

How to Build a Linen-Diaphragm Loud-Speaker (By Megohm)

THIS is a type of loudspeaker that is now enjoying great popularity in America, and has been called the balanced-tension type of reproducer. Several patterns varying in detail, but the same in principle, have been published, but in each case there are two frames upon which linen or skin is stretched, making two diaphragms, the centres being pulled together and bolted, and driven at this point by a cone speaker unit.

One pattern has both frames of the same size with linen diaphragms, another has the back diaphragm much smaller, and employs skin in place of linen, and so on. The employment of skin or parchment obviates the stiffening of the linen by impregnating it with varnish, celluloid solution or else with four or five coats of thin collodion.

No claim appears to have been made that one pattern excels another, but all alike give very fine reproduction, including the lower notes that are mostly suppressed by the average small horn speaker. Construction is simple, and if the instructions are carefully followed, a loudspeaker of which the constructor may be proud will result.

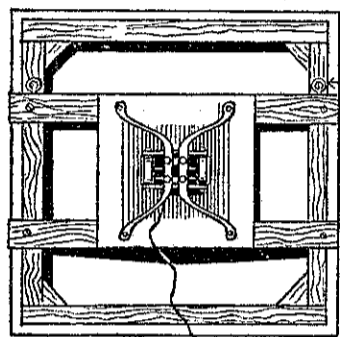


Fig. 1 Back View of Speaker

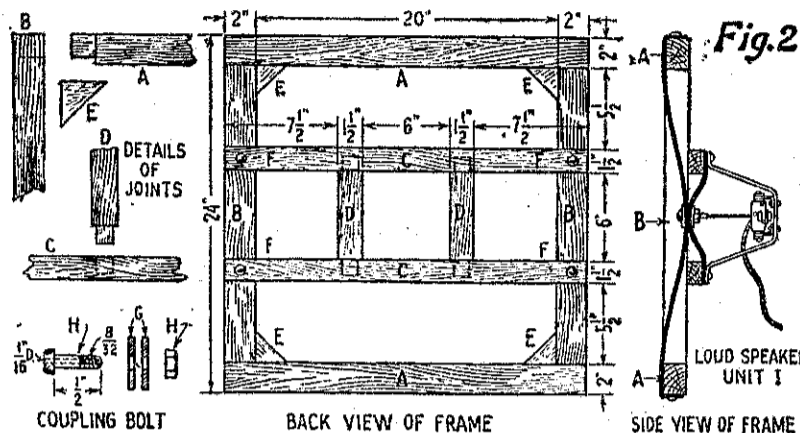
Construction of Frame.

THE first operation is the assembly of the wooden frame upon which the linen diaphragms are stretched. The back view of the frame, Fig. 2, shows how the various pieces of rimu or other suitable wood are cut and mortised together. This construction should be followed, for if the parts of the frame are not securely fastened by glueing, a rattle will be introduced in the speaker that cannot be eliminated without a great amount of trouble. After the pieces A and B have been glued, the corner pieces E are attached. The pieces marked C and D are next joined and screwed to the sides B, making sure that the pieces D are centred.

While the points of the wooden frame are drying, the two diaphragms

of high-grade linen are prepared. It is necessary that a hem one-half inch wide be sewed along each side of both the large and the small squares; the one being 26 inches square and the other 8 inches.

When the joints are thoroughly dried, the large square of cloth is placed over the front of the frame, tacking down one edge; be careful to place the tacks fairly close to one another, so that there will be little danger of the cloth's pulling out. When one edge has been fastened stretch the linen as tightly as possible and tack down the opposite side. This



The details of the construction of the wooden frame, for both the large and the small diaphragm, also the mounting of the loud speaker unit

process is repeated for the other two sides. The 8-inch square of linen is fastened to the rear frame in the same manner.

Preparing the Diaphragm.

NOW locate the exact centres of both diaphragms and carefully, with the point of a compass or a sharp nail, force a hole in the linen. Be careful not to break any threads, but spread them apart until the hole is 1/4-inch in diameter. Then prevail upon one of the ladies of the family to work a button-hole stitch around these two holes. The next operation should be performed either outdoors or in a room with the windows open, as otherwise the fumes from the collodion are liable to cause an unpleasant sensation. Paint the face of each diaphragm with the thin collodion and allow it to dry. Four or five coats are required; let each coat dry before applying the next one. When the last coat is dried the diaphragms will be stiff and slightly flexible and, when tapped with the finger, will sound like a drum.

An alternative method of treatment to the above is to impregnate the diaphragms with celluloid dissolved in amyl-acetate, or with a suitable varnish.

The small coupling bolt is next prepared. This is at 3/32 bolt, 3/4 in. length, through which is drilled length-

wise a small hole, just large enough to take the driving rod of the loudspeaker unit which is to be used. One of the washers is put over the bolt, and the head with the washer is put through the hole in the large diaphragm, from the front. The two diaphragms are forced together until the bolt can be slipped through the hole in the smaller square, after which the other washer and the nut are put on and tightened down.

The mounting of the unit itself is left to the ingenuity of the constructor. The method employed with good results by the writer can be seen in the

accompanying illustrations. It is important to remember that the unit must be so lined-up that the driving pin will come exactly in line with the hole in the bolt.

The finished speaker may be placed in a cabinet or hung from the ceiling. If it is desired to colour the linen diaphragms this must be done before treating them with the collodion. The tacks should be covered over with an attractive passe-partout binder for appearances' sake.

The material needed for constructing this speaker is as follows:—

- 4 pieces of rimu, 24 x 2 x 1 1/2 inches ("A, B").
- 2 pieces of rimu, 24 x 1 1/2 x 1 inch ("C").
- 2 pieces of rimu, 7 1/2 x 1 1/2 x 1 inch ("D").
- 4 triangular pieces rimu, 1 1/2 x 1 1/2 inches ("E").
- 2 squares of medium-weight linen, one 26 x 26 inches, and the other 8 x 8 inches.
- 4 1/4-inch wood screws ("F").
- 2 1/2-inch washers ("G").
- A 1/2-inch 8/32 brass screw and nut ("H").
- A package of No. 4 cut tacks.
- A roll of passe-partout binder.
- 10oz. collodion (obtainable at chemists), or varnish.
- A balanced-armature loudspeaker unit with driving rod ("I").

Alternative Construction.

SOME constructors may fancy the two equal diaphragms, as in Fig. 3, so details are here given.

Two frames 2 feet square are prepared in the same way as prescribed above. Fig. 4 shows a side view. The two frames are held 8 inches apart by strong threaded rods and nuts. The linen is on the outside of the frames, and the driving unit is secured to the two parallel bars of wood running across the centre of the back frame. The exact method of securing the driving unit will depend upon the type employed.

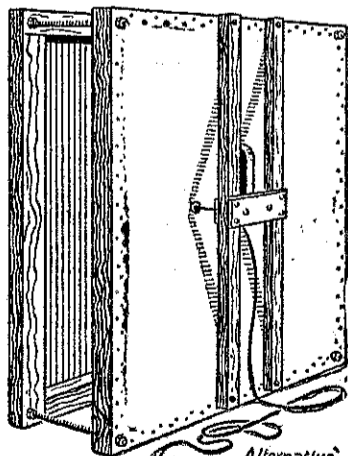


Fig. 3 Alternative Construction

Proof Against Overloading.

FROM the foregoing description it becomes obvious that the weight or tension of the vibrating diaphragms does not act as a constant load on the driving unit. Therefore, although it might be imagined that the highly-taut diaphragms require a great deal of power to actuate them, even the slightest movement of the drive pin is transmitted without loss to them; as a result the speaker is unusually sensitive, and operates with great volume even on moderately strong signals.

The new speaker is capable of handling far more power than is required for all ordinary radio purposes. In one test, for example, it was used in conjunction with a two-stage transformer-coupled audio amplifier employing two 210-type power tubes in

the last stage. A strong local station was tuned in, and a direct comparison was made between this speaker and another of the cone type, of probably the best design on the market to-day. The latter instrument started to rattle when a certain volume level was reached; whereas this linen diaphragm speaker continued to operate without distortion up to the limit of the amplifier.

Volume With Quality.

THE performance of this new loudspeaker, as judged by the ear alone, is remarkable for its brilliancy and faithfulness over the whole range of musical notes transmitted by a high-class broadcast station. Violin music comes through high and clear, without appreciable flattening of the high notes; while the sounds of drums and the low tones of a piano boom forth with clarity and realism. The unexpected responsiveness of the speaker to the low notes is somewhat disconcerting at first to a hearer unaccustomed to such reproduction; but, in a room of favourable acoustic properties (i.e., one furnished generously with rugs, thick curtains and similar echo-killing materials), the "booming" effects quickly lose their unpleasantness.

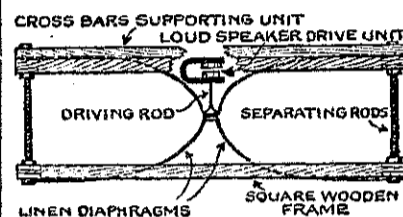


Fig. 4

The actual range of frequency-response of this speaker, according to tests made in the laboratories of the manufacturer, is from 30 to 8000 cycles. This more than covers the modulation range of the average broadcast station.

THE AR19 HORN SPEAKER

THE Amplion Standard Dragon AR19 horn speaker is probably the best seller of any horn speaker. A practical test shows that this speaker still retains the good qualities that have made it such a favourite amongst listeners. Its capacity for handling large volume is assured by a sturdy reproducing unit and the large bell-shaped flare constructed of oak. The price is £6 10s.

THE A.W.A. TRANSFORMER

LAST week the new A.W.A. Super-audio transformer was introduced to constructors. Full particulars have now come to hand as follow:— The primary inductance has been kept as high as is possibly consistent with the price of the transformer (18s.).

The cross section of iron in the core of A.W.A. Super-audio Transformer can be gauged both from the minimum airgap and from the overall dimensions and weight, as shown here:— Overall dimensions: 2 7/16 x 2 7/8 x 2 1/2 inches. Weight: 11lb. 4oz.

In the new A.W.A. Super-audio Transformer a comparatively heavy gauge of copper wire is used in the windings to diminish the risk of burn-outs, and to decrease the resistance. Below are given the safe limit of steady plate currents for the respective ratios, and it will be noted these are comparatively high values:—

Ratio	Limit of Steady Plate Current
2 to 1	3 to 4 milliamps
3 1/2 to 1	4 to 5 milliamps
5 to 1	6 to 7 milliamps

The 2 to 1 transformer is best used in conjunction with the detector valve, where the plate current is relatively low. If the steady plate current of the first audio valve exceeds the limit shown for the 2 to 1, then a 3 1/2 to 1 or a 5 to 1 transformer should be used in conjunction with it. As a general rule, the lower the ratio of the transformer, the better will be the reproduction, provided the steady plate current does not exceed the limit shown.

THE SCREEN-GRID BOOSTER FOR BROWNING-DRAKE

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AN Auckland constructor writes as follows:—"It may interest you to know that I have made up and attached the screen-grid booster (as described by you in the "Radio Record") to my four-valve Browning-Drake, and the results I am getting are beyond all expectations—Christchurch and Wellington on loudspeaker in daylight. In fact, it is such a success that I propose breaking down my shore-wave set and rebuilding it with the short-wave booster, as designed by you. . . ."



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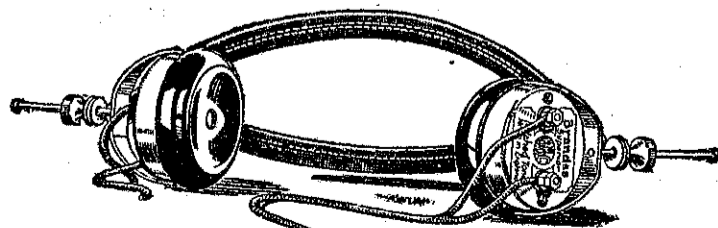
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