Mainly about Construction

BY "MEGOHM"

A FULL-WAVE BATTERY ELIMINATOR FOR HOME CONSTRUCTION

ADAPTING THE BH RAYTHEON TUBE

HEATING LAST AUDIO FILAMENT FROM ELIMINATOR

THE SMOOTHING CHOKE.

Radio chokes are not often included in an eliminator circuit, but they are simple to make, and are so effective that this eliminator will actually work without any other choke, but it is not advisable to attempt to do so, for the provision of a suitable choke certainly improves results somewhat, and more important still, ensures good working under more or less extreme conditions. However, the radio chokes cut out the necessity for two chokes or two windings on the one core

Ordinary black iron sheet running in thickness about 48 to the inch is suitable for the core. This same iron could be used for the transformer core if preferred, but the thinner laminations already specified make a very efficient article, though there is more cutting. About 35 pieces of iron 5 by 3 inches are required for the core. A sheet metal worker will supply them cut to size for 2s. 6d. Then a cardboard template must be made with which to make the iron for further cutting. The card is cut the exact size of the iron and then dimensions shown are marked off and the "window" cut out of the centre with a sharp knife, and also two notches as shown. The straight edge of notch A is to be at exactly the half-way point of the full length. The iron is first cleaned by wiping with a rag and benzine, then the template is laid upon each, the window and straight side of the two notches marked by scratching. In cutting, the cuts at A and B are made first, continuing to across the "window" about to the small cross shown. Then the two portions can be bent in the centre on dotted line, when it is easy to cut down the inside of the two arms of each. To cut across the end, one arm must be bent down on the diagonal dotted lines in Fig. 2. Then the iron is bent back and flattened by hammering. The next operation is to give the laminations a coat of shellac all over. The shellac is dissolved in methylated spirits and applied with a brush.

THE SPOOL.

The spool for the wire need not be very strong so long as the ends are well supported whilst the winding is in progress. Two squares of strong cardboard are cut 2¾ by 2½ inches with a square hole in the centre about 1 3-16 by 15-16 inch, but the exact size is to be made to suit the former with covering.

The former for the spool is a piece of wood exactly 2 13-16 long by 1 3-16 by ⅞ inches. A hole is drilled centrally through the length of this as accurately as possible by drilling part from each end, diameter to take a dowel-stick as a spindle. A strip of manilla or strong brown paper 2 13-16 inches wide is wrapped two or three times round the former and well glued to itself, but not to the former. Now the square holes in the ends are cut to fit over the ends of the paper, and are fixed with glue and further strengthened by glueing in small bent strips of strong paper as shown in Fig 4. During winding, the spool ends are best supported by a piece of thin board about the size of the end, drilled to fit the spindle and held fast, pressing against the spool end, by a nail passed through a hole in dowel. Once the winding is complete, it is safe without these supports.

WINDING THE CHOKE.

The quantity of 30's enamelled wire required to wind the choke is 1¼lb., and if this quantity is put on it will be quite sufficient for ordinary conditions, and will give about 5000 turns. There is actually room for about 7000 turns on the spool. The 30's wire gives the desirable low d.c. resistance. It is wise to solder on a short length of, say, 20's d.c.c. wire for a lead-out, and this is passed through the hole marked "in." The wire is then wound on in patches from one end, working towards the other, but not returning far over that already wound. A layer about one-eighth thick is put on in this way, irregularly wound, and then covered with tissue paper cut wider than the spool to allow for puckering. The next layer is then wound. Great care is required at the ends to prevent any turns of wire sinking below their proper level. The end of the wire is led out at the hole provided, and the winding covered with suitable protection.

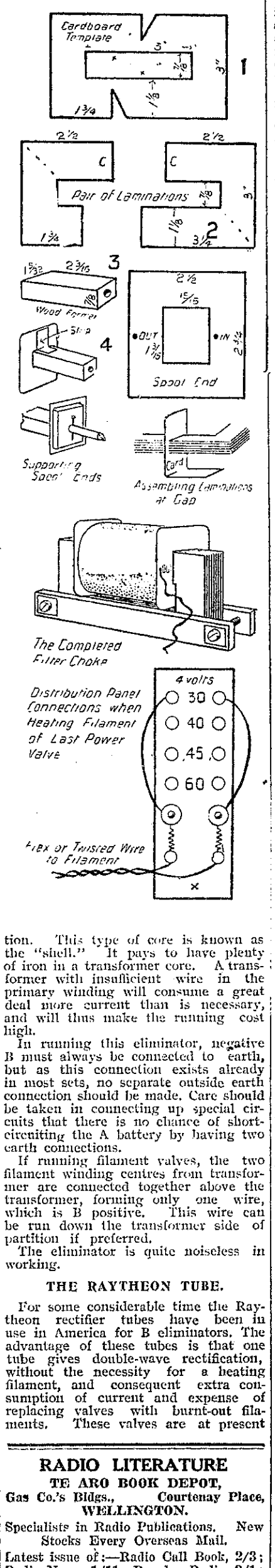
ASSEMBLING

The coil is then laid on the table ready for assembling the laminations in a flat position. Supports are provided for the portion of these outside the coil, with small strips of wood. The central division of the laminations, C.C., is to be outside the coil, and a piece of thin card is to be bent at right angles and stood upon the table in such a way as to be finally held between the two ends of the laminations, which are both pushed up against this card as they are assembled. This card forms a gap in the laminations, and its purpose is to safeguard the core from magnetic saturation by the direct current flowing through the coil. The laminations are assembled in alternate positions, so that the central portion comes evenly against one or other side of the card, but the joins inside the coil are in alternate positions, that is, brickwise.

The laminations should now be temporarily held at the outside corners by iron screw clamps or other means, whilst the wood clamps are secured, the card between ends of laminations having been trimmed flush. These clamps are strips of wood 1 by ⅜ by 6½ inches, drilled ¼-inch, 5⅜ centres. The strips should be shellaced and are secured in the same way as the transformer with brass plates and ¼in. brass bolts 2 inches long. The drawing of finished choke shows how brass angle-pieces would be provided at one end to provide for screwing to the partition in an upright position.

GENERAL REMARKS.

The transformer as described is thoroughly efficient, and "wattless" on no load, and consequently does its work with the minimum current consumption. This type of core is known as the "shell." It pays to have plenty of iron in a transformer core. A transformer with insufficient wire in the primary winding will consume a great deal more current than is necessary, and will thus make the running cost high.



In running this eliminator, negative B must always be connected to earth, but as this connection exists already in most sets, no separate outside earth connection should be made. Care should be taken in connecting up special circuits that there is no chance of short-circuiting the A battery by having two earth connections.

If running filament valves, the two filament winding centres from transformer are connected together above the transformer, forming only one wire, which is B positive. This wire can be run down the transformer side of partition if preferred.

The eliminator is quite noiseless in working.

THE RAYTHEON TUBE.

For some considerable time the Raytheon rectifier tubes have been in use in America for B eliminators. The advantage of these tubes is that one tube gives double-wave rectification, without the necessity for a heating filament, and consequent extra consumption of current and expense of replacing valves with burnt-out filaments. These valves are at present very scarce in New Zealand, and inquiry of a number of leading dealers shows that they are not at present stocked in Wellington, though one or two stated that they would have them in stock at a future date. An Auckland firm has a limited number in stock, and "Megohm" procured one of these for 36s. On account of this apparent scarcity, and many requests for constructional details of an eliminator, it was decided to describe the filament-valve type, so that constructors wishing to proceed with the work at once could do so, and get running with the two valves (P.M.4) until such time as the Raytheon tubes are available for all. The most suitable Raytheon tube for ordinary sets is type BH, delivering 85 milliamps at 200 volts.

A trial of this gas-filled tube proves its suitability for the work, and its adaptation to the present eliminator is an easy matter. The chief difference is that only one valve socket (American) is necessary, the filament winding on the transformer is not required for rectifying, and there are two small fixed condensers of 0.1 mfd. capacity to add one across each HT winding. These condensers are both screwed to the partition by the transformer. A wire connects one side of each condenser together, and runs to connect to HT centre tap. The remaining sides of the condensers are then connected, one to each of the back end of the HT fuses on transformer panel. The radio chokes are still retained in the two plate circuits as before. Filament wiring is disconnected from the valve sockets, and if not required the ends must be insulated separately with adhesive tape. The two filament terminals on the valve socket is use are now connected to the two plates of the Raytheon tube. Each of these terminals is connected through a radio choke to HT1 or HT2 of the transformer. The HT centre tap still forms B negative. The common electrode of the valve is the HT output, and its terminal on the socket is the one marked P, which connects to one end of the filter choke in place of the filament centre tap. Other connections remain as before. If the transformer is constructed without the filament winding, space is available for an extra layer or two for each side of the HT, which will give increased voltage, but results are quite satisfactory with windings as specified.

UTILISING FILAMENT WINDING.

A good method of getting cheap filament current for the last audio valve is to arrange to heat this from the filament winding on the transformer when liberated by the use of the Raytheon. The filament of a power valve runs quite noiselessly on raw a.c. in this way, and "Megohm" is now using this method, which gives current much more cheaply than by medium of an accumulator. This is accomplished by taking away the three wires running down through the baseboard from the distribution panel. The bottom bolt connection is not now required. From the two bottom bolts to which the resistance wires are attached, is run a twin flexible wire or d.c.c. 18's twisted together, and these are connected across the filament of the last valve. The connection between the two terminals on the distribution panel is broken. If four volts are required for the filament, the terminals are connected to the respective bolts marked 30, and for six volts to 40 or 45. Voltage is then finally regulated by the two resistance wires, testing with a voltmeter. The centre tap of the filament winding is connected to B negative terminal, that is, a point past all smoothing condensers. It is a feature of the arrangement that the leads from the eliminator to the valve filament should be twisted together, as this eliminates the hum.

Grid bias for the audio valves can also be obtained from the eliminator, but further experiment is needed to find the best method of effecting this before describing it.

The versatility of this eliminator will now be apparent to the constructor and experimenter, and although it entails rather more work in construction than one designed with a single purpose only, its advantages more than outweigh the comparatively small amount of extra labour.

MATERIALS REQUIRED.

When this eliminator was constructed no tally was kept of the amount of wire upon the transformer, but by calculation about 1¼lb. of 34's enamelled will do the two HT windings and the two radio chokes. Nine sheets of tinplate 20 by 28 inches are required, costing 9d. per sheet. The Raytheon tube as already stated costs 36s., and P.M.

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