

A. R. CUNNIUS.
SOUND REPRODUCING MACHINE.
APPLICATION FILED MAR. 20, 1911.

1,054,395.

Patented Feb. 25, 1913.

3 SHEETS—SHEET 1.

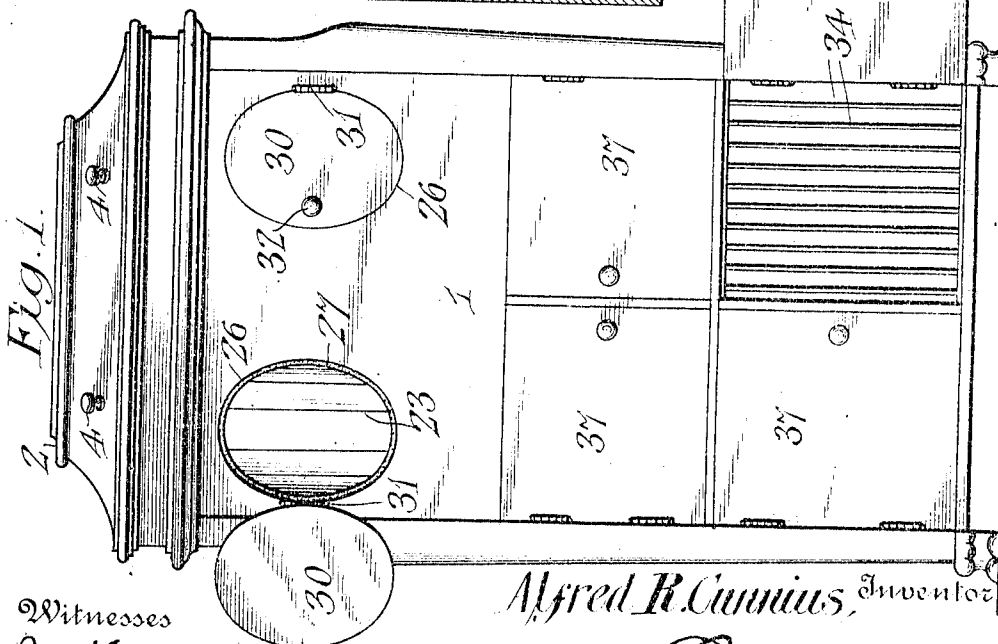


Fig. 1.

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Fig. 3.

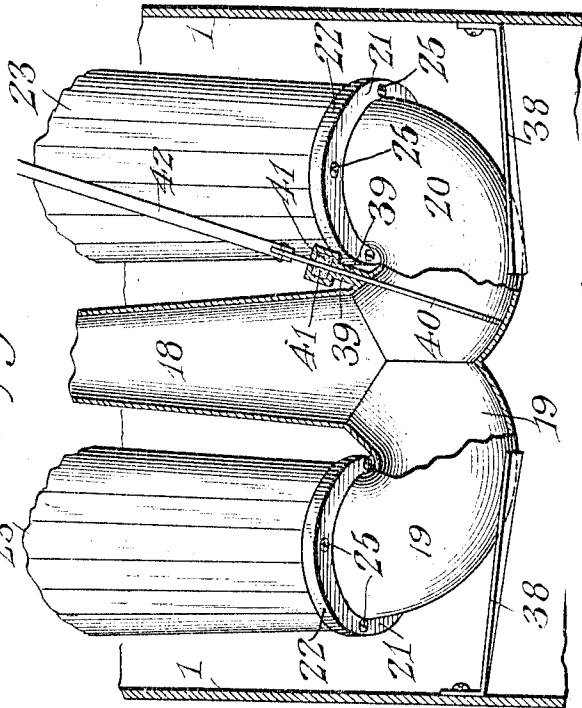
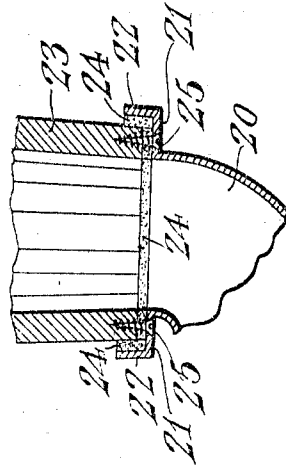


Fig. 4.



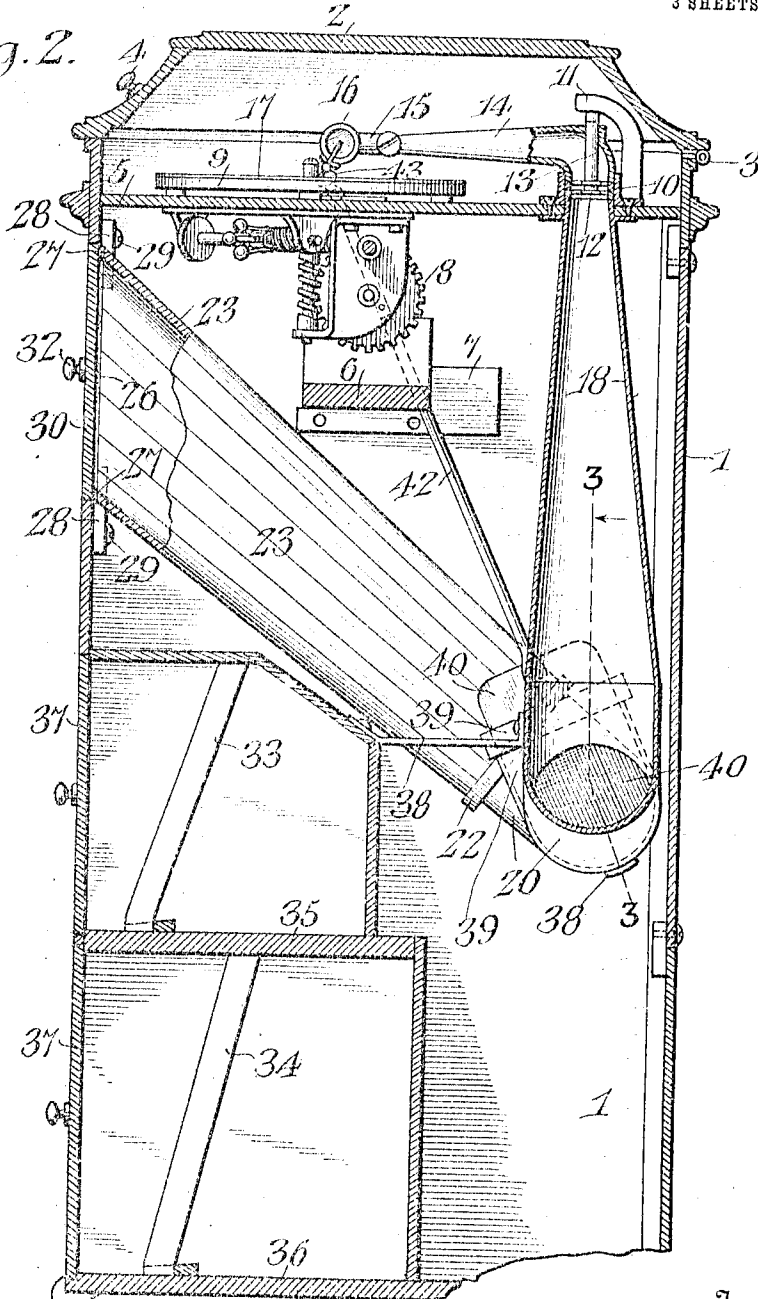
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3 SHEETS—SHEET 2.

Fig. 2.



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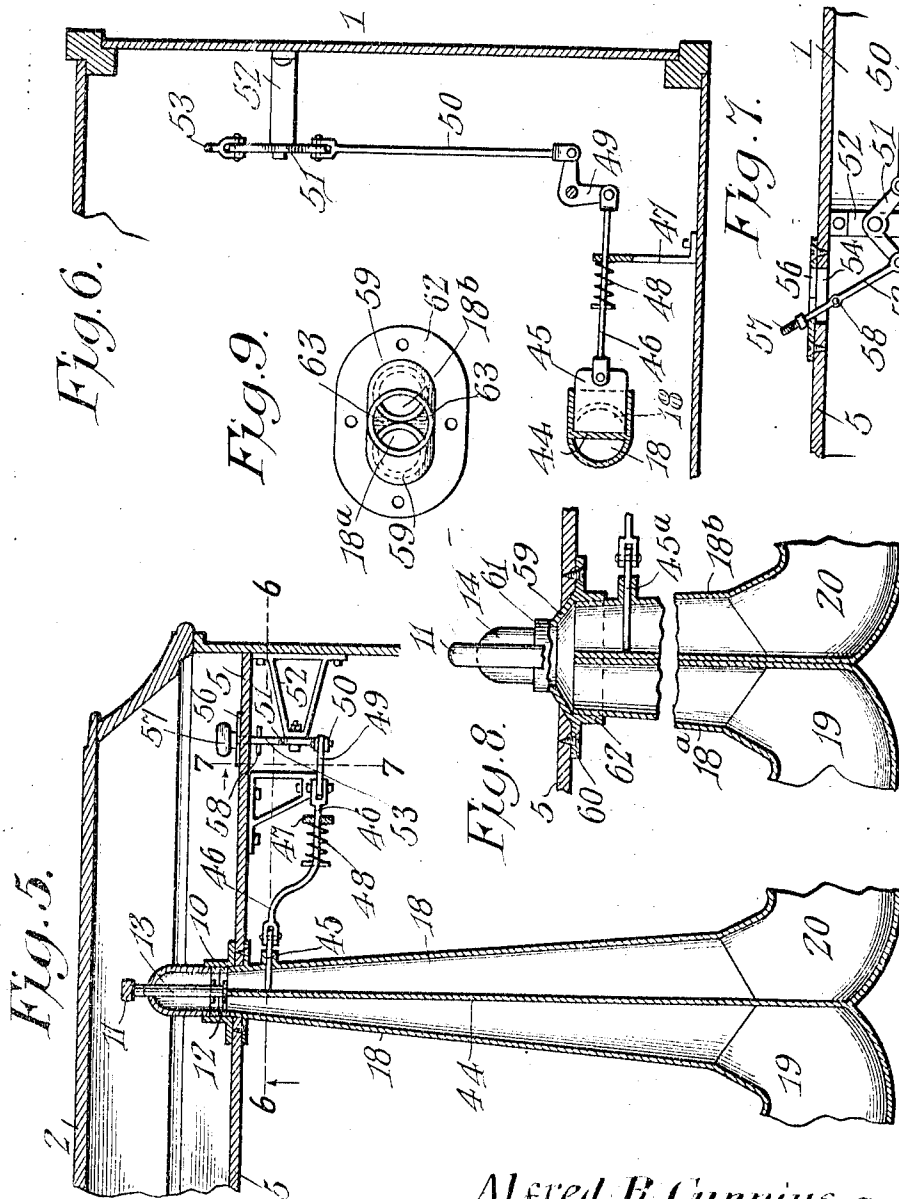
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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SOUND-REPRODUCING MACHINE.

1,854,395.

Specification of Letters Patent.

Patented Feb. 25, 1913.

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To all whom it may concern:

Be it known that I, ALFRED R. CUNNIUS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Sound-Reproducing Machine, of which the following is a specification.

This invention has reference to improvements in sound reproducing machines, and relates more particularly to the cabinet type of sound reproducing machines where the sound amplifier is carried beneath the motor mechanism and the large end of the amplifier terminates at the front of the cabinet.

The object of the present invention is to materially increase the volume of sound produced by such type of machine.

In sound reproducing machines of the cabinet type the motive mechanism and the turn-table for supporting the sound record, as well as the sound box and the taper arm, or as it is sometimes called the tone-arm, carrying said sound box all follow the usual construction found in sound-reproducing machines where the amplifying horn overhangs the turn-table, but the large end of the tone-arm is turned downwardly and connects with a sound conduit which in turn is coupled to the small end of a sound amplifying horn or conduit housed in the cabinet and projecting forwardly from the rear end of the cabinet to the front thereof where the large end of the amplifier terminates and is commonly closed in by doors, whereby the emitted sound may be modified at the will of the operator up to the full power of the machine. There is, however, a noticeable loss in volume as compared with the type of reproducing machines where the amplifying horn overhangs the tablet carrying table, but there are advantages in the cabinet type of sound reproducing machine in that the reproduced sound has a softness and naturalness not found in the other type mentioned, and which for convenience of description may be termed the horn type. Moreover, the cabinet type of machine is provided with a cover for inclosing the revolving table, the sound box and tone-arm, and the motor mechanism for driving the revolving table is housed in the body of the cabinet, so that machine noises and the noise of the reproducing stylus upon the record tablet as well as such sounds as are caused

by the reproducing diaphragm on the exposed face are all hushed, and only such sounds as travel through the sound conduit and are emitted through the large end of the sound amplifier are observable by the listener, the freedom from extraneous noises materially contributing to the perfection of the reproduction of the sound record.

By the present invention a very material lengthening of the sound conduit with corresponding increase in volume of the amplified sound is brought about, and, moreover, provision is made for a wide range of modification whereby the device is adapted to soft reproduction of sounds suitable for small rooms or a loud reproduction of the sounds suitable for large halls, or any intermediate degree of sound that may be desirable.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of this specification, with the understanding, however, that while the drawings illustrate a practical and commercial form of the invention, the latter is by no means limited to the exact construction shown, but may be varied in many details without departure from the scope of the invention.

In the drawings:—Figure 1 is a front elevation of the cabinet embodying the present invention with the controlling door of one of the sound amplifiers open and with one of the doors of a tablet containing compartment open. Fig. 2 is a front to rear vertical section through the machine with some parts shown in elevation and some parts broken away. Fig. 3 is a vertical section on the line 3—3 of Fig. 2. Fig. 4 is a section in substantially the same part as Fig. 3 but taken through the small end of one of the terminal amplifiers and of the adjacent portion of the neck connected thereto, the scale being somewhat larger than that of Fig. 3. Fig. 5 is a section at right angles to that of Fig. 2 and taken through the sound conduit where joining the pivoted end of the tone-arm, parts being omitted, and showing a somewhat modified form of the invention. Fig. 6 is a section on the line 6—6 of Fig. 5. Fig. 7 is a section on the line 7—7 of Fig. 5. Fig. 8 is a section in part similar to Fig. 5 and showing still another form of the in-

vention. Fig. 9 is a plan view of a coupling used in the structure of Fig. 8.

Referring to the drawings, there is shown a case or cabinet 1, which in general form may follow the design usually employed for the cabinet type of sound reproducing machines, and since such cabinets are often installed in dwelling houses the exterior of the cabinet may be of ornamental configuration. The body of the cabinet is provided with a top or cover member 2 connected to the body member by hinges 3 and provided with a handle or handles 4, whereby the top may be lifted to gain access to the interior of the upper end of the cabinet, which is divided from the main portion of the interior of the cabinet by a partition 5 inset a short distance from the upper edges of the walls of the cabinet and constitutes not only a division wall, but a support for parts of the mechanism. Below the partition or shelf 5 is a cross piece 6 in spaced relation to the shelf 5, and this cross piece may be fastened to the side walls of the cabinet by brackets 7 or otherwise. The cross piece 6 is designed to support a motor mechanism 8, such as is commonly employed in machines of this character for driving a turn-table 9 located above but in close relation to the shelf 5. The motor and turn-table may be of ordinary and well known construction and, therefore, need no specific description.

Considering that portion of the casing to which the cover 2 is connected by the hinges 3 as the rear of the casing, the shelf near the rear edge has fast thereto a ring-like member 10, which may be either cast or turned or both, and this ring-like member is provided with an upstanding flange in surrounding relation to a hole or passage through the shelf. The ring has connected to or formed thereon a bracket 11 between which and a suitable spider 12 within the ring 10 there extends a post 13, which may be made fast to a tone-arm 14, but which is free to turn about its longitudinal axis in suitable bearings in the bracket 11 and spider 12. The pivotal support for the tone-arm may be such as is ordinarily used in connection with machines of this character, and so needs no specific description. The small end of the tone-arm 14, which is of the customary taper form, carries pivotally a neck 15, which latter in turn carries a sound box 16 in position to engage, by a suitable stylus or "needle," a sound record groove in a tablet 17 lodged on the turn-table 9.

As so far described the structure need not vary in any essential particular from structures of like character already in existence, and, also, may be made in any other manner suitable for the purposes of the present invention, but which structures do not enter

into the present invention and, therefore, need no particular description, the showing of the drawings with respect to the several features named being typical rather than mandatory.

Depending from the shelf 5 coincident with the passage into which the tone-arm opens is an expanding sound conduit 18 forming a continuation of the tone-arm, so far as the conducting of sound is concerned, and this sound conduit is carried to a point comparatively low in the casing 1, and in the particular showing of the drawings extends more than half way toward the bottom of the casing. The expanded end of the conduit 18 which may be of metal is connected to divergent necks 19, 20, respectively, and these necks are returned on themselves so that the ends remote from those connected to the conduit 18 open in generally the same direction as the length of the conduit 18, but the longitudinal axes of the open ends of these necks are at an angle to the longitudinal axis of the conduit 18 although substantially parallel one with the other. Each neck 19 and 20 has formed thereon or connected thereto a radial flange 21 terminating in an annular flange 22 in which is lodged the smaller end of an amplifier 23, the latter being preferably made of a circular series of staves so shaped that the interior of the amplifier continuously expands from the end lodged within the flanged end of the respective neck 19 or 20 to the other end of the amplifier. To prevent rattling or other noises some soft material, indicated at 24, is interposed between the end of the sound amplifier 23 and the socket flange receiving it and the parts are secured together by screws 25 or in any other appropriate manner. The material 24 may be, and usually is, felt.

The necks 19 and 20 are each so shaped that the flanged ends and the amplifiers 23 carried thereby are directed toward the front of the casing and at the same time upwardly, so that they terminate on each side of the center line of the casing at the front thereof at openings 26, the corresponding ends of the amplifiers 23 terminating at an appropriate angle, so as to rest squarely against the inner wall of the front of the casing in surrounding relation to the corresponding opening 26, and in order to prevent any rattling at these points due to looseness of contact, a suitable felt gasket 27 is interposed, while cleats 28 glued or otherwise secured to the outer end of each amplifier serve as a means for securing the amplifier in place by the use of screws 29, or by other appropriate fastening devices. Because of the general frusto-conical shape of each amplifier 23 and the angle at which the larger end is cut in order to fit snugly against the inner face of the front wall of

the casing, the openings 26 are of oval form with the longer axis upright, but this form is by no means mandatory. Each opening 26, there being two amplifiers 23 on opposite sides of the center line of the casing, is provided with a door 30 which may be connected to the front of the casing by a hinge 31, and is provided with a knob or handle 32, whereby the door may be readily opened or closed. Any of the ordinary forms of latch devices may be used to hold the doors in the closed position, but such latch devices are not shown in the drawings. The longitudinal axes of the two amplifiers 23 are substantially parallel one with the other and the sound emitting ends of these amplifiers are of enlarged area due to the fact that the planes of said ends are each at an angle to the longitudinal axis of the respective amplifier, so that such enlarged ends operate acoustically like the expanded bell ends of ordinary sound amplifiers. Because of the upward and forward direction of the amplifiers 23, the openings 26 are located near the top of the casing and there remains ample room below these openings and below the amplifiers 23 for racks 33, 34, respectively, designed to receive record tablets of the disk type, and these racks may be supported by generally horizontal partitions 35, 36, of which the latter may constitute the bottom of the cabinet, and doors 37 may be provided to close in these racks against the entrance of dust or dirt, and, also, to add to the appearance of the front of the cabinet. The rack compartments in themselves form no part of the present invention, since they may be made in a manner corresponding to the usual custom in machines of this character.

To brace the lower end of the pendent conduit 18 and the lower ends of the amplifiers 23, bracing strips 38 are provided, and these strips may be connected to nearby fixed parts of the cabinet.

One of the necks, say the neck 20, is open at one side and this opening is flanked by guard members 39 between which may be passed a valve plate 40 held against rattling by strips 41 of felt or other material lodged in corresponding enlargements of the guard members 39. The valve 40 exterior to the guard members is connected to an operating bar 42 carried to and through the shelf 5, and above this shelf is provided with a manipulating handle 43. By pulling on the rod or bar 42 by means of the handle 43, the valve 40 may be pulled out of traversing relation to the corresponding neck 20, so that the latter is left free and open, or the passage through the neck may be closed by the valve on a proper manipulation of the rod 42.

Let it be assumed that the doors 30 are closed and that the valve 40 is in a position

where it closes the passage through the neck 20 from the conduit 18 to the corresponding amplifier 23. Let it also be supposed that a sound record tablet is lodged on the turntable and that the apparatus is in operation for the production of sound from such tablet. Because both amplifiers have their outer ends or mouths closed, and because one of the amplifiers is cut off from the conduit 18, the reproduced sound is so muffled as to be nearly inaudible. If, now, the door 30 controlling the mouth of the amplifier connected to the neck 19 be open, a volume of sound will at once issue from the instrument commensurate with the length and cross section of the sound conduit from the sound box to the mouth of the particular amplifier 23 under consideration. The volume of sound is readily controlled by the degree of opening of the corresponding door 30, and because of the length of the sound amplifier and, also, because of the cross section thereof, there issues from the amplifier connected to the neck 19 a volume of sound in excess of the cabinet type of sound reproducing machines as ordinarily constructed. If a greater volume of sound is desired, then the valve 40 is moved out of interfering relation to the interior of the neck 20 and there is immediately brought about a marked increase in the volume of sound until it reaches a maximum in excess of that producible by a commercial form of horn machine of large size. The extraneous sounds necessarily associated with the horn machine are eliminated in the cabinet type of machine of the present invention, while not only is the volume of sound emitted by the machine of the present invention far in excess of the volume of sound producible by any known commercial form of cabinet machine, but the volume of sound may even exceed the loudest commercial type of horn machine, and is only exceeded by the air pressure type of sound reproducing machines. Moreover, the amplifiers 23, which may be made of wooden staves, materially enhances the purity and naturalness of the reproduced sound in the same manner as is brought about by the use of a wooden horn in the horn machines.

The elongated sound conduit reaching well toward the bottom of the cabinet and the upwardly and outwardly directed amplifiers give a desirable length to the sound passages to impart volume to the sound, while the upward direction of the emitting end of the sound amplifiers causes a disposition of the sound, whereby in large audience halls the sound may be made to travel with practically the same volume to all parts of the hall, distance only serving to diminish the sound, while the sound is as readily audible to one side of the di-

rect line of projection from the machine as directly in front thereof. Moreover, the twin sound amplifiers makes it possible to greatly modify the volume of the emitted sound and to wider extent than would happen if the modification of the volume of sound was due solely to the opening and closing of a door or doors controlling but one amplifier, for one of the amplifiers may remain unimpeded with the door wide open while the sound may be diminished or increased by moving the valve 40 into and out of traversing relation to the neck 20 to any extent desired. The valve 40 does not interfere with the use of the doors 30 for modifying purposes, but usually these doors are used for the modification of the sound only in small rooms, where the full power of the machine, or even of one of the amplifiers is excessive.

The more pronounced control of the emitted sound may be brought about by dividing the conduit 18 into two parts longitudinally. This may be done, as indicated in Fig. 5, where the conduit 18 is traversed longitudinally by a centrally located web 44, so that there is no direct communication between the sound passages from the large end of the tone-arm to the emitting end or ends of the amplifiers 23. By the time the reproduced sound reaches the large end of the tone-arm it is amplified, but not to any very marked degree. In the structure shown in Figs. 2 and 3 the sound by the time it reaches the necks 19 and 20 is amplified about as much as the total volume of sound issuing from a cabinet type of machine of ordinary construction. The result of this is that while the valve 40 produces a noticeable diminution of the volume of sound issuing from the machine as a whole, this valve being placed in traversing relation to the neck 20, some sound will still issue through the sound amplifier which has been cut off from direct communication with the sound box, this being due to conduction of sound through the valve and the walls of the neck 20 adjacent thereto. With the construction shown in Figs. 5 and 6 there is less amplification of the sound in each half of the conduit 18 than would occur if the web 44 were absent, so that whatever sound may still issue from the cut off amplifier is much diminished with reference to the form shown in Figs. 2 and 3. In order that the direct communication with one side of the conduit 18 may be controlled before the sound passing thereto is amplified to any great extent, there is provided a valve 45 beneath but close to the shelf 5 and so positioned as to be movable into and out of traversing relation to that side of the amplifier 18 connected to the neck 20. In order that this valve may be readily controlled from the front portion of the machine, it is connected to a rod 46 trav-

ersing a bracket 47 fast to the interior of the casing, and this rod is also surrounded by a spring 48 tending to move the valve toward the closed position. The end of the rod 46 remote from the valve 45 is connected to a bell crank lever 49, which in turn is connected by a link 50 to another bell crank lever 51 mounted on a bracket 52 and provided with a manipulating rod 53 extending through the slot 54 in the shelf 5 and through a corresponding slot in a plate 56 on the shelf 5 immediately surrounding the slot 54. The rod 53 is formed with a handle 57 above the shelf 5, so that this handle may be readily reached by the operator and drawn up or pushed down as to whether it is desirable to move the valve 45 out of or into traversing relation to the portion of the conduit 18 connected to the neck 20. A pin 58 traversing the rod 53 may be pulled through the slot 54 in the shelf and the slot in the plate 56, and if this slot be of the key hole variety the pin 58 may be carried into locking relation to the plate 56, so as to hold the valve 45 in the open position against the tendency of the spring 48.

With the structure shown in Figs. 5, 6 and 7 the full volume of sound is approximately that of the structure shown in Figs. 2 and 3, but since the presence of the web 44 reduces the effective cross section of the conduit 18 so far as either of the amplifiers 23 is concerned, the volume of sound issuing through a single amplifier is less than in the structure shown in Figs. 2 and 3, and consequently the cutting off of one half the conduit 18 is more pronounced in effect in the reduction of the volume of sound than in the structure of Figs. 2 and 3.

It is possible to produce an even more marked effect by substituting for the conduit 18 two conduits separately connected to the respective necks 19 and 20, so that the combined cross sectional area of the two conduits may be greater than that of the single conduit 18 at the same point. In Figs. 8 and 9 two conduits 18^a and 18^b are indicated and each of these conduits may be circular in cross sections, and at one point may be brought into contact for convenience of mounting, being joined at these points by soldering or otherwise if found desirable. In order to connect the smaller ends of the conduits 18^a and 18^b with the large end of the tone-arm 14 there is provided a connecting member 59 in traversing relation to the shelf 5 and formed with a flange 60 adapted to engage the under face of the shelf 5 to be secured thereto by screws or otherwise. This connector 59 is formed above the shelf with a collar like extension 61 designed to receive the large end of the tone-arm 14, while the other end of the member 59 below the shelf 5 is formed with a flange 62 of a shape to receive the rounded smaller ends of the

conduits 18^a and 18^b, while the spaces between these conduits where in abutment may be closed by a filling 63 either formed in one piece with the member 59 or formed separately therefrom. The conduit 18^b is provided with a valve 45^a adapted to the shape of the conduit and controllable in the same manner as the valve 45 described with reference to Figs. 5, 6 and 7.

10 What is claimed is:—

1. A sound reproducing machine of cabinet type having sound record driving means, a sound box and a tone-arm in the upper portion, a sound conveyer of progressively increasing cross section communicating at the small end with the tone-arm and from thence having a downward direction or drop and also having a sound emitting end of double form rising from the lower end of the drop portion, and means for cutting out one of the two sound emitting devices from direct communication with the tone-arm, said means having an accessible manipulating portion extending to the upper part of the cabinet adjacent the sound record driving means.

2. A sound reproducing machine comprising a suitable cabinet provided with tablet actuating means, a sound box, and a taper tone-arm all located in the upper end of the

cabinet, a sound conduit of progressively increasing diameter communicating at its smaller end with the larger end of the tone-arm, said sound conveyer comprising a metallic portion extending from the tone-arm in a downward direction in the cabinet and terminating in two upturned branches or necks and upwardly directed continuations of each neck of the conveyer in the form of a hollow wooden member progressively expanding from the respective neck and terminating at the front of the cabinet below that portion containing the sound box and tone-arm, the terminal portion of each wooden continuation of the sound conveyer being provided with a door individual thereto, and one of the two necks of the metallic portion of the sound conveyer being provided with a cut-off having a manipulating member extending to that portion of the cabinet containing the sound box and tone-arm and there accessible.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ALFRED R. CUNNIUS.

Witnesses:

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DAVID R. WAGNER.