An Efficient "B" Battery Accumulator

Charges at Low Voltage

By "MEGOHM"

HERE is the promised B accumulator, so arranged that it can be charged up quickly and reliably with the A battery charger described on March 2. The chief departure from the orthodox arrangement is that the test-tubes are arranged in rows, seven in each row, or a total of fourteen volts in each row. The end plate of each row is connected to a length of wire sufficient to reach across the top of the battery and join up with a similar wire from the opposite end of the next row. The joining is accomplished quickly and effectively by means of a battery-clip attached to the end of each flexible wire. When the battery is used for reception the clips attached to the positive ends of the rows are all connected to the negative end of the adjacent row, then putting the whole battery in series. When charging is required the clips are all taken apart and all positive ones clipped on the upper edge of a brass or lead plate on the front of the battery, in which a terminal is inserted for connection to the positive terminal of the charger. All negatives are similarly connected to a plate at the back of the battery, with a terminal for connection to the negative of charger. Thus the rows are all connected in parallel, or form a 14-volt battery of much increased capacity, and can be charged with a charger giving 16 to 20 volts. A strip of wood above the centre of the battery forms a support for the clips out of the way of the acid, and whilst charging is in operation the clips and connections are more out of the way, as they are outside the battery case.

It is left for the constructor to decide just what voltage he requires, but rows of six or seven tubes in each should be adopted, and the number of rows constructed to give the nearest voltage, which will be 84, 98, 112, or 126 volts. Eight rows, giving 112 volts, is a useful size, 56 tubes being required. The plates to be described will go into ¾-inch test-tubes, but if 1-inch test-tubes are used there will be more room for liquid, which will not evaporate so quickly, and will not require distilled water adding so often.

THE LEAD PLATES.

THE lead plates, which will be afterwards pasted, are cut from strips of ridging lead used by plumbers. This lead is in strips 1½ inches wide and 8 feet long, and as it is machine-planed from thicker strips, it is bright and clean, ready for use. These strips are to be cut into 12-inch lengths, one for every tube to be used. The diagram shows how each plate is to be cut, and the best way to mark these for uniformity is to cut a cardboard template and lay it on each in turn, scratching round the position of the cut-out portion in the centre. A point to be noted is that the portion shown shaded is to be cut out as waste, and the outer strip left joined at X, afterwards to stand up clear of the acid spray, and to which the wander-clips may be attached for voltage tappings.

The plates for the end positions in the rows are to be separated by cutting the central connector at the end near X. This will leave the two halves separate with a tag on each. It is not feasible to cut the narrow tag much wider, because it would then interfere with the bending of the plates.

Tags for taps will not be necessary on very many of the cells, as the ends provide convenient taps. The first two ends give 14 and 28 volts, a tap in the centre of the second row will give 22, and in the centre of other rows, 36, 50, 64, 78, 92, and so on, so that only about six need be cut with tags besides those for the ends.

The total length of the plates when pasted and folded up will be 11½ inches, as ¼ inch at each end is folded over.

A number of holes not exceeding paste, with dilute sulphuric acid of punched in the plates with an inch nail or other convenient point. These holes should consist of a row of about 8 or 10 down the centre and the same number just outside each dotted line. The more holes the better, within reason. If it is desired to take the burr off the holes, it may be done with a sharp chisel, but the burr may be on what is to be the inside of the plates.

BENDING THE PLATES.

BENDING is the next operation. The plates have first to be bent at the dotted lines running the full length, forming a kind of gutter shape half an inch wide inside. For the purpose, a strip of wood a half-inch thick is prepared, and the two corners slightly rounded off. This wood is then placed over the lead and the sides are bent up as shown in section.

MAKING THE PASTE.

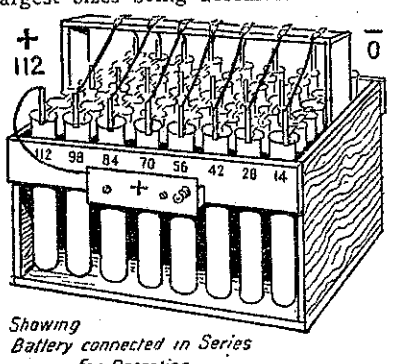
THE plates are now ready to be filled with paste, one end of each plate being filled with positive and the other end with negative paste. The negative paste is made from litharge, a buff-coloured powder, and the positive is made from ordinary red lead. These are not expensive, and the amount required will vary with the number of plates and the amount of paste put into them. About 1½ to 2lb. of each should be ample.

A quantity of powder is taken and mixed on a sheet of glass to a stiff paste, with dilute sulphuric acid of usual battery strength, using a wooden spatula, which may be made from a strip of wood thinned down. When a quantity of one of the pastes has been mixed, it can be laid in one end of each plate to a depth of one-eighth of an inch. The lead on each side is then folded down to overlap, and the quarter-inch at the bottom ends is turned up and all corners and joints attended to and pressed together to be as close as possible. The top ends also must be closed up, and to facilitate closing, the paste should not be laid too near the ends. The other ends may next be treated with the opposite kind of paste and closed up. All the plates are now to be laid aside to dry for several days, or a week, if possible, as thorough drying helps the paste to stay in the plates, though the form of construction gives it little chance to get out. Care should be taken to make the end with the tags either all positive or all negative, to preserve uniformity for tapping

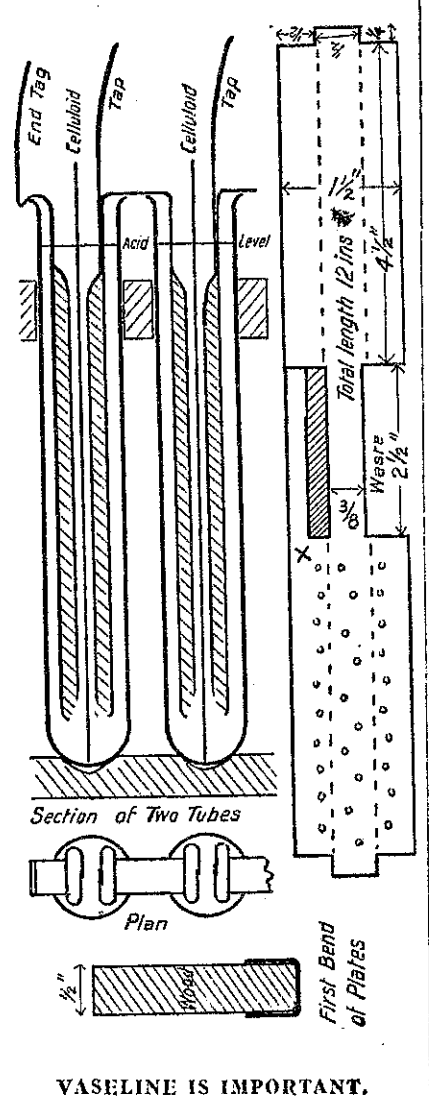
THE BATTERY CASE.

EXACT dimensions will be left to the constructor, as they will vary with the number and diameter of tubes decided upon. One item that should be adhered to is the division between the tubes, which should be ⅜-inch wood. There are several ways of supporting the tubes. One method is to bore holes in a sheet of three-ply or ¾-inch wood, and in the base drill countersunk marks to take the lower end of the tube. Another way of supporting the top end is by dropping ⅜ laths in between each row, a set of laths running each way, one set resting on those below, and the lower ones resting on strips inside the two ends of the case. The laths need not be fastened, as the tubes keep them in place. As much as possible of the front and back of the case should be left open to give a good view of the plates.

The strip of wood over the top to support the clips should not be less than 4in. above the tops of the tubes, and could be 1½ to 2 inches wide. The tubes should project nearly an inch above the strips that support them. Test tubes are very irregular in size, and "inch" tubes will vary in inside measurement from ⅞ to ¼-inch. Measurements must be made to allow for the largest sizes being accommodated.



Showing Battery connected in Series for Reception



VASELINE IS IMPORTANT.

BEFORE the tubes are put into place the tops should be smeared with vaseline with the finger for a depth of half-an-inch both inside and outside. All portions of the plates above the acid level to within about half-an-inch of the topend of tags and over all cell-to-cell connectors. If there are any soldered joints on tags it pays to coat them with celluloid cement or shellac and then liberally apply vaseline. In time the acid eats through unprotected copper wire. On no account neglect the vaseline.

GENERAL.

THE connecting wires should be flexible wire with rubber covering only—any kind of fabric soon rots with acid spray. An alternative way is to double in half two lengths of 26's enamelled, clean the enamel off the loop end and fasten to the screw of the battery clips, and solder loose ends to tag of plate. Another method is to waste a small amount of lead by cutting separate end plates with a tag of sufficient length and attach the clip to the end. Considering that the battery will only need charging about once every two weeks, when well formed, there will not be much wear on the connectors.

Have the negative end of every row at the front and the positions at the back, or vice versa. The two ends, negative and positive, can be permanently joined by a soldered wire to the front and back plates respectively. The terminals will then be the negative and power-valve connections to the set when charging is finished.

If preferred, a 1-16 drill could be used to make holes in the plates, as several could be drilled together.

When not charging, a coarse cloth can be thrown over the top of the battery to exclude dust, or otherwise a deep wooden lid could be made to drop over the top.

The plates are kept from touching in the tubes by a strip of motor-hood celluloid or glass, about 6½in. long and a very easy fit for the width of the tube used.

THE ACID SOLUTION.

IT pays to use good acid in a small accumulator such as this, so pure sulphuric acid should be purchased. Five parts of acid to twenty-one of distilled water is the correct strength to use. Place the water in a basin and add the acid gradually, stirring with a glass rod or other acid-proof article. Considerable heat is generated during the process of mixing. If distilled water is difficult to procure, water that has been boiled and allowed to cool is a good substitute. Where there is choice, rain water is better than artesian, as the latter often contains traces of mineral salts.

When calculating the amount of liquid required for the tubes it must be remembered that it is only necessary to provide sufficient to properly fill half the number of tubes without plates in, because the other half is occupied by the plates.

The plates must all be in position and all construction work finished when the acid is put in, and then the first charge may be proceeded with.

THE FORMING CHARGES.

WITH the end of every row connected to the nearest plate, the two terminals are connected to the charges, positive of battery to positive of charger, and negative to negative. A length of, say, five or six inches of 36's nichrome resistance wire or other kind of resistance should be inserted in the positive lead to ensure only a gentle current from the charger, but notice should be taken that minute bubbles soon begin to come away from the plates, showing that charging is proceeding. The resistance should never be sufficient to lower the voltage below the necessary amount. After 10 or 12 hours the battery may be disconnected from the charger, connected up in series, and discharged through an electric bulb, 230 or 110 volts, fixed in a socket with wires to attach to the battery terminals. This lamp should be left connected until it dies out, which will not be for several minutes, which should be carefully timed, as comparison will indicate the increased capacity with later charges. After this first charge, charge up again for, say, six hours, when, if anxious to test the battery, use it on the set for a session, but immediately afterwards discharge with the lamp and put on charge again for a further six hours. Altogether it is as well to give a total of 36 to 48 hours' initial charging, but care must be taken to keep the charging rate down with the resistance, which may be reduced a little after the third charge. The amount of resistance to be permanently used will depend upon the number of rows of cells.

The total cost of the battery should be well under £2 for the 112-volt size. One-inch test-tubes cost about 18s. for the half-gross, and three-quarters a little less.

When the first charge has been in progress for half an hour, the outside of the plates should begin to show the respective colours, deep chocolate the positive and grey for the negative. At a later stage the positive plates will be inclined to show a lighter brown in colour, but will later assume the deep tone and retain it. The object of the initial charges is chiefly to turn the red lead into the correct positive compound. During the early life of the battery it will be as well to charge at least once a week, and after a few weeks the time of recharging may be extended. During this time keep an eye on the positives, and if they turn light in colour it may be an indication that the battery has been standing too long and requires a charge.

Do not attempt to increase the thickness of the paste over ¼in., which will give plenty of capacity.

Plates must be at least half an inch above the bottom tubes to allow room for possible sediment.

The liquid is to be kept a quarter of an inch above the tops of the plates, which are ¾in. below top of tubes

Those who have not had much to do with accumulators may be inclined to leave short tags for taps, but it is important to have them as long as possible clear of the spray and acid, as the latter creeps up gradually and causes dirty contact for the clips.

This battery can be charged with any charger giving 16 volts or more. If you have a charger giving only about 14 volts, put only six cells in a row. Every cell gives two volts.

The plates at back and front are made to stand out by mounting on a strip of wood. Clips may then be attached to either the upper or the lower edge.

PHILIPS LABORATORIES

AN advance copy of a folder from the Philips Laboratories announces several new items, of which samples first appeared in Australia at the recent Sydney Radio and Electrical Exhibition. There is an audio transformer giving even amplification from 200 to 10,000 cycles, ratio 3-1, and it is claimed that if preceded by the 415 valve that the average "step-up" is 45 per stage. Splendid results are also obtained with A409 and A609.

New Power-Valves.

Two new 4-volt power-valves are announced, the B409 and B405. These are economical of plate current, and work on low grid bias. The B voltage recommended is 150.

B and C Eliminator.

The "Power-plus B and C Eliminator gives grid-bias at three different voltages up to 40 volts maximum. This is suited to ordinary receiving sets or those using A.C. valves.

New A.C. Valves.

Three types of alternating-current valve are announced. C142 for R.F. amplification with a factor of 150, is a screen-grid type using a.c. directly on the filament. The F215 is a special detector, therefore indirectly heated, and has an amplification of 15. The D143 is a power-tube with an amplification of 150 and contains three grids, the filament being heated directly with a.c.

Low Capacity R.F. Valves.

Interesting news is the production of two special valves for R.F. amplification, dispensing with the usual neutralising devices, yet giving exceedingly high amplification of R.F. signals. When used in cascade (several stages) they can be stabilised by very simple devices on account of the internal capacity being reduced to about 60 per cent. of that in the average valve. The A635 is a six-volt valve taking .06 amp., with amplification factor 35 and impedance 23,000 ohms. The A435 is a four-volt valve taking .06 amp. with an amplification factor of 35 and impedance 29,000 ohms. The popular 13/6 is to be the price of these special valves.

"A" Trickle Charger.

A trickle-charger for the "A" battery is also announced, which can be made to give an output varying from .01 to .17 ampere, the latter sufficient to keep an "A" battery operating the largest of receivers always at peak.

New Loudspeakers.

A new loudspeaker of the cone type is a slightly smaller replica of the popular "PCJJ" type, and sells at a lower price. Full volume is reproduced without rattle or distortion. It is to be known as the "PCJJ Junior." A smaller and less expensive type still, incorporating the same balanced magnet and floating cone system is the "Baby Grand."

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