# Mainly about Construction

BY "MEGOHM"

## A FULL-WAVE B BATTERY ELIMINATOR FOR HOME CONSTRUCTION

### A CONSTANT AND PLENTIFUL SUPPLY OF HIGH TENSION AT LOW RUNNING COST

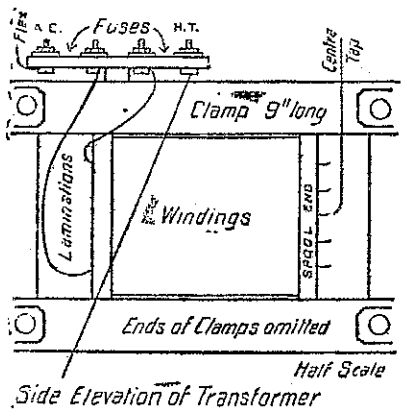
(Second Instalment.)

The description of this full-wave B eliminator commenced last week with a description of making the bobbin of transformer and winding the same with the three necessary different windings. Illustrations of the former on which the bobbin is formed are given below, and also a sketch of a rough stand about seven inches long with two sides in which are slots to take spindle of spool when winding.

Before going further it is necessary to call attention to the circuit diagram published last week. Through the wrong continuation of a line, the detector and LF outputs appeared to be connected together. There is a 2 mfd condenser joined to the detector output, and the line continuing up above the right-angle turn to the detector terminal is to be marked out. Look up the diagram and mark this.

#### THE LAMINATED CORE.

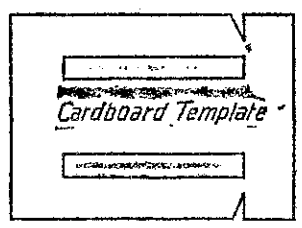
The cutting of the laminations can now be proceeded with, and for their construction six sheets of ordinary tinplate 20 by 28 inches are required. Give each side of the sheets a good coat of shellac before cutting up. When this is dry, mark out as shown, which plan gets fourteen pieces out of one sheet without waste. These could be cut up by the tinsmith on his guillotine and all would then be even in size The laminations consist of T's and U's, one of each being made from each 7 by 5⅝in. piece as shown in the diagram, the two strips which come out of the "windows" being waste. The cutting of the laminations should not be done until the transformer winding has been completed and finished off. The exact size of the laminations is then to be regulated to fit. The 2in. leg of the T pieces must be just an easy fit through the centre of the bobbin, and the length of this leg must equal the inside length of hole through bobbin, which should be 4½ inches. One piece should be cut to make a T and a U, and with these the sizes can be tested. The U must be large enough inside to clear the outside of the windings by one-sixteenth inch. When the exact size has been determined, a cardboard template should be cut as shown, and when this is laid upon the lamination pieces they can be quickly marked out by scratching round the cardboard and in the straight part of the two notches, which give the two points for cutting in to separate the two parts. The actual depth of the windows should be just under ⅝in. by 4½ long. If it is necessary to make them any deeper, too much space has been wasted in putting on the wire and insulation. Cutting is best started at X marked on diagram of lamination, then cutting down right round inside edge of U. The first leg of U must be bent down a little to assist cutting, but bend the tin as little as possible. A sharp pair of snips will soon get through this work. When the cutting is complete, the bends must be flattened out, and this is most easily done with the back edge of an old-fashioned flat-iron, the plate laid on the bench, and stroked with the back straight edge of the iron, its point being held up in the air. Stroking the tin on either side with fair pressure quickly straightens it. The next process is to give all another coat of shellac with a brush. There will be 84 of each, T's and U's, and these should be ample to fill the 1½in. thickness, and probably there will be a few over. The ordinary tin runs about 80 sheets to the inch, and the shellac coating will make up the difference All laminations have to be electrically insulated from each other, and shellac forms the handiest method.

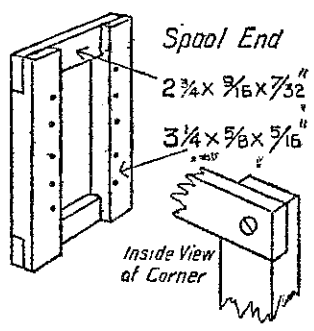


Side Elevation of Transformer

#### ASSEMBLING LAMINATIONS AND TESTING WINDINGS.

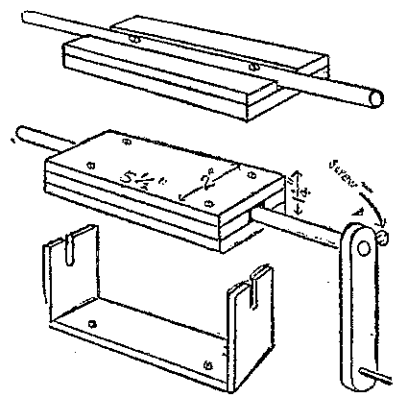
The laminations are now ready for assembling. Each layer consists of a T and a U, each placed the opposite way round to those in the last layer,




so that the joints do not come opposite. These should be assembled in a flat position. When most of them have been put in, and they begin to feel tight, the windings of the transformer can be tested

Care must be taken that everything is well arranged for this test, as a "short" of the high-tension winding might prove disastrous. The two




wires HT1 and HT centre tap are to be properly connected to a 40 or 60-watt 230-volt lamp and then the in and out primary ends are to be connected to the main supply of 230 volts a.c. The second wire is only to be touched on momentarily at first, and if the lamp lights up at nearly full brilliancy everything is correct, and the lamp may be lit again for a moment. Then cut off the main supply and connect the lamp to HT2 instead of HT1, leaving the centre tap connected. Now connect up the primary to main supply, and if the lamp lights up, all is well with the high-tension and primary windings. On no account be tempted to connect anything across the HT1 and HT2 taps, as their combined output is over 400 volts, and not safe to take any liberties with. The filament winding can now be tested, an old 6-volt valve being suitable. This should be connected across the two taps marked 45 turns, which give six to seven volts, according to the load. To save fusing the filament, a short piece of resistance wire could be put in the circuit. Now connect primary to the mains, and the valve should light up. If you have a voltmeter, the voltages across each pair of taps can be tested. All being correct, the remaining laminations can be put in. The sharp corners should be cut off the leg of the remaining T's at a sharp angle so that they will not cut the inside casing when being forced in. Use care and patience in this work and get in as many as possible. The wood clamps can then be put on and screwed up with ¼in. brass bolts 2in. long, a small square 22's brass plate being placed under the head of each bolt, and a similar plate under each nut in order to protect the wood from damage. These clamps, four in number, are 9in. long, 1½in. wide, ⅜in. thick. Quarter-inch holes, centres drilled about 7½in. apart to allow bolts to clear laminations. When bolts are in they must be covered with tape to prevent touching and connecting the ends of laminations.

#### FINISHING THE TRANSFORMER.

The last item for the transformer is the small panel containing the a.c. and high-tension fuses. This panel, of ebonite, measures 3¾in. by 1½in., and is supported by being screwed through the centre to a strip of wood, in turn screwed to the top clamps of transformer in the position shown. All the fuse contacts in this are spaced one inch apart, centre to centre, in both directions. Each hole is drilled ⅛in. and is fitted with ¼in. bolt with a washer and nut on the top surface of panel. The fuses are slipped under the washers. For the a.c., 40's copper wire, or thinner if handy, will answer well. For the high tension special fuses are required, the same being used on the front panel for outputs. The making of these fuses has already been described, but to make the article complete the description must be given again. The fuses are made by pasting a strip of cigarette tinfoil upon a piece of writing-paper, and then cutting this into the finest shreds with sharp scissors. The best cuttings about an inch or three-quarters long can be stuck with seccotine to a strip of strong paper, trimmed to size, and the ends slipped under the washers. The fuses will act so long as they contain a place where the tinfoil is narrow.

(To be continued.)

## ANSWERS TO CORRESPONDENTS

#### EXTENDING NEUTRODYNE.

In reply to D.B. last week connected with the addition of four stages of radio and a third audio stage to a five-valve neutrodyne, it was intended to state that in No. 7 of the "Record" there is a diagram by Mr. Billing of a neutrodyne circuit that might prove helpful so far as the radio side is concerned. Every effort should be made to get the present five valves to the highest efficiency before adding further to the set.

E.J.H. (Wellington) has had for a moment too much current through the filament of a valve, presumably a dull emitter. The valve now refuses to give results, although the filament is intact. This filament has lost its power of emission of electrons at the temperature at which it is intended to work. Sometimes this trouble can be cured, but it depends to some extent upon the make of valve. Some of the .06 type are not always curable. There is no harm in trying, and the method is to run the valve at the correct voltage for an hour without any H.T. on the plate. This brings some of the special chemicals to the surface of the filament, and normal electron emission may then result.

Another method is known as "flashing," but is decidedly risky. It consists in connecting one filament leg of the valve to one side of the H.T. battery, and just brushing the other H.T. connection on the other filament leg. A safe way of doing this is to charge a 2 mfd. fixed condenser by connecting it across the H.T., and then disconnecting and putting the filament legs across the condenser, which will discharge through the filament, but there is no danger of applying the current for too long a period. The H.T. used for either method should be 100 volts or so The thoriated-tungsten type of filament responds best to rejuvenation methods. If a dull emitter is frequently run at a somewhat higher temperature than that specified by the makers, the thorium at the surface is dissipated more rapidly than it can be replaced by diffusion from the interior.

## SEEKING PURE REPRODUCTION

### WHAT ARE THE CAUSES OF BAD TONE?

The radio constructor and experimenter, whatever stage of development and experience he may have arrived at, must never consider that he has reached finality in wireless matters. A new receiver may have been constructed, brimful of little tips and radical improvements, the result of several years of experience. Or a constructive aspirant may have completed his first set, which seems to its owner and producer to be something really fine and wonderful. In either case it must be remembered that radio matters are always on the move—new methods, new accessories, improvements of every kind are constantly making themselves evident And the enthusiast will usually be the first to seize upon and try out new ideas

One branch of radio reception that is now receiving increasing attention is that of pure reproduction, which is an aim to obtain from a receiving set a faithful duplication of the items broadcast from the local station particularly, and also from others at a greater distance.

A number of factors are responsible for bad tone—overloading of detector and audio stages being the most common, and frequently the loudspeaker is also an offender.

#### DON'T PUSH THE DETECTOR.

It is an easy matter to push the detector filament, even slightly in excess of its rated voltage, and go the limit with the high-tension supply. But what is the result? Plenty of "volume," no doubt, but very little more to an ear that appreciates music. Although there is plenty of volume, it is only the noisy volume of distorted signals on account of the ruthless "pushing" of the detector valve with both filament and plate voltages. If such signals are passed along to be amplified, even though the amplifiers do not add to the distortion, they add considerably to the volume, and as they are receiving more or less "mush" to deal with, they can only put out such mush in magnified form. Most listeners will be quite familiar with the harsh, scratchy, irritating tone of a set that is being wrongly operated and thus overloaded. From this it is clear that if distortion is produced by overloading the detector, it is useless to expect good tonal output from the set, however good the audio amplifiers may be. Therefore the lesson must be learnt and remembered—"that it does not pay to get too much from the detector"—its filament and plate voltages must be kept down if good tone is desired. More reduction that is, in a proportional sense, should be made in the plate voltage than in the filament, as too little on the latter may introduce scratchy tone.

Good tone may be obtained from a set with poor components, and unsuitable valves, provided the volume of output is kept down, but it might happen that such a set would only give fair 'phone strength without distortion, even with four or five valves. Yet perhaps all that would be required to effect a surprising change would be the replacing of audio transformers by a better type, with valves to suit, and possibly the substitution of valves in other parts of the circuit. Even the substitution of valves alone may make marked improvement in a set. Some valves give harsh tone as detectors, though made for the purpose, whilst others, properly handled, give mellow tone. In the audio department there is a very particular relationship between the primary winding of each transformer and the valve that precedes it. If the transformer primary has a high impedance, the detector or first audio valve preceding it must have a similar, but not exactly the same impedance. If the primary impedance is low, that of the preceding valve must be low also. Actual test with several valves of suitable impedance will soon show which actually gives the best results.

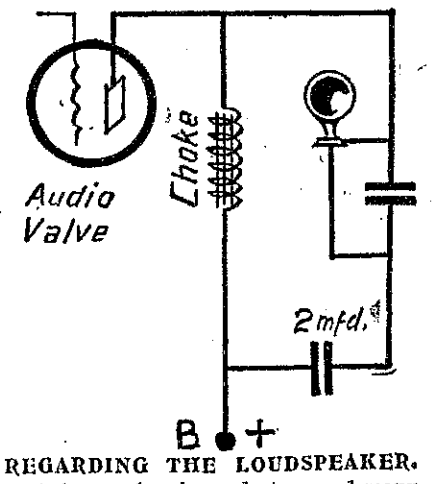
#### POWER VALVE IN LAST AUDIO.

It is impossible to get both good volume and good tone with two stages of transformer—coupled audio with an ordinary general purpose valve in the last stage. If the previous stages throughout the receiver are working efficiently and doing their share in boosting up the signals, the output current of three or four valves can only be handled without distortion by a power-valve, preferably one of the larger type, and of low impedance. Such a valve will handle large volume without distortion, but it is not at all essential that even here the high-tension voltage should be pushed to the limit given in the manufacturer's table of particulars.

#### USES OF AN OUTPUT FILTER.

Overloading of the speaker windings is a frequent cause of distortion, which may be adding to that already caused in the set. The fine wire of which there is a good quantity on the magnets of the speaker, is not capable of carrying a comparatively large direct current such as the output of a four or five-valve set, and the best way to improve matters in this portion of the circuit is to instal what is known as an "output filter," by means of which the loudspeaker is coupled to the set in such a way as to receive only impulses of voltage, or only the modulated current instead of the full plate current, increasing thereby the useful load that may be given to the speaker, and at the same time protecting its windings from the possibility of a burn-out. This filter coupling is used for the head-phones as well, and has the added advantage of not demagnetising their magnets or those of the speaker, whichever way they may be connected.

The choke filter consists only of a 2 mfd fixed condenser and a choke coil of from 20 to 50 henries, which may be made by replacing the windings of a small audio transformer with 34's or 36's enamelled wire wound in one continuous length, irregularly, but with a layer of tissue paper now and then, turning up slightly at the inside ends of bobbin, to prevent turns sinking to the layer below. Too high an inductance (henries) should not be allowed in the choke, as tone would suffer accordingly, and therefore a choke of 100 henries or more should not be adopted except after thoroughly satisfactory trial. The diagram shows this arrangement, also including the fixed condenser across the output, without which the tone of any receiver is liable to be harsh.




T.M.V. asks for advice regarding a particular circuit which has baffled several experts to whom he has referred the question of getting the set into working order. "Megohm" has not a very high opinion of the circuit in question which, for the number of valves employed, gives very poor results. It is not, in examples that have come under his notice, a good distance-getter, and is easily beaten by an efficient 4-valve Browning-Drake. People in the radio business are probably too busy at present to give full attention to this problem.

A Southern reader has built a one-control 7-valve super-het. and does not find it very satisfactory. There is trouble from harmonics, and reception only equals a four-valve set. It is proposed to use the components in constructing a more serviceable circuit. It may be that the single control introduces trouble that takes a good amount of adjusting. Further information will be given as requested.

As usual, a number of replies have been sent by post.

#### REGARDING THE LOUDSPEAKER.

If the speaker is used at a good many yards distance from the set and is connected by twisted flexible leads, tone may suffer on this account, but not