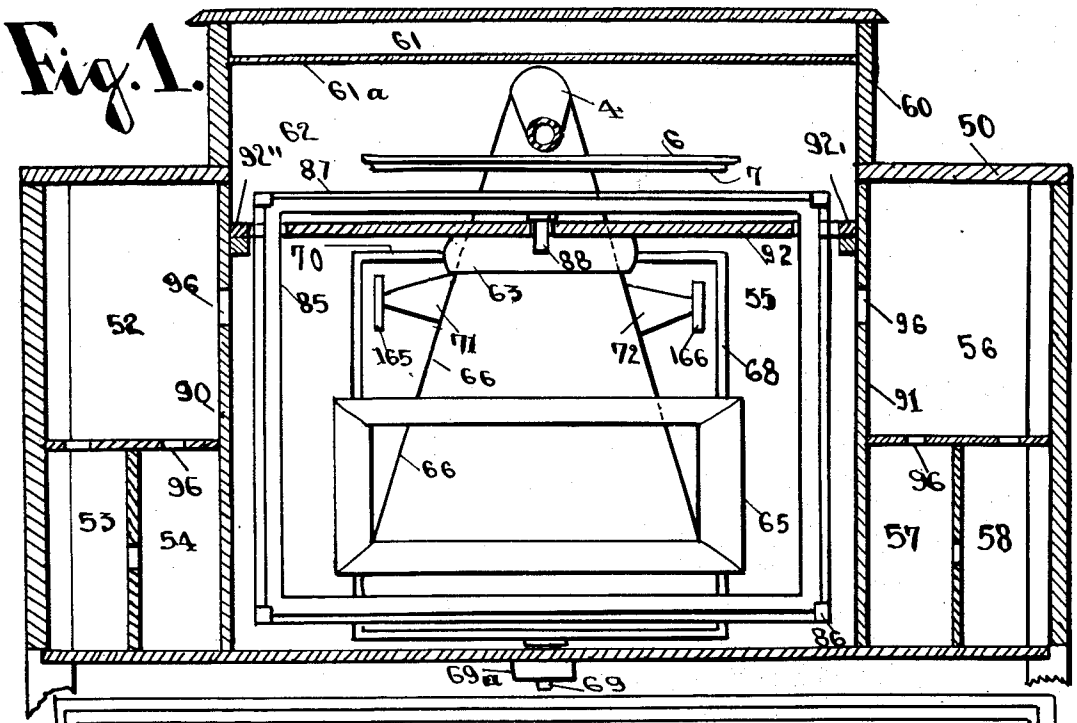
Aug. 1, 1933. J. B. BROWNING 1,920,628

COMBINED RADIO AND PHONOGRAPHIC RECORDING AND REPRODUCING SYSTEM

Original Filed June 26, 1922 3 Sheets-Sheet 1

Fig. 1.



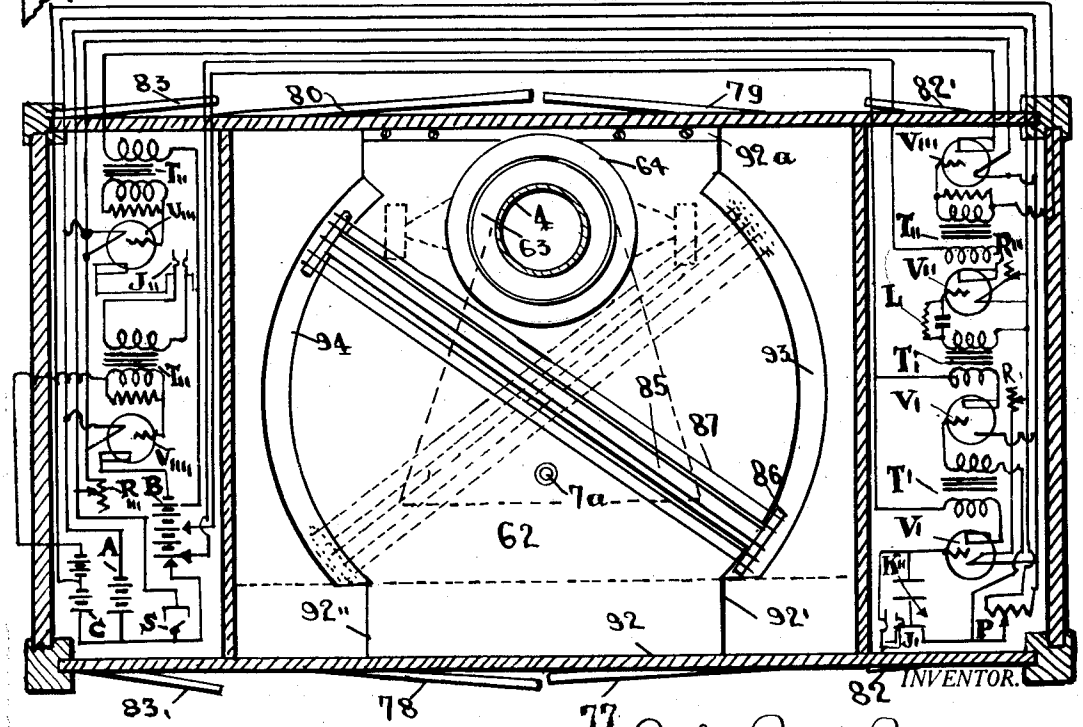


Fig. 2.

Aug. 1, 1933. J. B. BROWNING 1,920,628

COMBINED RADIO AND PHONOGRAPHIC RECORDING AND REPRODUCING SYSTEM

Original Filed June 26, 1922 3 Sheets-Sheet 2

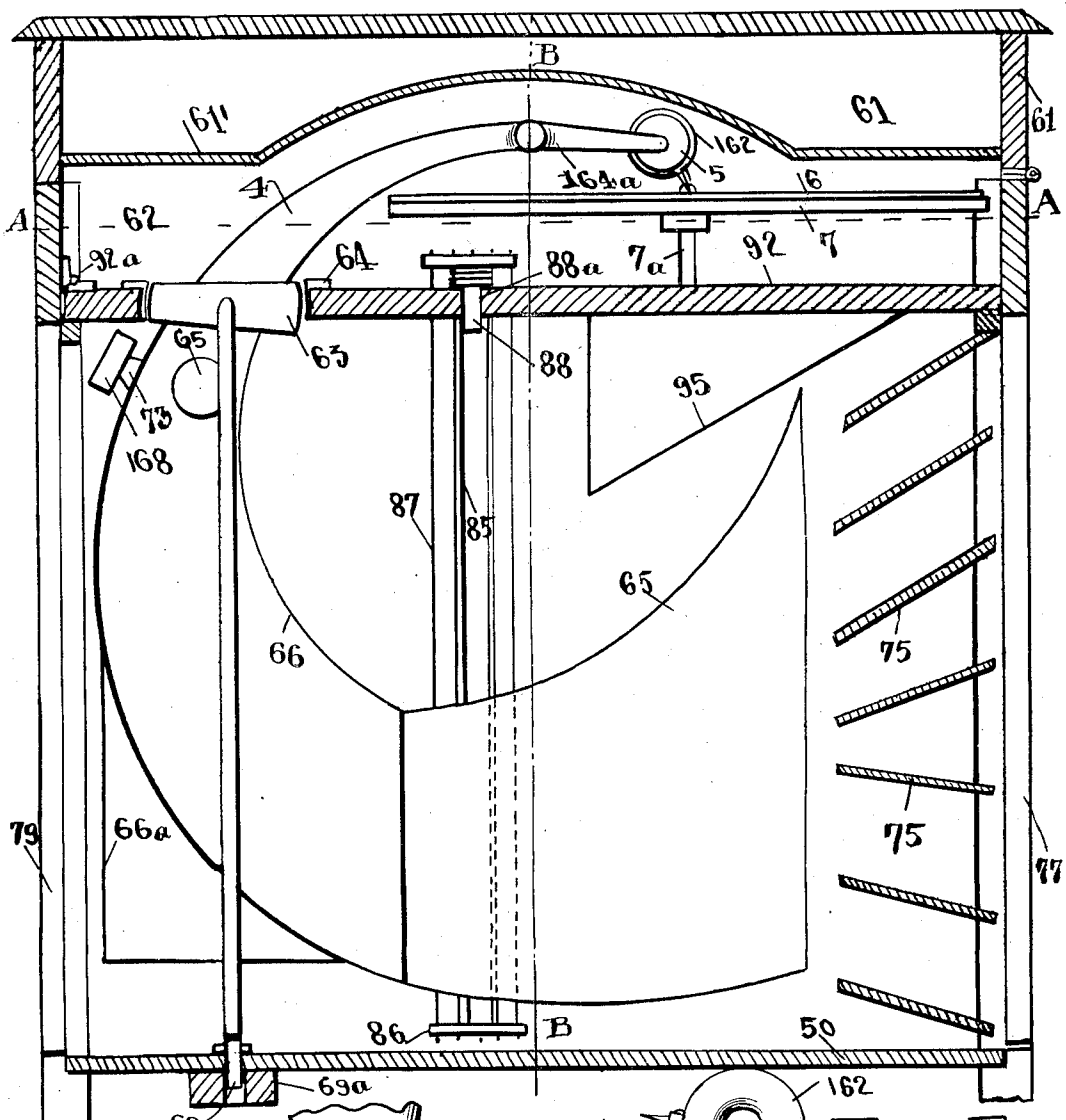


Fig. 3.

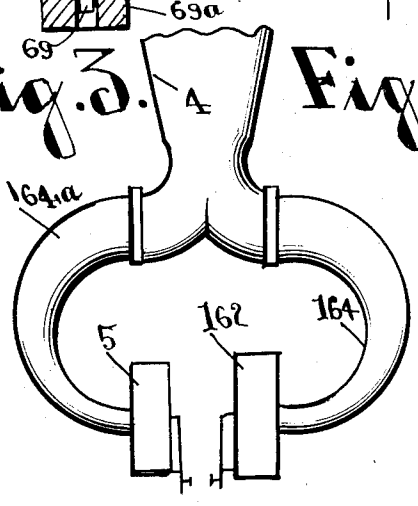


Fig. 4.

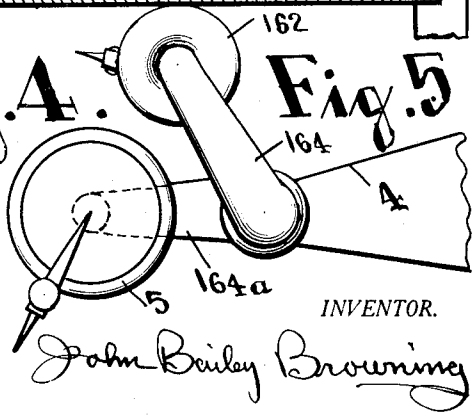


Fig. 5

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Aug. 1, 1933. J. B. BROWNING 1,920,628

COMBINED RADIO AND PHONOGRAPHIC RECORDING AND REPRODUCING SYSTEM

Original Filed June 26, 1922 3 Sheets-Sheet 3

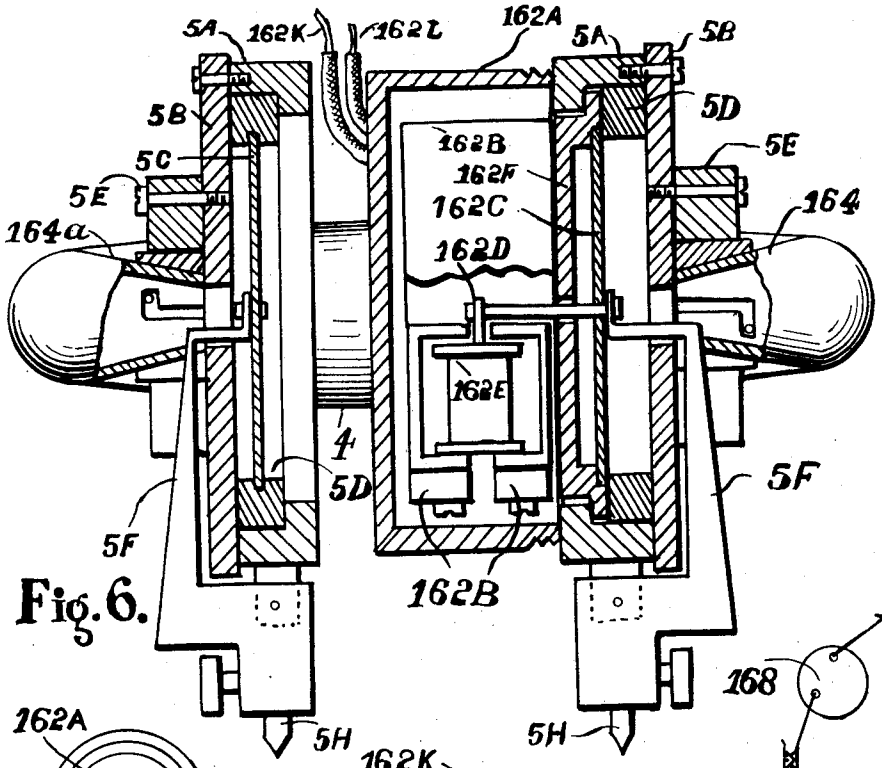


Fig. 6.

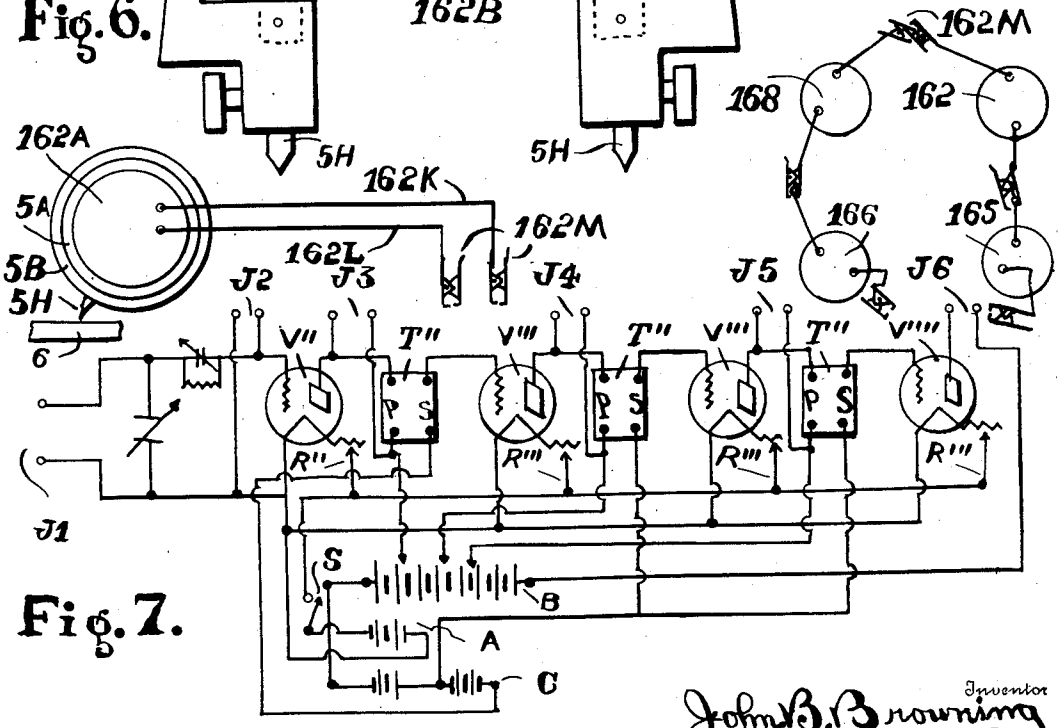


Fig. 7.

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UNITED STATES PATENT OFFICE

1,920,628

COMBINED RADIO AND PHONOGRAPHIC RECORDING AND REPRODUCING SYSTEM

John Bailey Browning, Camden, N. J.

Original application June 26, 1922, Serial No. 570,906, now Patent No. 1,743,706, dated January 14, 1930. Divided and this application February 18, 1927. Serial No. 169,306

9 Claims. (Cl. 179—100.11)

An object of this invention is to combine into a portable cabinet the most desirable reproducing characteristics of the best constructions known to the phonograph and radio arts.

Another object is to provide a radio-telephonograph having a cabinet with radio telephone receiving and transmitting circuits, sound recording and sound reproducing means, including a comparatively large sound amplifier of audible sound impulses therein; and to provide in such a machine sufficient space in any desired part within the cabinet to mount a radio antenna or pick up, in such a manner that it may be directionally positioned within the cabinet and with respect to the sound outlet or outlets of the cabinet movable either about parts of the apparatus or otherwise.

And further objects are to provide in such a machine an improved sound conduit having a continuously curving sound passage of continuously increasing cross section and mounting therefor; to provide a neat, convenient, compact portable cabinet within which are arranged the electric loud speaking receivers, loop antenna, radio set, electric transmitter, batteries to operate the set, transmitter and receivers or means to adapt the house electric circuit for the same purpose, all the wiring, and the elements of the phonograph and radio set requiring an operator, being conveniently positioned for operation without movement of the cabinet or any portion thereof.

A still further and important object is to provide an improved system in which a radio receiving set, a phonograph and a sound recording means are so combined into a unitary scheme whereby the system may be used in any one or more of the following ways:—

(*a*) As an ordinary radio receiving set,

(*b*) As a radio recording means,

(*c*) As an ordinary phonograph,

(*d*) As a phonograph in which certain parts of the radio receiving set, notably the amplifier and the batteries can be utilized for increasing the volume of the phonographic record reproducing means.

(*e*) To transmit ultra audio impulses and audible sound impulses simultaneously,

(*f*) To broadcast ultra-audio impulses while recording audible sound impulses simultaneously, and

(*g*) To phonographically record a radio reproduction on a record tablet while it is being listened to.

Further objects and details of the construction and mode of operation of the invention are hereinafter fully brought out in the following description, especially when read in conjunction with the accompanying drawings, in which

Figure 1 is a vertical sectional view of an illustrative embodiment of my invention taken along line 1—1 of Figure 3.

Figure 2 is a horizontal section taken along line 2—2 of Figure 3.

Figure 3 is a side view partly in section.

Figure 4 is an enlarged plan view of the double goose neck carrying the mechanical sound recorder or reproducer and the electrical receiver or transmitter.

Figure 5 is an enlarged side view of the same elements.

Figure 6 is a vertical section of the mechanical sound recorder or reproducer and the electrical receiver or transmitter, showing the details of construction.

Figure 7 is a diagrammatic representation of the electric amplifier and its connections.

Referring to the drawings, one embodiment of this invention is shown in the form of a console or table cabinet 50 which may be varied for other well known upright forms.

The cabinet is provided with a plurality of resonance chambers 52 and 56 positioned between the walls of the cabinet and the walls of the amplifier, each of which may be subdivided with smaller chambers 53, 54, 57 and 58, within which may be placed various elements of the machine and radio set without materially affecting the resonance of the cabinet. Between the two chambers 52 and 56 and beneath the cover 60 is provided a central chamber 55, which comprises the outer portion of the sound amplifying means not including the radio amplifiers of the set.

The inner amplifier includes a hollow vibratory portion 65, which is carried by a hollow non-vibratory connection 66, which communicates with a minor hollow tapered portion 4, a plurality of hollow tapered transversely extending portions 164 and 164*a* are carried by, communicating with and movable with respect to the portion 4, and a plurality of hollow extending tapered portions 71 and 72 are carried by and communicating with the nonvibratory connection 66, all of which including 4 and its connections, lead to the common outlet of 65.

4 and its connections are arranged to swing in both a vertical and lateral plane above the panel 92, turntable 7 and record 6, while 65 and its connections are arranged to swing in both

vertical and lateral planes below the panel, turntable and record.

A substantially heavy portion 66*a* is carried at the rear of 66 to counterbalance 4 and 66 with its connections.

The extending connections 164, 164*a*, 71, 72 and 73 are arranged to communicate with the transmitter 162, receivers or loud speakers 165, 166 and 168, either of which may be interchanged, the phonograph sound recorder or reproducer 5 is also interchangeable on either tube 164 or 164*a*.

The reproducer 5 and 162 illustrated in detail in Fig. 6 comprises a casing or cap 5A, back plate 5B, diaphragm 5C, gasket 5D and stylus bar 5F, all being of a well known form with the stylus bar 5F reversed in a well known manner.

The diaphragm 5C is removed from a similar reproducer 5 and the cap is also removed from a Baldwin loud speaker or telephone receiver unit of well known form, removing the outer casing 162A.

The magnet 162B of the Baldwin unit is passed through the ring or cap 5A, the diaphragm casing 162F of the unit resting against the lip of the cap 5A, after which the gasket 5D is replaced and the back 5B secured to the cap 5A and the stylus bar 5F is waxed or secured to the diaphragm 162C of the unit in a well known manner.

The element 5 is connected to the tube 164*a* and the element 162 is connected to the tube 164, both tubes being pivotally mounted on the tone arm 4 in a well known manner.

A stylus 5H is positioned in the bar 5F and positioned in cooperation with a record tablet 6 and sound is then reproduced mechanically from either element 5 or 162.

The leads 162K and 162L are provided with clips 162M and maybe clipped or switched to the terminals J2, J3, J4 or J5 of the input circuit of the electric amplifier illustrated in Fig. 7 and when so connected the element 162 cooperating with the loud speakers 165, 166 and 168 through the amplifier will reproduce signals of low frequency from a phonograph record electrically.

By switching the element 162 from the input to the output of the electric amplifier and connecting to J1 a tuned antenna circuit the element 162 will reproduce ultra audio signals from a distant station at audible frequencies.

By switching the element 162 back into antenna circuit in cooperation with a record 6, the element 162 with its connections will transform and transmit the phonograph record at ultra audio frequencies to a distant station after turning down the rheostats R'''.

By again switching the element 162 back into the output of the electric amplifier, turning up the rheostats R''', and bringing the stylus 5H in cooperation with a tablet the detected high frequency may be recorded phonographically in a well known manner.

If a Brandies or other well known radio telephone receivers are used in place of the Baldwin unit, the cap is unscrewed and the receiver unit strapped or secured to the element 5 and assembled as before described. It is obvious that a carbon transmitter button may be attached to the bar 5F as has been widely advertised.

It will be noted that 4 and 65 with their connections form a continuously curving tapering sound amplifier of continuously increasing cross section avoiding all sharp turns, thus giving all the efficiency of a large cumbersome straight horn. Not only is this arrangement of special advantage when used in connection with the phonograph, but also of great advantage when used in a cabinet in co-operation with the radio loud speaker.

Arranged across one end of the chamber 55 are a plurality of deflectors 75 which may be arranged to deflect the sound backward, upward or downward. Also arranged on opposite sides of the cabinet at the sound delivery openings of this chamber are double doors 77, 78 and 79, 80, which may be adjusted to modify the quality of the reproduction of sound at will on either side of the cabinet.

Doors 82, 82', 83 and 84 are also provided for the chambers 52 and 56 for the same purpose as the other doors.

The dividing walls 90 and 91 arranged between the chambers 52, 55 and 56 are semi-transparent or conductive to sound vibrations, each of which may be provided with sound openings 96 through which sound may pass into the adjacent chambers or sound passages and then into the atmosphere.

The panel or motor board 92 may be divided into a major portion 92 and minor portions 92' and 92'', the minor portions being easily removed while the major portion may be hinged at 92*a* or pivoted to the cabinet and removable in a manner well known in the talking machine art.

The radio antenna or pick up device of ultra-audio impluses shown in this modification, which may be varied, includes a square frame 85, with four cross pieces 86 one at each corner, around which is wound, the antenna wire 87, the desired number of turns. The frame is also provided with a pivot 88 which fits into a socket bearing 88*a* in the panel or motor board 92, permitting the antenna as a unit to swing freely through the openings 93 and 94, provided in the panel 92, around the motor compartment 95, sound amplifier 65 and on both sides of said panel.

The motor for the support shaft 7*a* is contained within the compartment 95 which may be arranged in any convenient position beneath the board 92 within the chamber 55.

The yoke 68 on which is mounted the portion 66 is provided with two lateral arms 70 which are provided with pivots at the end of each arm and which fit into bearings arranged in the ball portion 63 of 66 which permits vertical movement of 4 and 66, lateral movement being provided by the pivot 69 of 68, which fits into the pivot bearing 69*a*, the support being positioned in the chamber 55.

The ball portion 63 of 66 is arranged to work in a socket bearing 64 secured to the panel 92.

The cover 60 is hinged to the cabinet 50 movable to permit adjustment of the radio and phonograph apparatus carried by the panel.

The cover 60 is provided with a resonant chamber 61 formed by a partition 61*a* within which may be arranged a radio circuit including an antenna, all of which may be conveniently operated when the cover is raised.

Sound waves that are projected from the mechanical or electrical reproducer positioned in the chamber 62 formed by the cover 60 when closed will pass through the openings 93 and 94 into the chamber 55 where they will comingle with the sound delivered from 65.

The antenna may be removed as a unit by raising the cover and motor board 92 in a well

known manner, removing the turntable 7 and lifting the antenna through the top.

4 and 65 with their connections may be removed from the cabinet as a unit by disengaging the pivot 69 from 69*a* and passing the unit through the top or rear of the cabinet.

It is sometimes desirable and advantageous to use the phonograph and the radio set simultaneously as a single machine for the following reasons:

First, to transmit radio and audible sound impulses simultaneously from a sound record. The impulses are first produced by operative contact of the reproducer 5 with the record 6 and are discharged into the sound passages 164*a* and 164 to the transmitter 162, or the transmitter may be brought directly into contact with the record in a well known manner, where the impulses are transformed into electric impulses and pass through the radio circuit illustrated in this and the parent application, finally being broadcast as ultra-audio impulses to a distant station, while the audible sound impulses are being magnified through the sound amplifying passages of the machine and are delivered therefrom directly to listeners in the vicinity of the machine.

Second, to broadcast radio or ultra-audio impulses while recording audible sound impulses upon a record tablet, for future reproduction and possible broadcasting. The element for producing primary sound vibrations or the artists are positioned so as to phonographically record sound in a well known manner, the sound waves or audible sound impulses passing through the sound passages of the machine to the transmitter 162 where they are transformed into radio or ultra-audio impulses in a well known manner, and at the same time to reversely actuate a reproducer of any well known form, to record sound waves upon the record tablet for future reproduction and probable transmission at either or both audio or ultra-audio frequencies.

Third, to listen to and simultaneously record the audible sound waves upon a tablet 6. The doors of the cabinet are adjusted to permit the delivery of sound from the amplifier 65 or the chamber 55 and the reproducer or recorder 5 is arranged to record the audible sound waves delivered into the sound passages from the electro-magnetic reproducer 165, 166 or 168 upon a tablet 6 while sound is being delivered from 165, 166 or 168 directly to listeners in the vicinity of the machine, as above described. Since the element 162 has a diaphragm it may be used instead of element 5 as a recorder in this mode of operation.

Fourth, the co-operation of the electric amplifier and the phonograph to function simultaneously in co-operation with a record tablet. To co-operate the phonograph reproducer and the radio amplifier illustrated in Fig. 2, the reproduced 5, illustrated in Fig. 3, is first positioned to function with the record 6, the transmitter 162 being positioned on the tube 162, Fig. 4, which may be of any well known form provided with or without a stylus for direct contact with the tablet 6 in a well known manner, or the transmitter may be thrown back as illustrated in Fig. 5, and actuated by the vibrations produced by 5 passing through the tubes 164 and 164*a*. The transmitter 162, may be wired to a plug and cut into the jack J'', illustrated in Fig. 2, in place of the telephone receivers, it being understood that other jacks similar to J'' may be connected to the input circuit of either of the other audio transformer, T'', T'' or the detector V'' when it is desired to use the transmitter in a circuit of an electric amplifier. If jacks are not used then batter clips may be wired to the transmitter leads and clipped to the input terminals of the desired circuit in a well known manner.

While the foregoing description applies to the circuit illustrated in Fig. 2, it is understood that it may be applied to other radio or electric circuits if the use of such is desired, as this method is well known.

While three receivers 165, 166 and 168 are shown communicating with the conduit 66 any number of receivers each having different tonal characteristics or head phones may be connected in the circuit illustrated and one of the receivers 165 may be wired to the transmitter 162 in a separate circuit to permit listeners to hear the phonograph while others listen in with the head phones to radio signals at the same time from the same cabinet. In Fig. 7 the element 162 is shown hooked up as a loud speaker in series with the other loud speakers 165, 166 and 168, other series of any desired number may be hooked up in parallel and used to increase the volume as desired all using a common amplifier.

The element 5 of the unit 4, 161, 161*a*, 5 and 162 includes a diaphragm and stylus, the element 162 of the unit includes electric mechanism and a stylus, the diaphragm or the electric mechanism may be selectively operated for reproduction by manually moving either element 5 or 162 into or out of cooperation with the tablet 6.

Arranged within the cabinet in a manner not to interfere with its resonance is a radio telephone receiving circuit the diagram of which is shown in Fig. 2.

This hook up may be modified according to desire for either transmission or reception or substituted for any other well known receiving or transmitting circuit, either line or radio, and it may be built up of a number of separate units which may be arranged to meet the different requirements. The hookup may include a battery as a source of energy or be directly connected with the electric light circuit with the proper means contained within the cabinet to make it suitable for the purpose.

In this diagram there is only one adjustment required to tune the set to the proper wave length. This adjustment is accomplished by means of a variable condenser across the loop antenna and given a variation sufficient to tune in any of the radiophone broadcasting stations that may be heard.

An ordinary switch S controls the current of all the filaments of the vacuum tubes used in the radio amplifier, as well as the field of the loud talker, which may be of any well known type. Consequently, once the condenser has been adjusted to receive the transmission from a radio broadcasting station with maximum intensity, it is merely necessary to turn on the switch S when the station is broadcasting or transmitting, to bring in speech and the music that is being transmitted. This feature makes it a very easily operated radio set.

In the radio amplifier are incorporated two stages of radio frequency amplification, which may be increased if desired, and three stages of

audio frequency amplification so as to operate a loud talker with maximum efficiency. In this diagram J' represents a single circuit jack, for the connection of the loop aerial to the set which is made by means of a plug. J'' is a double circuit jack to cut in the second step of audio frequency if it is desired to use the transmitter 162 or to plug in a pair of head phones for long distance reception. K'' is a variable condenser shunting the loop aerial for the purpose of tuning the circuit to the proper wavelength, while L is the grid leak and K' the grid condenser the capacity of which depends upon the type of vacuum tube detector used; it is generally between .00025 and .0005 microfarad. T' represents the radio frequency transformers. V' represents the vacuum tubes of the radio frequency amplifier. V'' is the detector tube. V''' the amplifying tubes of any make and V'''' the 5 watt power tube upon the plate of which a very high voltage may be applied. R' and R'' are respectively the rheostats of the radio and audio amplifying tubes and R'' the detector tube. A represents the A battery which should be of sufficient size to supply all of the tubes and the field of the loud talker, for sufficient length of time without recharging. C and C' are the grid batteries used on the plates of the last three tubes. B is the B battery which for maximum efficiency should have a voltage of 200 to 300 volts with the taps for the detector, the radio amplifier and the two first audio amplifier tubes. The grid leaks shown across the secondary windings of the audio frequency transformers are necessary only if a high voltage is used. The radio frequency transformers may be of the iron core type and should be designed so as to cover the band of wave lengths it is desired to receive. If desired, they may be of the air type and tuned with variable condensers, and a potentiometer P should be used to keep the grids of the two tubes at their potential.

The loud speakers or ear phones are not shown in the diagram but should be connected between the plate of the last tube, and the positive of the "B" battery, the field coils being in parallel with the filaments of the tubes. The transmitter 162 is not shown in the diagram but may be connected in a circuit in any well known manner for either transmitting ultra audio signals from a record tablet. The loud speakers are shown mounted on the heavy non-vibrating portion 66*a* communicating with the passage which leads to 65 or 4. If it is desired, either of the loud speakers may be placed on the small tubes 164 or 164*a* and wired as desired.

A radio selection may be tuned in and the phonograph reproducer 5 arranged to reproduce a properly synchronized record.

The advantage of this is that if a dance program is being received from a distant station and it fades out, which it frequently does, the reproduction of the phonograph may be given sufficient volume from a similar record to continue the dancing and as the radio fades in with stronger volume, it will predominate over the phonograph until such a time as the distant station fades or becomes weaker when the phonograph will predominate.

The subject matter of this application has been carved out of a parent application Serial No. 570,906 filed June 26, 1922, now Patent No. 1,743,706, Jan. 14, 1930. Reference is also made to the following applications: Serial No. 23,569 filed April 16, 1925; Serial No. 170,794 filed Feb. 25, 1927; and Serial No. 309,793 filed Oct. 2, 1928; all of which have been carved out of the same parent case. Each one of these cases including the parent application contains claims covering one or more of the divisible features of my invention, the claims of the present application having been drafted with a view to cover both broadly and specifically a combined radio and phonographic recording and reproducing system.

What I claim is as follows:

1. An apparatus of the class described, comprising a radio receiving set, an electrical reproducer for phonograph records, an audio frequency amplifier, electric circuits connecting said amplifier with the aforesaid devices, a loud speaker electrically connected to the output of said amplifier, phonograph record recording means, and means operatively connecting said loud speaker and said recording means whereby sound produced by the loud speaker may be simultaneously heard and recorded.

2. An apparatus of the class described, comprising a radio receiving set, an electrical reproducer for phonograph records, an audio-frequency amplifier, electric circuits connecting said amplifier with the aforesaid devices, a loud speaker electrically connected to the output of said amplifier, phonographic record recording means, and accustical means connecting said loud-speaker and said recording means whereby sound produced by the loud-speaker may be simultaneously heard and recorded.

3. A device of the class described, comprising a radio receiving set, an electrical reproducer for phonograph records, an audio-frequency amplifier common to said reproducer and receiving set and switching mechanism for connecting said amplifier for operation with either, a cabinet in which said apparatus is mounted, an open sound chamber in said cabinet, a loud-speaker electrically connected to the output of said amplifier and mounted in said chamber whereby sound produced by the loud-speaker may be simultaneously heard and recorded.

4. An apparatus of the character described, comprising a radio receiving set, an electrical reproducer for phonograph records, an audio frequency amplifier common to said reproducer and receiving set, switch mechanism for connecting said amplifier for operation with either said reproducer or receiving set, a loud speaker connected to the output of said amplifier and phonograph record recording means mounted in position to be actuated by the sound waves produced by said loud speaker, whereby sound produced by said loud speaker may be simultaneously heard and recorded.

5. An apparatus of the character described, comprising a radio receiving set, an electrical reproducer for phonograph records, an audio frequency amplifier common to said reproducer and receiving set, a switch mechanism for connecting said amplifier for operation with either said reproducer or said receiving set, a loud speaker connected to the output of said amplifier, phonograph record recording means and acoustical means connecting said loud speaker and said recording means whereby sound produced by the loud speaker may be simultaneously heard and recorded.

6. In a combined radio and phonograph recording and reproducing system, a radio receiving set, a combined electrical phonograph re-

producing and recording device, an audio-frequency amplifier having both an input and an output circuit and means for connecting said receiving set or said device to said input circuit or said receiving set to said input circuit and said device to said output circuit.

7. In a combined radio and phonograph recording and reproducing system, a radio receiving set, a combined electrical phonograph reproducing and recording device, an audio-frequency amplifier and a loud speaker, said audio-frequency amplifier having an input and an output circuit and connections for connecting either said device or said loud speaker or both to said output or said receiving set and device to said input circuit.

8. An apparatus of the class described, comprising a radio receiving set, an audio frequency amplifier, electric connections between said receiving set and said amplifier, a loud speaker electrically connected to the output of said amplifier, phonographic recording means, and means operatively connecting said loud speaker and said recording means whereby sound produced by the loud speaker may be simultaneously heard and recorded.

9. An apparatus of the class described, comprising a radio receiving set, an audio frequency amplifier, electrical connections between said receiving set and said amplifier, a phonograph record recording means, and a loud speaker electrically connected to the output of said amplifier and acoustically connected to said recording means, whereby sound produced by the loud speaker may be simultaneously heard and recorded.

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