

A Three-Foot Roll-Type Speaker

A Reproducer Simple of Construction and With Excellent Tonal Quality

By CLYDE J. FITCH

THE loud speaker offers one of the most interesting fields of experimentation open to the radio listener. When we see the vast number of horn speakers of all shapes and sizes, and also plain cones, oval cones, eccentric cones and roll- or book-type speakers, both free-edge or otherwise, of various sizes and forms, we begin to realize how enormous is the loud-speaker field, and also to wonder if the loud-speaker problem will ever be satisfactorily solved. Its evolution is toward better quality of reproduction. What the final solution will be is difficult to predict.

The large, three-foot-cone type of loud speaker has proven itself so excellent, as far as quality of reproduction is concerned, that by analogy why should not a large roll-type speaker prove superior to the smaller ones? (And the small ones are very good.) With this in mind, a large roll speaker was built, with the parts designed for a three-

as shown in the various illustrations, Fig. 4 giving the dimensions. Be sure to use a heavy, hard wood, such as oak; because, the more weight added to the unit, the better will be the results. Remember that, on these large speakers, the vibrating member or diaphragm weighs as much as the unit; and unless weight is added to the unit, the diaphragm will remain stationary and the unit will vibrate.

The roll, or rather double roll, is made from one sheet of 38 x 38-inch speaker cone material. The sheet is folded once through the center, across the grain, as shown in Fig. 4. (This material is usually supplied in rolls, with the grain running lengthwise with the roll.) Before folding, draw a line through the center with a straight edge. Now using the straight edge and a sharp pointed tool, go over this line, making an indentation in the paper. The sheet may now be folded along this line without fear of crushing.

Next we require a thin piece of brass cut out and drilled as shown in Fig. 4A. This is fastened to the threaded drive rod of the unit, bent up around the outside nut, and clamped upon the center of the folded edge of the sheet with a small nut and screw, as shown at B. Before clamping this piece to the sheet, mount the unit on the center of the wooden frame with wood screws.

With the unit in place and the folded sheet attached to it, procure a few thumb tacks; bend the sheet over to the sides of the frame and securely attach it with the tacks. If desired, a gold braid may be placed along the sides to improve the appearance. The addition of a cord to hang the instrument to the picture moulding completes the assembly. Although called a three-foot roll, the speaker in fact is 38 inches long and 28 inches wide.

A loud speaker of this type lends itself admirably to decoration in a style harmonious with its surroundings. In contrast to the neutral tint of the diaphragm paper, braid trimmings may be used in brighter colors, agreeing with the other furnishings and the general scheme of the room in which it is hung.

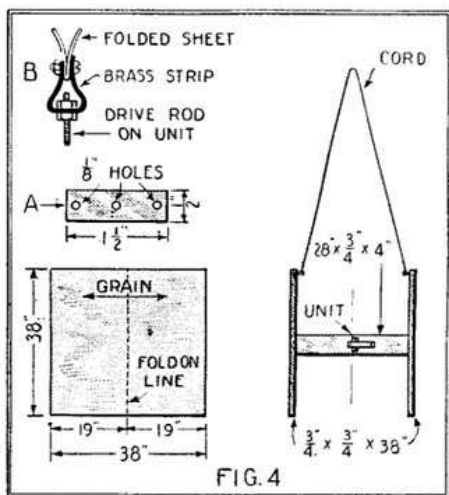
In selecting the parts for this speaker be sure to procure a good cone unit, preferably a direct-drive one; in other words, one that has no mechanical reducing levers for reducing the motion applied to the cone. The one used in the writer's experiments was not a balanced unit, and could therefore be directly connected in the plate circuit of the output power tube of the set, without the use of an output transformer or choke coil and con-

denser system. A type 112, 171, or 210 power tube may be used in this manner without fear of damaging the unit.

THEORY OF OPERATION

The theory of operation of the large roll speaker is somewhat similar to that of the cone speaker. In order to obtain faithful reproduction of the low tones, such as are produced by the bass viol, it is necessary to move a large volume of air. This requires a large, light, and strong diaphragm, the larger the better, up to a certain point where the lowest musical tones are reproduced. A sheet of paper may be large and of light weight;

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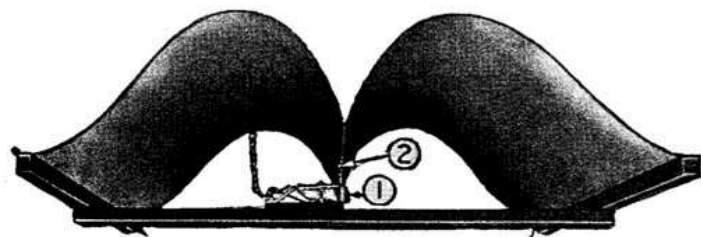


Details of construction for the roll-type speaker. At the upper left are data for preparing the metal strip that is attached to the diaphragm.

foot cone speaker. The roll speaker, shown in the accompanying illustrations, was found surprisingly simple to make. Only a few minutes were required to assemble it; it was then directly compared with a three-foot cone, using a resistance-coupled set. Whether the roll is superior to the cone, is difficult to determine. It is slightly higher in pitch than the cone and it certainly gives excellent reproduction. It is a matter of personal opinion which is the better speaker; many who heard the roll speaker prefer it to the cone, and vice versa. The type of set used with this speaker must also be taken into consideration when tests are being made.

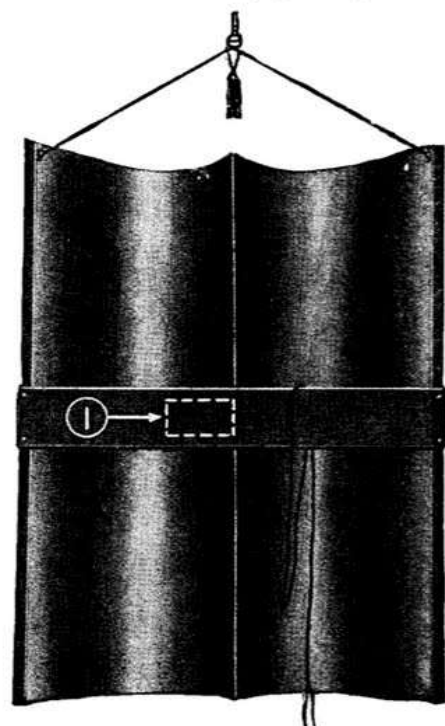
CONSTRUCTION OF SPEAKER

The construction of the speaker is so utterly simple that it requires little comment here. First a frame of three sticks was built,



On the left is the end view of the speaker, showing the manner in which the unit is mounted. No. 1 in both views is this unit and No. 2 is the point where the unit's drive rod is attached to the paper diaphragm. On the right, rear view of the speaker.

Photos by courtesy Engineers' Service Co.



A Three-Foot Roll-Type Speaker

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but it has no strength unless formed into a cone or roll, after which it serves as an excellent diaphragm. In the cone the vibrations are applied at the apex and waves radiate outward; in the roll speaker the transition between vibratory and undulatory motion is more gradual, giving it a distinctive tone of its own, not found in other speakers.

A Simple Roll-Type Loud Speaker

Easy and Inexpensive to Construct and Capable of Great Volume

By E. M. YARBROUGH

THE construction of this double-semi-cylinder loud speaker is simplicity itself, as a moment's consideration will show; and the cost of its materials is practically nothing, outside of the unit. It should make an immediate hit with a good many of our readers.—EDITOR.

OF all loud speakers the writer has ever heard, the double-cylindrical diaphragm now to be described, built on the principle of Dr. de Forest's Audalon, is the most nearly perfect in reproduction. It is also, in contrast with most other paper-diaphragm devices, highly efficient, and absurdly cheap and simple to construct.

Briefly, this reproducer consists of a sheet of heavy paper folded in the middle, with the two halves rolled into semi-cylindrical shape so that the end view is like an "m"; the outer edges being supported, while the center of the crease floats on the diaphragm of a loud-speaker unit. This construction results in a quality of tone realized only by

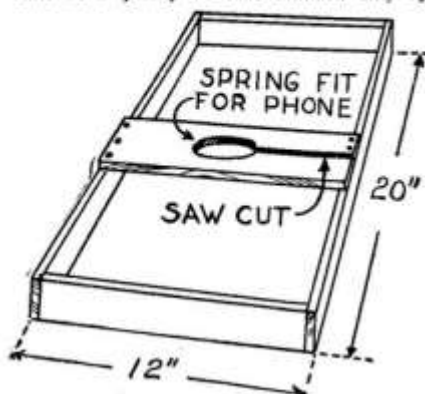


Fig. 2-A. The simple framework upon which the loud speaker is assembled.

the best free-edge cones, with a slight increase in actual volume over horn-type reproduction.

The only materials essential to its construction are a high-grade telephone unit, a cork, and a sheet of heavy art paper, about 20 x 30 inches, such as used for the covers of advertising pamphlets and programs. The latter may be obtained in several shades at any stationery store, or at the local print-shop, for about fifteen cents.

CONSTRUCTION IS EASY

Art paper comes with a colored parchment finish on one side. Fold the sheet in the middle by placing one end true with the other and creasing the fold, being sure that the parchment finish is on the inside. Fasten the edges together with wire paper-clips about two inches up from each end of the crease, in order to stiffen the crease. Mark the center of the crease and insert it into a knife slit in one end of a long, narrow cork. (See Fig. 1). This cork should be long enough to rest on the diaphragm of the phone without allowing the paper to touch the cap. Cork, being of nearly the same density as paper, makes a much better acoustic link than metal.

Make a light, rectangular, wooden frame, about a foot wide and the length of the crease. (See Fig. 2-A). In the center of the frame, fasten crosspiece to which the phone is to be attached. Mount the phone exactly in the center, using the method of fastening best adapted to the unit. Now tack the free ends of the paper to the side-pieces and set the cork link on the center of the diaphragm. (See Fig. 2-B). The instrument may now be used in a horizontal position with good results.

If it is desired to use the speaker in a vertical position, by standing it on end or hanging it on the wall, the crease must be supported from the end-pieces by light rubber bands, both to give the cork a proper contact with the diaphragm and to prevent sagging of the crease. The diagram makes this clear. If a drop of glue is used to stick the cork to the diaphragm, the tension on the bands need not be great.

FINISHING THE SPEAKER

The ornamentation of the finished product may be as simple or as elaborate as the constructor desires. However, if the result is to be in good taste, it is best to follow the old rule that construction should be ornamental in itself, and ornamentation constructional. Perhaps the best treatment would be to leave the two columns of paper unadorned, thus accenting the beauty of the parchment, and to provide at each end artistic guard rails, as illustrated, matching the style of furniture in the room in which the instrument is to be used. These rails should not touch the membrane. If the paper is used alone, a neat row of inked swastikas may be used at each end.

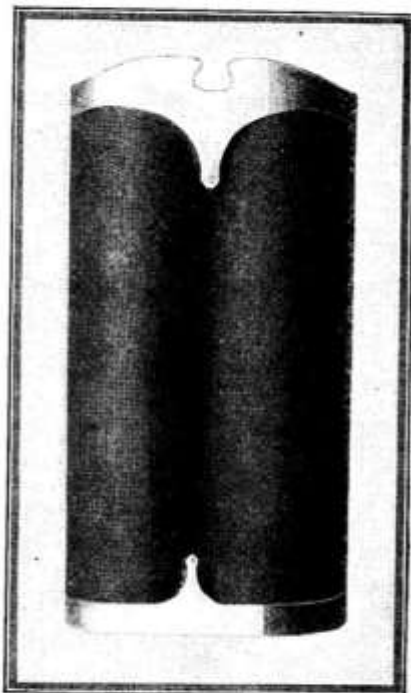
In order to get the best possible tone from the speaker (assuming of course that the output of the radio amplifier is distortionless) we must eliminate, as far as possible, the distortion arising from the use of a stretched metal diaphragm in the phone unit. The best low-priced units are those in which



a large diaphragm is supported between resilient washers, and in which the distance between the magnets and the diaphragm is adjustable. Simply unscrew the cap altogether and adjust the magnets until good tone and volume is had. The cork can now be made very short, resulting in better linkage, and may, if desired, be set on various parts of the diaphragm until the best point is found.

POWERFUL AND COMPACT

The efficiency of conversion by this speaker, of electrical energy into sound energy, is attested by the fact that the resultant sound is as loud and distinct all



One form of decoration by the use of an ornamental guard rail at each end of the diaphragm, if so desired. A very neat effect is thus obtained.

over the room as it is an inch from the membrane. As a result, excessively powerful signals are not necessary for good volume. The writer uses only 66 volts on three "bootleg" 199's in a Roberts Reflex, with a choke coil for the last step. But to hear this outfit talk, you would think that five hundred miles were five, and that "twenty bits" were "twenty bones."

The rectangular construction of this loudspeaker is admirably adapted for portable receivers, for the paper may be made removable from the sides, and folded flat, so that the whole may be packed in the lid of a suitcase. Another stunt is to use a single horizontal cylinder as a combination speaker and dust cover for an open-built

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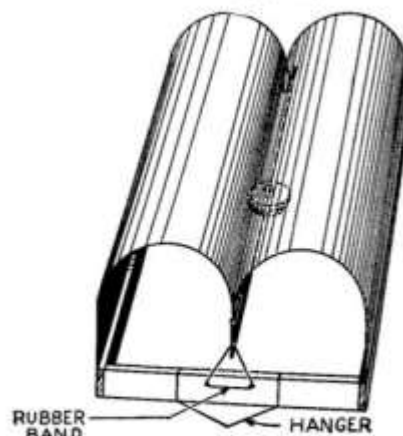


Fig. 2-B. The completed loud speaker, arranged for use on the wall, as viewed from the top. The position of the unit is indicated.

Simple Loud Speaker

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set. A neat, compact outfit is the result. The phone should be mounted on sound-proof pads.

As a final word to those who intend to convert their old phonographs for electrical operation, you will find that the available space within the cabinet is more completely utilized by the double cylinder than by a cone. A speaker of the size described is equivalent to a cone 26 inches in diameter, which would be hard to fit into most cabinets. In the case of the large models, there would be no difficulty involved in fitting a double cylinder, twice this size, into the space now occupied by the records.