Construction Continued

ACCUMULATOR CHARGING

IN order to charge an accumulator, it is necessary to pass a current through it in the reverse direction to that in which the current flows when it is lighting the filaments of our valves. The filament current consumption of the average home broadcast receiver is about ½ ampere, and, assuming that we use a six-volt accumulator, we shall thus have a voltage of six driving a ½-ampere filament current through the filaments. Now, the measurement of power in watts is obtained by multiplying the voltage by the current, the formula for power being W equals I x E, where W is the power measured in watts, I the current measured in amperes, and E the voltage. It is obvious from this simple equation that if we know the value of any two of the quantities expressed it is easy to find the value of the missing one. Therefore, it is equally true to say that I equals W—E and E equals W—I.

Maximum Charge and Discharge Rates.

IF our receiver requires a current of ½-ampere, we must choose an accumulator whose normal discharge rate as specified by the maker is not less than this value. For safety we shall probably choose an accumulator which can be discharged at a considerably greater rate without suffering injury; in this manner we shall also gain the advantage of being able to add an extra valve or two to our set without the necessity of purchasing a new accumulator.

Now, the normal discharge rate of any accumulator depends on its ampere-hour capacity, which itself depends upon certain physical characteristics of the accumulator which are fixed by its makers. In general, the greater the ampere-hour capacity of an accumulator the greater its bulk and weight. The normal discharge rate, which is also the normal charging rate, is the maximum safe rate at which the accumulator can be charged or discharged without risk of injury to it; this rate is normally one-tenth of the actual ampere-hour capacity of the accumulator. Thus if we have an accumulator possessing an actual ampere-hour capacity (hereinafter referred to as the A.H.C.) of ten, the rate of discharge must never exceed one ampere.

There is nothing to prevent us from charging or discharging at a lower rate than the normal one. Therefore, we can charge, for instance, by passing a current of 1 ampere through the accumulator for 10 hours, ½ ampere for 20 hours, ¼ ampere for 40 hours, etc.; the same rule holds good when discharging. Thus it follows that if we know the total filament current taken by our receiver and the A.H.C. of the accumulator, we can predict with certainty the length of time during which our accumulator will operate our receiver before it requires recharging. The formula for this is T equals I—A.H.C. where T equals the time expressed in hours, I the current in amperes, and A.H.C. the actual ampere-hour capacity of the accumulator. By using the same formula we shall know exactly how long our accumulator will take to charge if we connect it in series with any apparatus through which a current of given value is flowing. It will be again obvious that if we know any two quantities in the above equation that we can find the third, and that I equals A.H.C.—T and A.H.C. equals I x T.

Most experimenters are aware that if a low-voltage accumulator, say 6 volts, is re-charged from a high-voltage main, say 230 volts, D.C., by means of resistances, most of the energy drawn from the mains is wasted in the resistance. Of course, if the charging is done in the evening, when the electric lights are on, and the current through the latter is passed also through the accumulators, this is a very efficient, although not always a convenient system.

With alternating-current main supply, however, it is always possible, by means of a transformer, to step-down the voltage to the right value, or thereabouts, when the wastage can be reduced to a small quantity. Some form of rectifier is, however, necessary in this case, so as to pass current through the accumulator in one direction only.

Charging from D.C. mains, when only one battery is dealt with, is a far more expensive process than charging from A.C., on account of the great loss of current dissipated by resistances, and which has to be paid for.

New Accumulators.

A NEW accumulator should not have the acid put in it till just before charging. If it is likely to have only occasional use or indifferent care, 1-10th less decimal point gravity of acid (i.e., 1.19 if 1.20 is recommended) will be safer, and efficiency not noticeably less; 1.18 is not too low.

After one or two charges and discharges some active material from the plates will generally be found in the bottom of the case. This is seen mostly in the corners; and if at any time, either on charge or discharge, or even when not in use, it should touch any two plates, positive and negative, it will probably ruin the whole accumulator.

When seen to have reached a dangerous point it must be got out. This sediment ruins more cells than any other thing. Excessive rate of charge and discharge causes most of it.

Removing Sediment.

DRILL a 3-16in. hole in the corner of the lids of each cell, then take out vents, and empty acid in a clean jar, and let it settle. Rinse out the cells with soft water until all that will dislodge has come out. The small holes you drilled in the corners will perhaps take a knitting needle, and stir up any that has got solid, and will enable you to get out the last bit of dirt. Then put in the cleanest of the acid again, and at once have it charged. Plug the little holes you made with celluloid cement or a rubber plug. Whether there is any dangerous sediment to come out or not, this will often improve the capacity of the accumulator. As to the sympathy of the charging man for your cells, you can only hope for the best.

The top of the accumulator must be kept as free as possible from acid, and the terminals and all metal parts kept coated with vaseline. To ease a sulphated terminal, warm it, and if you have to use pliers, go carefully. Clean it well afterwards, and vaseline.

Final Hints.

DON'T discharge at more than one-tenth of the rated capacity, or even less than this for fairly constant work. And reckon one-tenth of a reputed 40 amp. accumulator as 2 amp., and other sizes accordingly. Exceeding this, except for short periods, is not good for the plates. The same applies to charging. This is why the more valves you use the larger should be the accumulator.

Beware of the acid getting on the clothes. It burns holes at this strength. Liquid ammonia kills it in the cloth, but is worse than the acid itself on the skin. A discharged accumulator standing by is like a dry battery at work. It is eating its inside away.

A broken lug should be burnt on, but it may be soldered, or mended with a brass plate, or threaded brass wire and nuts. In either of these last two cases be sure to coat the mend well with paraffin wax or celluloid cement before replacing.

Always keep the dielectric well up, and make up for loss in evaporation only with pure distilled water. Ordinary house tap water may cause peculiar and dangerous sediments and deposits to collect.

Finally, remember always that an accumulator is a chemical and not a mechanical device.

STILL, they come! Another static reducer is reported from America. A machine that reduces static noises has been invented by William Scott, band instrument repairer, after twenty years of experimenting. The clariphone, as it is called, is connected to the output of the radio receiver. Valves in the machine reject all noises that are not harmonic signals. A fortune awaits Mr. Scott if his gadget is a success.

GERMAN fans who recently heard so much applause after the renditions of an orchestra from the Langenburg station formed the opinion that the group was performing before an enthusiastic audience. It was only a phonograph record containing the reproduction of a crowd applauding.

ACCUMULATOR CAPACITY INDICATOR

ASSUMING that the acid in a lead accumulator cell is of the correct specific gravity, the terminal voltage of the cell may be taken as an indication of the state of plates; thus a fully-charged cell has an E.M.F. of just over 2 volts, which falls to 1.8 in the discharged condition. A voltmeter may, therefore, be used to indicate the condition of an accumulator, and this principle has been made use of in a new accumulator capacity indicator. The scale, instead of being calibrated in volts, is subdivided into three regions marked "Low," "Medium," and "Full," each band being given a distinctive colour. A simple test revealed that the red or "Low" region covers a range of 1.5 to 1.7, the orange or "medium," 1.7 to 2.4, and the blue or "full," 2.4 to 2.7 colts per cell. The latter range, representing maximum potential, is for use while the battery is on charge, and indicates when the charge should be stopped.

The L.T. type gives ample warning before the filament current runs down, and the H.T. type must be the means of saving many accumulator H.T. batteries from ruin; too often a battery is left in service until signals fade away and three or four complete discharges of this nature are sufficient to damage the small plates beyond repair.

IMPROVING AUDIO QUALITY

QUALITY of reproduction may be marred on the audio side in many different ways. There is distortion, arising from transformers, from badly-proportioned resistance coupling, low volume-carrying capacity of the last valve, lack of grid-bias, and last, but not least, low-frequency reaction.

Although the internal resistance of B battery or eliminator may not be so high as to cause an actual howl in a two or three-valve amplifier, there may be distortion caused by reaction due to such internal resistance. A remedy for this trouble, if it is suspected to be present, is to place an extra resistance in the plate supply leads excepting that to the power-valve. A 2-mfd. by-pass condenser is placed across each such resistance on the side away from the source of current, and B negative filament common lead.

In a general way, a resistance of 20,000 ohms at least, is recommended, and whilst it may be considered that a great drop in plate voltage would result from its inclusion in the circuit, when an eliminator is in use, the drop need not cause any appreciable drop in volume.

This method will at least prove a good last resort for any tendency to trouble from reaction on the audio side, as it is a practically certain cure. It may also be applied to the detector. The method is also a cure for "motor-boating."

SCREEN GRID ON S.W. ADAPTER

A CORRESPONDENT asks for particulars as to how the screen-grid R.F. unit can be connected to the short-wave adapter. This will be fairly obvious to many, as it means just the same treatment as is given to the detector portion of the short-wave receiver. It would be best to mount the unit and adapter one one board as a complete unit. "Megohm" will look into the matter, and any points of importance will be dealt with next week.

The construction of short-wave receivers and adapters is going apace just now, in preparation for the Tunney-Heeney fight, and the screen-grid unit will be found an invaluable addition. Constructors of adapters are reminded to ascertain which pole of the A battery is "earthed" in their broadcast receiver, and to earth the same in the adapter. In the "Listeners' Guide" diagram A positive is earthed, so if A negative is earthed in the broadcast receiver, it only means in the adapter altering the earth connection from filament positive to filament negative, where shown just above the valve base in diagram. If this point is not attended to it may result in the A battery being short-circuited.

CONNECTING AUDIO TRANSFORMER

ENQUIRY is frequently made as to the way in which a transformer should be connected up when marked IP, IS, etc. Failing any definite directions, it should be connected as follows:—O.P. to plate of previous valve, IP to B positive, O.S. to grid of next valve, and I.S. to negative of grid-bias battery, or if no grid-bias, to the filament battery or terminal marked C positive.

This arrangement is usually correct, but reversals of both primary and secondary should be made in turn if there is any suspicion that everything is not O.K.

The value of the fixed condenser shunted across the primary of the first audio transformer is not often stated by the manufacturers, but is often of importance in a circuit. Its value may be from .0005 to .001 mfd.

RADIO DIRECTORY

What to Buy and Where

AUCKLAND

ATWATER-KENT RADIO ..	Frank Wiseman, Ltd. 270-272 Queen Street, Auckland.
ALTONA & HAMMARLUND-ROBERTS SETS.	Johns, Ltd. Chancery Street, Auckland.
AMPLION LOUDSPEAKERS ..	All Radio Dealers.
BREMER-TULLY RADIO	Superadio, Ltd., 247 Queen Street, Auckland.
BURGESS RADIO BATTERIES,	All Radio Dealers.
CE-CO VALVES	All Radio Dealers.
FADA RADIO	Radio Supplies, 251 Symonds Street, Auckland.
FEDERAL, MOHAWK, GLOBE	Federal Radio House, 9 Darby Street, Auckland.
GILFILLAN AND KELLOGG .	Harrington's, Ltd., 138-140 Queen Street, Auckland.
GREBE RADIO	Howie's, Dilworth Building, Custom st., Auckland.
MARCONI ECONOMY VALVES	All Radio Dealers.
MULLARD VALVES	All Radio Dealers.
RADIOLA RECEIVERS	Farmers' Trading Co., Ltd., Hobson Street, Auckland.
RADIOTRON VALVES	All Radio Dealers.
RELIANCE BATTERIES N.Z. Made	Reliance Battery Mfg. Co., Ltd., 96 Albert Street, Auckland.

COUNTRY TOWNS

CROSLEY ELECTRICAL AND BATTERY MODELS	The Forrest-Crosley Radio Co., Ltd. Cuba Street, Palmerston North.
CROSLEY RADIO SALES AND SERVICE	D. A. Morrison and Co. The Avenue, Wanganui.
FEDERAL AND AIR PATROL RADIO	J. B. McEwan and Co., Ltd., New Plymouth.
GAROD, CROSLEY, RADIO AND ACCESSORIES	The Hector Jones Electrical Co. King and Queen Streets, Hastings.
GREBE, CROSLEY AND RADIOLA SERVICE	E. Dixon and Co., Ltd., Hawera.
RADIOLA DEALER AND SERVICE	G. C. Carrad. 140 The Avenue, Wanganui.
PHILIPS VALVES AND APPARATUS	All Good Radio Dealers,

CUTTING OUT THE DETECTOR TAP

IN order to do away with the unequal drain caused on B batteries by the detector tap, or the extra high resistances required in B eliminators to sufficiently reduce detector voltage, a good plan is to employ a first audio stage of resistance coupling. By this means the B voltage need not be cut down by external resistances, as the coupling resistance will do all that is required.

In such a case a higher resistance than the 100,000 ohms. usually employed may be used, and 2 or 3 megohms will be found to work well and give high amplification with a saving of B current. The coupling condenser between plate and grid may be a half-microfarad, which will efficiently pass the lower audio frequencies. It is also necessary that the grid leak on the first audio tube should be as high as will work without "blocking," which would soon be indicated by distortion or motor-boating.

If this change is made according to the lines indicated, and a high-mu valve used as detector, amplification will be fully as great as that obtained from a transformer, and the gain in quality will depend somewhat upon the type of transformer replaced.

THE International Bible Students' Association arranged for May 30 what is believed will be the greatest radio hook-up to that time in America. More than 100 stations were linked together to hear an address at Albany by Joseph F. Rutherford, president of the organisation. The key station was WBZ, Boston.

RADIO, infant of the arts, is steadily gaining favour in Greece, ancient mother of the arts. Receiving sets imported in the last year were valued at £10,000. Sets manufactured in France lead the list of Greek imports with 105, the United States is second with 47, Germany third with 29, and Great Britain fourth with 19.

THE bullfight as broadcast by Spanish stations is the favourite radio diversion of the large Spanish colony in Paris. Before the fight is heard a talk by the toreador, then a description of the weather and of the crowd, and finally the shouting as the fight proceeds and acclamation of the hero of the day.

WHEN one soldered joint has to be made close to another one, a damp rag wrapped round the latter will tend to prevent it becoming heated and unsoldered.

EARTHENWARE jars should not be used as wet-battery containers, as there is much more leakage with these than with glass.