Jan. 8, 1935. G. B. BELLINGER 1,987,320

TELEPHONE AND CALL SYSTEM

Filed Oct. 10, 1932 2 Sheets-Sheet 1

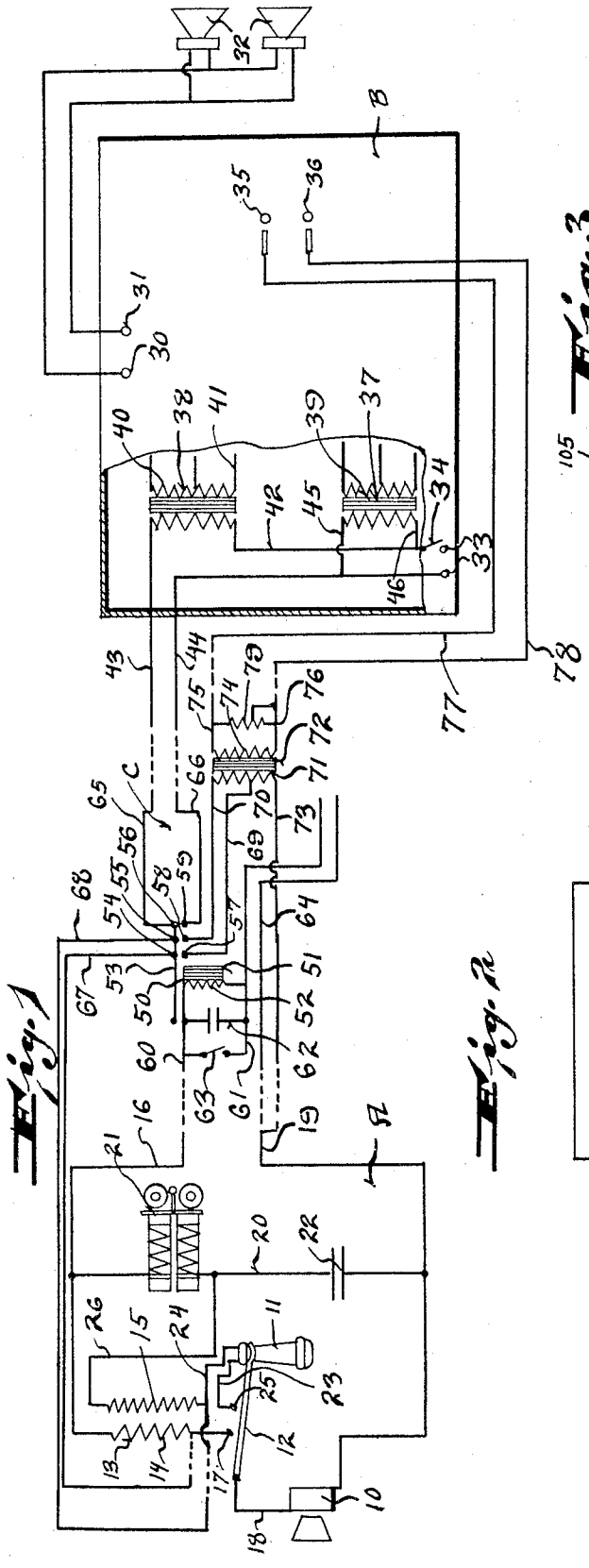


Fig. 1

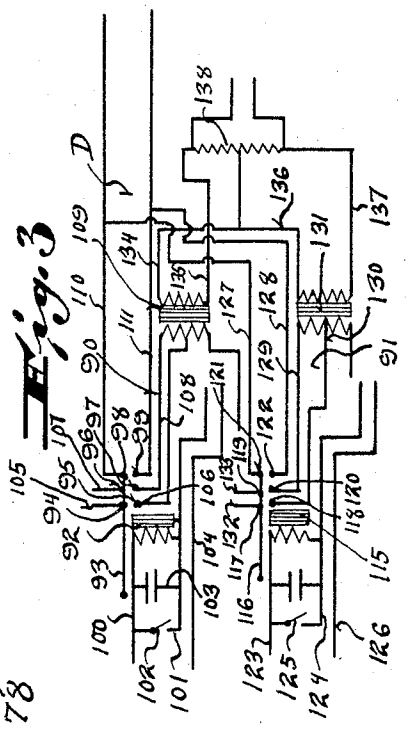


Fig. 3

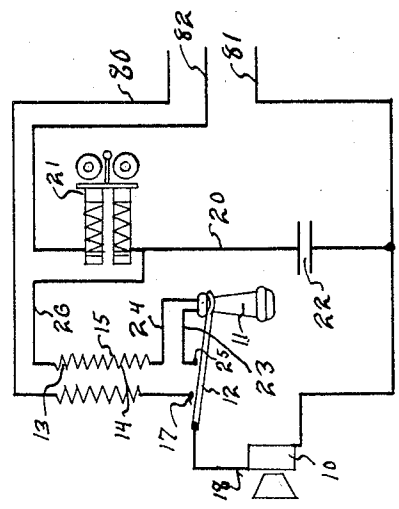


Fig. 2

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Jan. 8, 1935. G. B. BELLINGER 1,987,320

TELEPHONE AND CALL SYSTEM

Filed Oct. 10, 1932 2 Sheets-Sheet 2

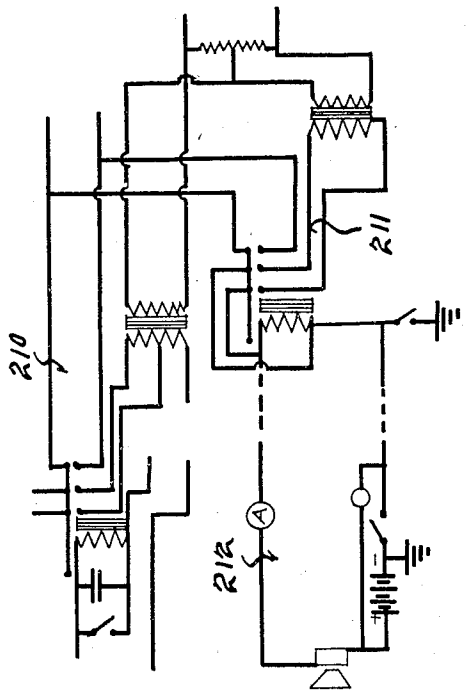


Fig. 6

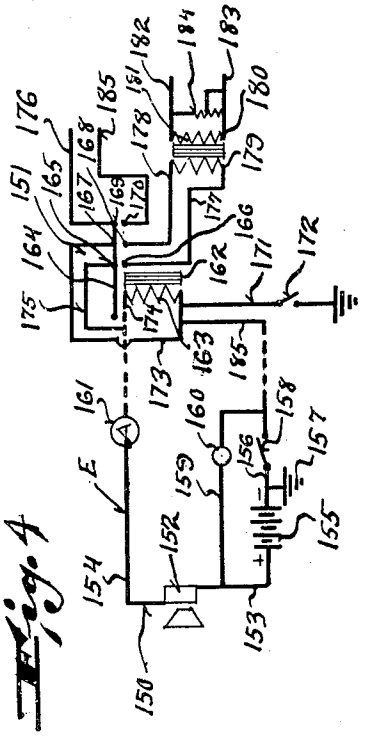


Fig. 4

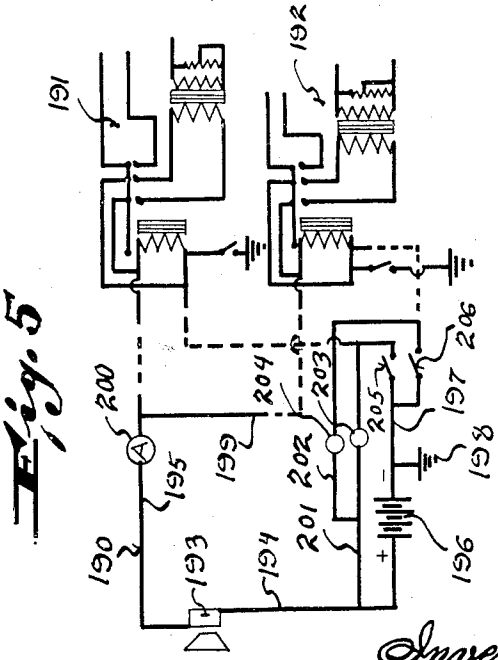


Fig. 5

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UNITED STATES PATENT OFFICE

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TELEPHONE AND CALL SYSTEM

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Application October 10, 1932, Serial No. 637,003

16 Claims. (Cl. 179—1)

This invention appertains to telephone and call systems which are susceptible for general useage (business offices, etc), but are particularly adaptable and desirable for use in fire and police stations and the like.

One of the primary objects of my invention is to provide an amplifying system for use in connection with an ordinary telephone, whereby upon the lifting of the receiver of the telephone off of the hook, the voice of the calling party as well as the voice of the answering party is broadcasted throughout the building or station, so that all of the men on duty will know the exact nature of the call and immediately be ready for any emergency.

Another object of my invention is to provide novel means for coupling and audio-frequency amplifier with a telephone so that the filaments of the tubes of the amplifying set will be burning at all times, whereby the set will immediately start functioning upon the lifting of the receiver of the telephone off of its hook.

A further object of my invention is to provide a voice amplifying call system embodying a transmitter adapted to be located in the office of a chief of a department coupled with amplifying sets located in substations or the like, whereby the specific directions of the chief spoken into the transmitter can be simultaneously given to all of the men in the substations.

A still further object of my invention is to provide novel means for coupling the voice amplifying call system with the ordinary telephone, whereby the incoming and outgoing voices can be amplified and broadcasted as well as the specific directions of the chief.

With these and other objects in view, the invention consists in the novel arrangement, construction, and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic view illustrating my invention applied to a conventional telephone of the two-wire subscribers' type and with an audio-frequency amplifying set.

Figure 2 is a diagrammatic view illustrating a three-wire subscribers' set which can be used with my invention.

Figure 3 is a diagrammatic view illustrating my invention apart from the telephone and amplifier and of a type adapted to be used with two telephones.

Figure 4 is a diagrammatic view illustrating my invention utilized with a call system and of a type adapted to be connected with a single amplifier set, the set not being illustrated in this figure.

Figure 5 is a view similar to Figure 4 illustrating my invention applied to a call system and adapted to be used in connection with two amplifying sets.

Figure 6 is a view similar to Figure 4 illustrating the use of my invention in connection with a subscribers' telephone and a voice call system.

Referring to the Figure 1 of the drawings, the subscribers' telephone set is indicated generally by the reference character A and the same is connected with an audio-frequency amplifier set B through the medium of my novel coupling set generally indicated by the reference character C.

The subscribers' telephone A embodies the usual carbon transmitter 10 and receiver 11 which normally holds the receiver hook 12 depressed against the tension of a coil spring or the like. The telephone induction coil 13 includes the usual primary and secondary windings 14 and 15 and as shown, one of the telephone wires 16 leads to one terminal of the primary coil 14, while the other terminal of the coil terminates in a contact 17. The hook 12 of the receiver is electrically connected with a wire 18 which leads to the transmitter 10 and the other terminal of the transmitter has electrically connected therewith the telephone wire 19. Ordinarily, these wires 16 and 19 would lead to the telephone exchange, but in my invention I connect the same with my coupling set C, as will be later set forth.

The wires 16 and 19 are bridged by a wire 20 which has interposed therein the telephone subscribers' ringing bells 21 and a condenser 22. Leading from the receiver 11 are wires 23 and 24. The wire 23 terminates in a contact 25, while the wire 24 is connected with one terminal of the secondary winding of the induction coil 13. The other terminal of this winding is connected by means of a wire 26 with the bridge wire 20 between the condensor 22 and the ringing bells 21. When the receiver 11 is lifted off of its hook, this hook will raise under the influence of its spring to bridge the contacts 17 and 25.

The audio-frequency amplifier set B is substantially of the ordinary or any preferred type and its output terminals 30 and 31 can be connected with one or more loud speakers 32. This set is provided with the usual terminals 33 for connection with the source of alternating current and a switch 34 can be provided for controlling the

flow of this current. Terminals 35 and 36 are also provided, which terminals are adapted to be connected with parts of my coupling set, as will be later set forth, and the terminal 35 leads to the grid of the first audio amplifier tube while the terminal 36 leads to the filament ground or cathode of the first audio amplifier tube. Only sufficient parts of the amplifying set B is illustrated to permit an understanding of the invention to be had, and, as shown, the amplifier embodies the filament transformer 37 and the plate transformer 38. The transformer 37 embodies a secondary coil 39, the wires from which lead to the filament (A. C.) of the amplifier tubes. The plate transformer 38 embodies a secondary coil 40, the wires 41 from which lead through the rectifier system to the plates and grids of the amplifier tubes. A wire 42 extends from one terminal of the primary coil of the plate transformer and leads to one terminal 33. The other terminal has connected therewith a wire 43 which leads out of the set. A second wire 44 leads into the set and it is connected with one of the terminals 33, and this wire is provided with a branch 45 which is connected to one terminal of the primary coil of the transformer 37. The other terminal of this coil is connected by means of a branch wire 46 with the wire 42. The wires 43 and 44 are connected with a part of my novel coupling set C, as will be later described.

My improved coupling set C comprises a relay or electromagnet 50 embodying a core 51 and a coil 52 this relay upon the energizing thereof is adapted to attract a pivoted armature 53 normally held in a raised position by the use of a suitable spring. The armature 53 carries contact points 54, 55 and 56 which are adapted to engage contacts 57, 58 and 59 when the armature is in its lowered position. Connected with the terminals of the coil 52 of the relay are the main wires 60 and 61.

A condenser 62 is connected between the wires 60 and 61 to by-pass the bell ringing current for the subscribers' telephone set A, as will be later set forth, and a switch 63 is utilized for connecting and disconnecting these wires 60 and 61 and is bridged across said relay coil rendering the relay inoperative or operative to render the amplifier set inoperative or operative without effecting the telephone. The wire 61 after it leaves the relay is extended to the telephone exchange and the other wire 64 leading from the telephone exchange is connected with the subscribers' set, as will be hereinafter more fully set forth.

Connected with the points 56 and 69 are wires 65 and 66 which are adapted to be connected with the wires 43 and 44 of the amplifying unit B; electrically connected with the contact points 54 and 55 are wires 67 and 68 which are adapted to be electrically connected with the lower ends of the primary and secondary windings 14 and 15, respectively, of the induction coil 13 of the subscribers' telephone set A. Leading from and electrically connected with the points 57 and 58 are wires 69 and 70. The wire 70 is electrically connected with one terminal of the primary coil 71 of the coupling transformer 72. The wire 69 is taped into this coil intermediate its ends as shown. A wire 73 can be connected with the lower terminal of the primary coil 71 and this wire can be extended to and electrically connected with the wire 19 of the subscribers' set. Connected with the opposite terminals of the secondary coil 74 of the coupling transformer 72 are wires 75 and 76 which are adapted to be connected with wires 77 and 78. These wires 77 and 78 can be connected by means of suitable jacks with the contacts 35 and 36 of the amplifying unit or set B and serve as means for impressing the voice on the amplifying unit. Extending across the wires 75 and 76 is a potentiometer volume control 79 which serves as means for regulating the tone and volume of the impressed voices.

In operation of my invention, the unit C is connected with the subscribers' telephone A and the amplifying unit B in the manner set forth and when the operator at the central telephone exchange rings the subscribers' set A, the current flows through the wires 61 and 64 through the condenser 62 to the telephone set when switch 63 is opened. This current does not operate the relay 50 in view of the fact that it is by-passed by a condenser 62 which by-passes the alternating current, so that the same flows through the ringing bells 21.

The answering operator at the department lifts the receiver 11 off of the hook 12, which allows the hook to come in contact and bridge the points 17 and 25. This closes the circuit and sets the telephone in operation and energizes the coil 52 of the relay 50. The energizing of the relay attracts the armature 53 which closes contacts 54 and 57; 55 and 58, and 56 and 59. The engagement of the contacts 56 and 59 allows the supplying of current to the plate transformer 38 of the amplifying unit B, as it can be seen that the incoming alternating current will flow through wire 42 to the primary coil of the plate transformer through wire 43, wire 65, contacts 56 and 59, wire 66 and back through wire 44. The circuit to the filament transformer 37 is normally closed, as it can be seen that the alternating current will normally flow through branch wire 46, the primary coil of the filament transformer 37, through wire 45, and thence back through wire 44. The closing of the contacts 54 and 57 and contacts 55 and 58 closes the circuit of the voice pick-up points at the induction coil of the telephone set by means of the wires 67 and 68 through the coupling transformer 72 of the coupling unit C. This is accomplished due to the connection of the wire 69 and 70 with the said coupling transformer. The transformer 72 is connected by means of the wires 77 and 78, as heretofore intimated, to the in-put of the first audio tube and the voice amplifies through the set B and into the loud speakers 32.

The switch 63 is used to short-circuit the relay 50 if repairs are needed to the coupling unit C. It makes parts (namely the relay and amplifier) of the system inoperative, but does not effect normal use of the telephone.

The device operates practically instantaneous because the filament transformer 37 is on all of the time and the relay 50 only operates the plate transformer 38. The keeping of the tube filaments burning constantly does not impair the life of the tubes to any great extent and makes the amplifier instant in operation when the relay 50 is energized, which closes the contacts 56 and 59 to the plate transformer 38.

This system can be used on either the two-wire or the three-wire subscribers' telephone sets without changes in the wiring of my coupling set C and the amplifying unit B. In Figure 1 I have shown a two-wire subscribers' telephone set and in Figure 2, I have illustrated a three-wire telephone set.

Referring to Figure 2, it will be noted that

the same embodies wires 80, 81 and 82. The wires 80 and 81 correspond to wires 16 and 19 of the telephone set A, and these wires 80 and 81 are adapted to be electrically connected with the wires 60 and 64 of my coupling unit C. The wire 82 is a ground wire and is connected with the ground in any suitable manner.

While I have only illustrated the use of one telephone in Figure 1, it is to be understood that two or more telephones can be used in conjunction with a single amplifying unit B.

In Figure 3 of the drawings, I have illustrated a slightly modified form of my coupling unit, which is adapted to be utilized with two independent subscribers' telephone stations. This modified form of coupling unit is generally indicated by the reference character D in Figure 3. In order to permit the use of two telephones, the coupling unit C is duplicated or doubled, as can be clearly seen by referring to Figure 3. Thus, the coupling unit D includes substantially independent coupling units 90 and 91. The coupling unit 90 embodies the relay 92 for attracting the armature 93 which is utilized for closing the pairs of contact points 94, 95; 96 and 97, and 98 and 99. Connected with the terminals of the coil of the relay 92 are wires 100 and 101 connected together through the medium of a switch 102. A by-pass condenser 103 is placed across the wires 100 and 101, as shown. The wire 101 leads to one of the telephone wire connections and a wire 104 leads to the other wire of the telephone connection. These wires 100 and 104 correspond to wires 60 and 64 of the coupling unit C and are adapted to be connected with the wires 16 and 19 of the telephone set A.

Contacts 94 and 95 have electrically connected therewith wires 105 and 106, while contacts 96 and 97 have electrically connected therewith wires 107 and 108. The wires 106 and 108 lead to the primary coil of a coupling transformer 109, while the wires 105 and 107 lead to the induction coil of the telephone set. The wires 105 and 107 correspond to wires 67 and 68 of the coupling unit C. Leading from the contacts 98 and 99 are wires 110 and 111 and these wires lead to the in-put terminals for the first audio tube of the amplifying unit B. The wires 110 and 111 lead to the amplifying unit and correspond to wires 65 and 66, of my coupling unit C and these wires 110 and 111 are connected to the wires 43 and 44 of the set B.

Referring now to the unit 91 of my double coupling unit D, the same embodies a relay 115 which is adapted to attract an armature 116. This armature when attracted by the relay is adapted to close the pairs of contacts 117 and 118; 119 and 120, and 121 and 122. Connected with the opposite terminals of the coil of the relay are wires 123 and 124. These wires can be connected together through the medium of a switch 125. A wire 126 is extended parallel with the wire 124 and these wires 124 and 126 are connected with the incoming telephone wires from the central exchange. The wires 123 and 126 correspond to wires 60 and 64 of my coupling unit C and are connected with the wires 16 and 19 of a separate telephone subscribers' set, it being understood that one telephone set is connected with the unit 90 and another telephone set connected with the unit 91. Connected with the contacts 121 and 122 are wires 127 and 128 which are electrically connected with the wires 110 and 111 of the unit 90 and thus, these four wires are connected together to the wires 43 and 44 of the amplifying unit.

Wires 129 and 130 are employed for connecting the primary coil of a coupling transformer 131 with the contacts 118 and 120. The corresponding points 117 and 119 for the contacts 118 and 120 have electrically connected therewith the pick-up wires 132 and 133 which lead to the induction coil of the subscribers' telephone set with which the unit 91 is connected. Leading from the terminals of the secondary coil of the coupling transformer 109 of the first unit are wires 134 and 135, and leading from the secondary coil of the coupling transformer 31 of the second unit 91 are wires 136 and 137. The wires 134 and 136 are electrically connected together, while the wires 135 and 137 lead out of the coupling unit D to the in-put for the first audio tube of the amplifying unit B.

A potentiometer volume control 138 is connected with the wires 135, 136 and 137 as shown. This coupling unit operates in the same manner as the coupling unit C and further description of this unit is believed unnecessary.

While my improved coupling unit is particularly advantageous for use in connection with a telephone, the same can be utilized with great benefits as a call or announcing system and in Figure 4 I have illustrated such an announcing or call system. This system permits a head of a department located at a point distant from a station or the like to give his desired directions to the men on duty in such substations. The amplifying unit with its loud speakers permits all of the men on duty to simultaneously hear the directions, and the system is so constructed that the same is under the control of the operator or head of the department at all times.

The voice call system is generally indicated by the reference character E and includes the operator's unit 150, the coupling unit 151, and the amplifying set (not shown in this figure). The coupling unit is substantially the same as the unit C illustrated in Figure 1 and the amplifying set used is identical with the amplifier B in said Figure 1.

The operator's unit 150 includes a carbon transmitter 152 having connected to its terminals wires 153 and 154. The wire 153 is connected with the plus terminal of a source of electrical energy such as a battery 155. The other terminal of the battery is provided with a wire 156 which can be grounded as at 157. The wire 156 is adapted to be extended beyond the operator's set and can have interposed therein a control switch 158 of any desired character. A bridge wire 159 is connected with wire 153 intermediate the battery 155 and the transmitter 152 and to the wire 156 beyond the switch 158. A signal lamp 160 is interposed in the length of the wire 159. An ammeter 161 is interposed in the wire 154 and this wire as well as the wire 156 is adapted to be extended beyond the unit 150.

The coupling unit 151 includes the relay 162 having a primary coil 163. The core of the relay is adapted to attract a pivoted armature 163 upon the energizing of the relay and this armature is adapted to close the pairs of contacts 165 and 166; 167 and 168, and 169 and 170. The light tension spring normally holds the armature spaced from the core of the relay. This coupling unit 151 as well as the amplifier set is adapted to be located within the sub-station with which the chief or other executive desires to communicate, and leading from one terminal of the coil of the relay is

a ground wire 171. A manually operable switch 172 is interposed in this wire for a purpose which will be later set forth. Connected with the mentioned terminal of the coil is a second wire 173 which is electrically connected with the contact 167. Electrically connected with the other terminal of the relay coil is a wire 174, and this wire 174 is connected by means of a branch wire 175 with contact 165. The contact 168 has electrically connected therewith a wire 176. Connected with the contacts 166 and 168 are wires 177 and 178 which are electrically connected with the terminals of a primary coil 179 of a coupling transformer 180. A secondary coil 181 of the transformer has electrically connected therewith wires 182 and 183 across which can be bridged a potentiometer volume control 184. Leading from the contact 170 is an outlet wire 185. The wires 176 and 185 correspond to wires 65 and 66 of the coupling unit C, and the same lead to the transformers of the amplifying set. The wires 182 and 183 correspond to wires 75 and 76 of the coupling unit C and lead to the voice input terminals of the amplifying set.

In the use of this voice call system, when the chief or other executive desires to give instructions to the sub-station or department, he closes the switch 158. This closes the circuit from negative of battery 155 to the relay coil 163, through ammeter 161 through the transmitter back to the plus side of the battery. The closing of the circuit through the relay coil 163 attracts the armature 164 resulting in the closing of the pairs of contacts 165 and 166; 167 and 168, and 169 and 170. The engagement of the contacts 169 and 170 closes the alternating current circuit contacts, thus supplying current to the plate transformer of the amplifier set. The engagement of the pairs of contacts 167 and 168, and 165 and 166 closes the circuit of the voice system pickup points from the transmitter to the coupling transformer 180, which is connected to the input of the first audio tube and the voice travels through the amplifier and into the loud speakers.

The closing of the switch 158 by the chief also lights the indicator lamp 160, which shows that the battery current is being applied to the circuit. Also, when the circuit is closed the ammeter 161 will register the normal current flowing through the system, the value of the current reading being determined by the resistance of the microphone or transmitter and other different parts of the circuit. If the ammeter shows excessive current there is a short circuit in the system, and if no current at all is registered there is an open circuit in the system or trouble in the line wires which lead from the chief's office to his department.

The chief keeps the switch 158 closed until he has finished his message, after which this switch is moved to its open position and the indicator light 160 is extinguished and the ammeter needle falls to its zero mark, indicating the system is dead. One of the men at the sub-station then contacts the switch 172, which indicates that the sub-station has received the call and that they know the nature of the message and are ready to carry out the instructions. When the switch 172 is closed the current will flow from battery 155 through wire 153; wire 159; indicator light 160, through wire 185; wire 171, through the current back to the battery.

While I have only shown the use of one amplifier set with the voice call system for one sub-station, it is obvious that a number of amplifying sets can be used for any number of sub-stations or departments.

In Figure 5 I have illustrated a pair of coupling units to be used with two amplifying sets located at different stations, and these two coupling units are electrically connected with a single operator's unit located at the office of the chief or other executive.

The operator's unit is generally indicated by the reference character 190 in Figure 5, and the coupling units are indicated respectively by the numerals 191 and 192. The amplifier sets for the coupling units have not been illustrated in this figure in view of the fact that these sets are identical with the set B shown in Figure 1 of the drawings.

The operator's unit 190 embodies the microphone or transmitter 193 having electrically connected to its terminals wires 194 and 195. The wire 194 is connected with the plus terminal of a battery 196, and the other terminal of this battery has electrically connected therewith a wire 197 which can be grounded by means of a bridge wire 198. The wire 195 is adapted to be led from the operator's unit to the coupling unit 191, and a branch wire 199 is connected with the wire 190 and is adapted to be led to the coupling unit 192. An ammeter 200 is interposed in the length of the wire 195. Connected with the wire 194 are wires 201 and 202, having indicator lights 203 and 204 interposed in the length thereof. These wires 201 and 202 are adapted to be connected through the medium of switches 205 and 206 to the negative wire 197 of the battery.

The wire 201 is adapted to be connected to the coupling unit 191, while the wire 202 is adapted to be connected with the coupling unit 192. These units 191 and 192 are the same as the coupling units previously described and a detailed description thereof is not deemed necessary in connection with this figure.

It is obvious however that when the switches 205 and 206 are closed by the chief that his voice will travel through both units 191 and 192 to independent amplifier sets.

It may be advantageous to permit the voice call system to be coupled to the telephone system illustrated in Figure 1 of the drawings, so that after the telephone conversation has been amplified the chief or other executive can give his department his specific instructions relative to the carrying out of the message received over the telephone. This voice call system and telephone system is illustrated in Figure 6 of the drawings, and as shown the same embodies a coupling unit 210 and a coupling unit 211. The coupling unit 210 is adapted to be connected with an ordinary type of subscriber's telephone set, as indicated by the reference character A in Figure 1, while the coupling unit 211 is adapted to be connected with an operator's voice call unit 212 which can be of the same type as the operator's unit 150, shown in Figure 4 of the drawings. The phone connections for the coupling unit 210 is identical with the phone connections for the coupling unit C, shown in Figure 1, and the connections for the coupling unit 211 with the operator's unit 212 is identical with that shown in Figure 4 of the drawings, and it is therefore believed that detailed description of this figure would be superfluous.

The different values, capacities, etc. of the various operating parts of the different systems have not been designated as obviously these values will change with the use of different current values.

The volume control illustrated in the different figures is used as follows:

In Figure 1, the volume control 79 is used across the secondary of the coupling transformer 72 to regulate the volume to the amplifier.

In Figure 3, it is used across the two secondaries of the two telephone coupling transformers 109 and 131 to regulate the volume of each telephone circuit so that the volume output of each telephone circuit will be the same to the input of the amplifier.

In Figure 4, it is used across the secondary of the coupling transformer 180 to regulate the volume to the amplifier.

In Figure 5, two volume controls are used to control the volume of the two outputs into two amplifiers in the two separate sub-stations.

In Figure 6, it is used across the secondary of the two coupling transformers of the sets 210 and 211 to regulate the volume of each circuit so that the volume output of each circuit will be the same to the input of the amplifier.

From the foregoing description it can be seen that I have provided a novel voice amplifying call system and telephone system which will be especially useful for police and fire stations.

Changes in details may be made without departing from the spirit or scope of this invention, but what I claim as new is:

1. In a voice amplifying device, a speaking set embodying a transmitter, an audio-frequency amplifier set, a coupling unit interposed between the speaking set and the amplifying set, said coupling unit including a relay and a coupling transformer, means upon the closing of the circuit through the transmitter for energizing said relay, means actuated by the closing of said relay for closing the in-put circuit and the voice pick-up points of the coupling transformer electrically with the energizing points of the energized coil of said relay, the in-put circuit of the coupling transformer being operated and connected in parallel with the coil of said relay, and means actuated by the closing of said relay for closing the circuit through the plate transformer of the amplifier set.

2. In a voice amplifying device, a telephone subscriber's set including a transmitter and a receiver, an audio-frequency amplifier set and a coupling unit, said amplifier set embodying a normally closed circuit for the filament transformer thereof, said coupling unit including a relay and a coupling transformer, means for closing the circuit through the relay upon the removal of the receiver of the telephone set from its hook, and means actuated by said relay for closing a circuit through the plate transformer of the amplifier set and for closing the circuit from the induction coils of the telephone set to the input of the amplifier set, said last mentioned circuit embodying the coupling transformer.

3. In a voice amplifying device, a telephone subscriber's set including a transmitter and a receiver, an audio-frequency amplifier set and a coupling unit, said amplifier set embodying a normally closed circuit for the filament transformer thereof, said coupling unit including a relay and a coupling transformer, means for closing the circuit through the relay upon the removal of the receiver of the telephone set from its hook, means actuated by said relay for closing a circuit through the plate transformer of the amplifier set and for closing the circuit from the induction coils of the telephone set to the input of the amplifier set, said last mentioned circuit embodying the coupling transformer, and a volume control bridged across the terminals of the secondary winding of said coupling transformer.

4. In a voice amplifying device, a telephone subscriber's set including a transmitter, a receiver and an induction coil, an audio-frequency amplifier set, and a coupling unit, said coupling unit embody a relay and a coupling transformer, the amplifier set embodying a normally closed circuit for the filament transformer thereof and a normally opened circuit for the plate transformer thereof, means for closing a circuit through the relay upon removal of the receiver from its hook, means closing the circuit through the plate transformer upon energizing of the relay, and means connecting the coupling transformer with the input of the amplifier set and with the induction coil of the telephone set upon energizing of said relay.

5. In a voice amplifying device, the combination with a telephone subscriber's set including a transmitter, a receiver and an induction coil, an announcer's set including a transmitter, an audio-frequency amplifier and coupling units for connecting the subscriber's telephone set and the announcer's set with the amplifier, each of said coupling units including a relay and a coupling transformer, said amplifier set embodying a normally closed circuit for the filament transformer thereof and a normally opened circuit for the plate transformer thereof, means for operating the relay of each coupling set upon the closing of the circuit through the telephone subscriber's set and the closing of a circuit through the transmitter of the announcer's set, and means operated by said relays for closing the circuit through the plate transformer of the amplifier and for closing a circuit through said coupling transformers from the input of the amplifier set and through the transmitter and receiver of the telephone set and the transmitter of the announcer's set.

6. In a voice amplifying device, the combination with an announcer's set including a transmitter, a pair of independent audio-frequency amplifiers and a coupling device for the amplifiers including independent coupling units, each of said units including a relay and a coupling transformer, the amplifier sets including a normally closed filament transformer and a normally open plate transformer, means for energizing the relays of the coupling units, upon the closing of a circuit to the transmitter, and means operated by said relays for closing the circuits through the plate transformers of the amplifier sets and for closing circuits including the coupling transformers to the input of the amplifier sets and the transmitter.

7. In a voice amplifying device, the combination with an announcer's set including a transmitter, a pair of independent audio-frequency amplifiers and a coupling device for the amplifiers including independent coupling units, each of said units including a relay and a coupling transformer, the amplifier sets including a normally closed filament transformer and a normally open plate transformer, means for energizing the relays of the coupling units, upon the closing of a circuit to the transmitter, means operated by said relays for closing the circuits through the plate transformers of the amplifier sets and for closing circuits including the coupling transformers to the input of the amplifier sets and the transmitter, and a signal light at the announcer's

set for indicating the operation of the announcer's set.

8. In a voice amplifying device, the combination with an announcer's set including a transmitter, a pair of independent audio-frequency amplifiers and a coupling device for the amplifiers including independent coupling units, each of said units including a relay and a coupling transformer, the amplifier sets including a normally closed filament transformer and a normally open plate transformer, means for energizing the relays of the coupling units upon the closing of a circuit to the transmitter, means operated by said relays for closing the circuits through the plate transformers of the amplifier sets and for closing circuits including the coupling transformers to the input of the amplifier sets and the transmitter, a signal light at the announcer's set for indicating the operation of the announcer's set, and means for operating the signal light in the announcer's set at a point distant from the announcer's set.

9. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said transmitter and receiver with said line circuit, an audio frequency amplifying device loud speakers connected to the output of said audio frequency amplifying device, switching means connected to the input of said amplifying device, and means controlled by the switching means for connecting the voice output circuit of the telephone substation transmitter and the voice input circuit of the telephone sub-station receiver to the input of said amplifying device.

10. In a device of the class described, a telephone substation system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said transmitter and receiver with said line circuit, an audio-frequency amplifying device, switching means connected to the input of said amplifying device, means controlled by the switching means for connecting the voice output circuit of the telephone substation transmitter and the voice input circuit of the telephone substation receiver to the input of said amplifying device, means for increasing the volume of speech of the calling and answering parties of the telephone substation when in operation by said amplifying device when energized by a source of current, and loud speakers for reproducing the amplified voices of the calling and answering parties of the telephone substation, said loud speakers being connected to the output of said amplifying device and actuated by said amplifying device when energized.

11. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, said audio frequency amplifying device having a tapped primary input forming two primary input circuits, switching means connected to the input of said amplifying device, means controlled by the switching means for connecting the voice output circuit of the telephone substation transmitter to one of said primary input circuits and the voice input circuit of the telephone sub-station receiver to the other of said primary input circuits of the amplifying device.

12. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said telephone transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, a volume control connected in the circuit of said audio frequency amplifying device, a relay having a coil connected in the line circuit, means for closing the telephone sub-station circuit through the relay coil when said switch hook connections are closed for energizing said relay, means actuated by the relay when the coil thereof is energized for connecting the telephone transmitter and receiver to the input of said audio amplifying device and for closing the plate circuit of said audio amplifying device, the switch hook connections when open breaking the circuit through the relay coil thereby disconnecting the telephone transmitter and receiver from the input of said audio frequency amplifying device and opening the plate circuit of the audio frequency amplifying device.

13. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said telephone transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, a volume control connected in the circuit of said audio frequency amplifying device, a relay having a coil connected in the line circuit, means for closing the telephone sub-station circuit through the relay coil when said switch hook connections are closed for energizing said relay, means actuated by the relay when energized for connecting the telephone transmitter and receiver to the input of said audio amplifying device and for closing the plate circuit of said audio amplifying device, a switch, and a condenser connected in parallel, and said condenser and switch being connected to the energizing points of the coil of the relay, means for opening the circuit by said switch, which is connected to the energizing points of the coil of the relay to allow current to flow through said relay coil to energize said relay upon the closing of the switch hook connections, means for closing the circuit by said switch to allow no current to flow through said relay coil to prevent the energizing of the relay upon the closing of the switch hook connections, the condenser by-passing the bell ringing current that is choked by the impedance of the coil of said relay.

14. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, a volume control connected in the circuit of said audio frequency amplifying device, a relay having a coil connected in the line circuit, line conductors connecting said telephone substation to a central telephone exchange having a source of current, means for closing the telephone sub-station circuit through the relay coil when said switch hook connections are closed for energizing said relay from the source of current at said central telephone exchange through the line conductors, and means actuated by said relay when energized for connecting the voice out-

put circuit of said telephone sub-station transmitter and the voice input circuit of said telephone substation receiver to the input of said audio frequency device, and means also actuated by said relay when energized for closing the plate circuit of said audio frequency amplifying device.

15. A device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connections of said telephone transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, a volume control connected in the circuit of said audio frequency amplifying device, a relay having a coil connected in the line circuit, means for closing the telephone sub-station circuit through the relay coil when said switch hook connections are closed for energizing said relay, means actuated by said relay when energized for connecting the telephone transmitter and receiver to the input of said audio amplifying device and for closing the plate circuit of said audio amplifying device to energize said audio frequency amplifying device, means actuated by said audio frequency amplifying device when energized to amplify the voice output of said telephone sub-station transmitter and the voice input of said telephone substation receiver, means for reproducing said telephone voices by said loud speakers actuated by said audio frequency amplifying device, and a volume control connected in the amplifier circuit to regulate the volume of voice amplification in the audio frequency amplifying device.

16. In a device of the class described, a telephone sub-station system including a transmitter, a receiver, a line circuit, a switch hook controlling the connection of said telephone transmitter and receiver with said line circuit, an audio frequency amplifying device, loud speakers connected to the output of said audio frequency amplifying device, said audio frequency amplifying device having a tapped primary input transformer forming two primary input circuits, a volume control connected in the circuit of said audio frequency amplifying device, a relay having a coil connected in the line circuit, means for closing the telephone sub-station circuit through the relay coil when said switch hook connections are closed for energizing said relay, and means actuated by said relay when energized for connecting the voice output circuit of said telephone transmitter to one of said primary input circuits and the voice input circuit of said telephone receiver to the other of said primary input circuits of the audio frequency amplifying device.

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