circuit energized and said visual signal control circuit responsive to signaling energy incident upon said signal receiving circuit for actuating said visual signal exteriorly of said casing.

8. In a call box system, a casing, a cover member for said casing movable to either an open or closed position with respect thereto, a radio receiver mounted within said casing and including a signal receiving circuit, a sound reproducer, and a visual signal responsive circuit within said casing, means for continuously maintaining said signal receiving circuit in operative condition for the reception of signaling energy, means controlled by the position of said cover member when closed for normally maintaining said sound reproducer inoperative, and means operative by the opening of said cover member with respect to said casing for restoring said sound reproducer to operative condition with respect to said signal receiving circuit, said visual signal responsive circuit being maintained operative with respect to said signal receiving circuit independent of the movement of said cover member.

9. A radio call box system comprising a casing, a cover member adapted to be opened and closed with respect to said casing, radio transmitting apparatus arranged within said casing, said radio transmitting apparatus including a voice modu-

lation circuit and an automatic keying circuit, means controllable exteriorly of said casing when said cover member is closed with respect thereto for conditioning said radio transmitting apparatus and operating said automatic keying circuit, and means controlled by the opening of said cover member with respect to said casing for conditioning said radio transmitting apparatus and rendering said voice modulation circuit and said keying circuit operative with respect thereto.

10. A radio call box system comprising a casing, a cover member adapted to be opened and closed with respect to said casing, radio transmitting apparatus arranged within said casing, said radio transmitting apparatus including a modulation circuit and a keying circuit, means operative exteriorly of said casing when said cover member is closed with respect thereto for conditioning said radio transmitting apparatus and operating said keying circuit, and means controlled by the opening of said cover member with respect to said casing for simultaneously conditioning said radio transmitting apparatus and rendering both said keying circuit and said modulation circuit operative with respect to said radio transmitting apparatus.

11. A radio call box system comprising a call box including a casing, a cover member movable to either open or closed position with respect to said casing, radio transmitting apparatus mounted within said casing, a modulation circuit for said radio transmitting apparatus, a keying circuit for said radio transmitting apparatus, code means for actuating said keying circuit, a circuit controller operatively connected with said cover member, said cover member when in closed po-

sition operating said circuit controller to maintain said keying circuit inoperative with respect to said radio transmitting apparatus, while maintaining said modulation circuit also inoperative with respect thereto, and said circuit controller being operative upon the opening of said cover with respect to said casing for rendering both said modulation circuit and said keying circuit operative with respect to said radio transmitting apparatus.

12. A radio call box system comprising a call box including a casing, a cover member movable to either open or closed position with respect to said casing, radio transmitting apparatus mounted within said casing, a modulation circuit for said radio transmitting apparatus, a keying circuit for said radio transmitting apparatus, selective code means for actuating said keying circuit, a circuit controller operatively connected with said cover member, said cover member when in closed position operating said circuit controller to maintain said keying circuit inoperative with respect to said radio transmitting apparatus, while maintaining said modulation circuit also inoperative with respect thereto, and said circuit controller being operative upon the opening of said cover with respect to said casing for rendering both said modulation circuit and said keying circuit operative with respect to said radio transmitting apparatus, and a selector operative when said cover member is in open position with respect to said casing for selectively determining the particular code means by which said keying circuit controls said radio transmitting apparatus.

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