

Construction Continued

THE LIFE OF THE B BATTERY

SOME INTERESTING FIGURES

A RECENT article dealt with the cost of running B batteries, demonstrating the advantage of using the larger or "super" sizes rather than the small or "standard" sized cells where the load is more than 5 milliamperes, or a three-valve set. Claims are sometimes made that these small cells will stand up to a heavier drain, but they cannot be substantiated.

A British radio journal gives further light on the subject. A test was made of a "standard" dry B battery upon the label of which it was stated that the normal discharge rate was 10 milliamperes. Run for three hours a day upon week-days only and kept at a constant temperature of 62 degrees Fahrenheit, this battery proved to have a useful life of just under eleven days, or 82½ hours of service, and this, with an initial drain of 10 milliamperes, which, as the voltage fell, was reduced to 7 milliamperes.

THE average potential drop of this battery during its daily three hours' run was nearly 12 volts. The actual rate at which the voltage drop occurs during a three hours' run is also a matter of considerable importance. It might be thought that it would take place quite regularly, but this is not the case. During its period of rest the battery recuperates the potential rising to a reading much above that obtained at the end of the previous working period.

GRID-BIAS ADJUSTMENT.

AS soon as the battery is placed under load again a rapid falling off is seen owing to rising internal resistance. The current declines in proportion, and when a point is reached at which the discharge rate is such that the battery can cope with it fairly well the reduction of potential becomes much more gradual.

Records of curves from readings taken every quarter-hour show that a heavy fall in voltage is to be expected during the first hour, a smaller one during the second, and a still smaller one during the third. When, therefore, small batteries are used under a fairly heavy load, a reduction of the grid bias may be desirable at the end of the first and second hours of each run. It should, however, be remembered that any such reduction will mean an increase in the current and, therefore, a still more rapid fall in the voltage.

ANOTHER point worth attention is the amount of recuperation shown by the battery. On some days, in the case of the one whose history is plotted in Fig. 1, this was as much as 12 volts, or rather more. Now, rapid recuperation, especially if it means a quick fall in the voltage at the beginning of the next working period, is not altogether a virtue; in fact, one would much prefer a battery which showed a smaller temporary recovery, and a subsequent voltage drop of less amount.

Another point which emerges from a study of Fig. 1 is that voltage readings taken after a rest period, and before the battery is placed under load, may be entirely misleading. On the eleventh day, for example, a reading taken prior to the working period would have shown a voltage of 84.2; one might, in fact, have thought that the battery was by no means in bad condition.

At the end of the first hour, however, the voltage was 72.8 and at the end of the second, 70.4. A reading should never be taken until they have been for at least an hour under their normal working load.

BATTERIES OF LARGER TYPE.

IN addition to the standard capacity battery two other sizes are upon the market. These are the "large capacity," made up of cells 1½ in. in diameter by 2½ in. in height, and the "super capacity," whose cells measure on the average 1½ in. in diameter by rather less than 3½ in. in height. What performances are to be expected from these under a load of 10 milliamperes? The life history of a good quality large-capacity battery (by no means the best of those tested) over a period of eighteen weeks, the conditions of the test being the same as those previously described, shows a discharge at the rate

of 10 milliamperes for three hours daily on week-days.

HEAVY INITIAL DROP.

THIS curve is most instructive. It shows that, as might be expected, a fairly heavy fall takes place during the first week, after which the battery settles down and maintains a comparatively steady E.M.F., with a very gradual falling off. The point at which it begins to steady down is approximately 93 volts, thus showing that about 9 milliamperes is a load with which it is well able to deal.

On a conservative basis their average useful life may be estimated as at least six months. This means that two renewals will be required in the course of a year at a cost of roughly fourpence per volt. The annual cost thus works out for 100 volts at £3 6s. 8d., or 8 penny per hour for 1000 working hours.

AN IMPORTANT POINT.

A VERY important point to notice about the life curves of the large-capacity battery is the small fall in E.M.F. which takes place during a working period. On the last day of the first week, for example, the average fall during the three hours' run was just over 8 volts out of the 100, and matters were very little worse after eighteen weeks.

It follows that no noticeable distortion is likely to occur during an evening's reception if the low-frequency valves are properly biased at the beginning; it will be seen that there is very little need to bother about the grid bias, provided that it is correctly adjusted at the end of the first ten days or so. The life of the average small grid-bias battery is about nine months, and its own fall in E.M.F. will be almost sufficient to allow for that which takes place in the high-tension battery.

THE "SUPER" CLASS.

WE come next to the super battery, usually made up in nominal 45- or 50-volt units weighing from eleven to twenty pounds apiece. The actual weight depends largely upon the nature and amount of solid insulating material used. These batteries entail rather a large initial outlay, but experience shows that whenever the average load is 10 milliamperes or more they are well worth the extra money.

They will stand a drain of 25 to 30 milliamperes for long periods, and one of their great virtues is that they very seldom become noisy even when their voltage has fallen to something very low indeed.

The provision of super batteries represents an initial cost of about sixpence per volt. Under a 10-milliamperes load at least a year's working on an average of three hours a day is to be expected. The annual cost for 100 volts, therefore, works out at £2 10s., or 6 pence an hour for a thousand hours of work.

It will be realised that the life of any size of battery depends (provided that it is of reasonably good quality and is kept in a suitable place) mainly upon the number of hours per week that it is run and the average load imposed upon it.

USING TWO B BATTERIES.

THE use of two separate B batteries is then discussed, showing that a small battery may be used for all but the power tube, and for that a medium or large sized battery supplied the current.

Should the first low-frequency valve, either of the "first stage L.F." or of the "R.C." type, be resistance-coupled, it may also be served by the small battery, for the total load for the whole of this portion of the set is in this case not likely to exceed 3 or 4 milliamperes. The valve in the last stage may then be provided with a battery of its own of the medium capacity type if it is of the small power kind, or of the largest type if it is a super-power valve.

Besides leading to economy in working, the use of a separate battery for the last low-frequency valve has other advantages, which cannot be dealt with here. Let us take a concrete example of the saving produced by using separate batteries. On measuring the total current taken by a three-valve set we find that the amount is, say, 10 milliamperes. On switching off the last valve, however, the current falls to 3. The high-frequency and rectifying valves are thus passing 3 milliamperes and the power valve in the last stage 7.

ANNUAL COSTS.

REFERENCE to the life curves in Fig. 6 shows that under a 3-milliamperes load about half a year's working may be expected from the small battery, whilst at 7 milliamperes one of medium capacity should last for some thirty-five weeks. The small battery will thus have to be replaced twice a year, the annual cost being thus about £1 for H.F. and rectifier H.T. supply. The medium-capacity battery will need renewal about once every nine months. If, therefore, 100 volts are used, the annual cost will be about £2.

We thus get a total outlay of £3 per 100 volts, which for a thousand hours works out at 72 pence per hour. Now, if a common battery of the medium capacity size were used to supply the 10 milliamperes needed for the set, its useful life, as the curves show, would be about half a year. The annual ex-

TIPS AND JOTTINGS

A CONSTRUCTOR at Spreydon, Christchurch, writes as follows: "I have just completed the construction of the full-wave B battery eliminator that you gave in the 'Radio Record' some time back. Although I have been some time building this eliminator on account of delays in procuring parts, I must say I have been amply rewarded for the trouble, or, I should say, the pleasure it has given me in the making. The eliminator has proved a great success. I have not been able to detect any hum, and have far better results than formerly. Words cannot express my appreciation of this design, and many others that you print in the 'Radio Record.'"

Short-wave Adapter.

SO long as only limited wave-band of reception is satisfactory to the listener, one set of fixed coils is quite a good idea, but to be able to cover the entire range the plug-in coils are worth while. A .00025 variable condenser answers quite well for secondary control, but the use of a condenser of smaller capacity makes the necessary fine tuning much easier, and is invaluable in a receiver that may at any time be required to get down below twenty metres, where the frequencies are tremendously high, and tuning consequently more difficult.

Neutralising the Browning-Drake.

SEVERAL inquiries have come to hand regarding neutralisation. The early part of the instructions in recent specifications was rendered ambiguous owing to the printers misplacing a line, so we give the instructions here. "Tune in a loud station near centre of broadcast waveband, 1YA or 3YA, maximum volume being carefully obtained without oscillation, reaction being turned well down. Next turn out the filament of R.F. valve, then with the neutralising stick turn neutralising condenser until signals are inaudible or at minimum strength, then turn on filament of R.F. valve, and the station should

QUERIES BY CORRESPONDENCE.

1. Every communication enclosing queries is to be addressed to "Megohm," Box 1032, Wellington, and must be accompanied by a stamped addressed envelope for reply by post.

2. Questions must be written so that a space is left in which the reply may be added.

3. No charge is made for replies.

come through well. Now see that the variable condensers are both at maximum tuning; if not, they must be altered to get the best tuning, and the process of neutralisation is gone through again. The second attempt is practically certain to be correct. If neutralisation cannot be obtained, reverse the connections to the R.F. primary and try again. If it cannot be obtained either way, it may be an indication that the capacity of the neutralising condenser is too great or too small. In either case the correct value must be substituted.

Rectifier Tubes.

TWO new Radiotron rectifier tubes are the UX280 (full wave) and UX281 (half wave). These contain a new type of oxide coated ribbon filament giving high emission with low power input. The filament of the former takes 5 volts at 2 amps, and the maximum output is 125 milliamperes at 300 volts. The half-wave tube requires 7.5 volts at 1.25 amps on the filament, and passes 110 milliamperes at 750 volts.

Alternating Current Receivers.

QUITE a large number of these receivers has now been installed in listeners' homes in New Zealand. The distributors state there has been for less trouble in every way with these receivers than with the average battery set, and that all are working satisfactorily.

Be Careful of UX222.

CARE must be taken that when in action the UX222 does not receive a shock, which may cause the filament to touch the control grid and burn out. Purchasers of these valves should test them with a 6-volt battery, one pole being connected to a filament pin, and the other touched on each of the pins in turn. The filament should only light when battery leads are both on the filament pins. If there is a circuit in any other way, the valve is defective. Test also for connection between inner screen and control grid, and between plate and screen.

Big B Batteries Pay.

IT pays best to purchase the large sizes of B batteries, where several valves are in use, for as a rule the battery of double milliamperes capacity will last more than twice the time of the smaller one on the same work, as the larger the battery the less will the strain of a given demand be felt.

The Browning-Drake Primary.

In constructing the R.F. transformer for the Browning-Drake, care should be taken to provide good insulation between the primary and secondary coils, owing to the high potential difference across them. In no case should the insulated wires of one be allowed to come into contact with those of the other, but the insertion of a strip of stout paper between the two will remove any chance of a "short."

penditure would thus be, roughly, £4, or .96 pence per hour for a thousand hours.

There is thus a very distinct economy in such a case in using two batteries.

(End of Construction.)

AUCKLAND DIRECTORY

What to Buy and Where

ATWATER-KENT RADIO	Frank Wiseman, Ltd. 170-172 Queen Street.
ALTONA & HAMMERLUND RADIO SETS.	Johns, Ltd. Chancery Street.
AMPLION LOUDSPEAKERS	All Radio Dealers.
BREMER-TULLY RADIO	Superadio, Ltd., 147 Queen Street.
BURGESS RADIO BATTERIES,	All Radio Dealers.
CE-CO VALVES	All Radio Dealers.
CROSLEY RADIO	Lew's Eady, Ltd., 190 Queen Street.
FADA RADIO	Radio Supplies, 251 Symonds Street.
FEDERAL, MOHAWK, GLOBE	Federal Radio House, 8 Darby Street.
GILFILLAN AND KELLOGG	Harrington's, Ltd., 138-140 Queen Street.
GREBE RADIO	Howie's, Dilworth Building, Custom St. E.
MARCONI ECONOMY VALVES	All Radio Dealers.
MULLARD VALVES	All Radio Dealers.
RADIOLA RECEIVERS	Farmers' Trading Co., Ltd., Hobson Street.
RADIOTRON VALVES	All Radio Dealers.
RELIANCE BATTERIES	Reliance Battery Mfg. Co., Ltd., 90 Albert Street.
PHILIPS VALVES AND APPARATUS	All Good Radio Dealers,

A RADIO FURNACE

NEW ELECTRICAL MARVEL.

The secrets of the mysterious forces of electricity are now being applied in many ways, especially in the world of industry, and equally as marvellous. The magicians of science recently perfected a method of melting steel to a glowing red-white and molten state within a wooden box with radio.

Scientists to whom this achievement is due are satisfied that the powers and wonders of electricity are only beginning to be understood. They visualise the time when great power plants in different parts of the country will radiate their power by wireless to be picked up in shops, factories and houses, wherever it is wanted, and they believe that this will be realized within a few years.

The method of melting steel by radio was discovered in a workshop in Sheffield, England.

For more than two centuries iron and steel have been melted in pots called "crucibles" by heating them in coal, coke and gas furnaces. It has been a hot, hard and long job, taking three, four and five hours to melt a pot containing sixty pounds of metal. The metal in its making, has picked up many impurities from the coke and gas, and the steel has never been perfect. Electricity has solved the problem.

Quick and Simple Method.

The wireless furnace consists of a wooden box, standing on a tilting frame in a clean, cool room. Inside the mystery box is a pot that holds four hundred and fifty pounds of steel. The pot is surrounded by an inch or two of sand, outside this sand is a brass or copper coil of piping, with water running through it, and the whole is enclosed in a wooden frame which makes the box about four feet square.

Electricity is switched on to the coil, then a sharp staccato crackling starts within the pot, and the steel, although there is no connection between it and the coil, becomes a faint red, then white, and slowly turns, within half an hour, to liquid. In another twenty minutes it is in a white-hot molten state, ready to be poured into ingot moulds. One great advantage is that the metal is free from sulphur and phosphorus.

BROADCASTING "FINANCE"

NEW YORK SHAREBROKING.

The first Wall Street (New York) investment house to broadcast radio programmes was to "go on the air" on April 5, it was announced recently. The firm is Halsey, Stuart & Co., which will broadcast weekly through the thirty-two stations of the Red Network operated by the National Broadcasting Company. Music and information for investors will comprise the programmes. In announcing the enterprise, Halsey, Stuart & Co., said: "Officials of the National Broadcasting Company came to us and pointed out the need for a clearer conception of investment information among the countless thousands who, during the recent years of prosperity, have, perhaps for the first time, been confronted with the problem of investing surplus funds. They asked us whether we would assume the job. Our own observation over a considerable period brought home to us the existence of the need, and, seeing in the radio an added channel for what we are already doing in educational advertising, we told them we would."

Music as a Supplement.

"The educational feature of our programmes will be supplemented by musical features of the highest order. It also is planned to have as speakers leaders in industry, banking and business, who will contribute from their own experience toward the better understanding of investing that will be the sole object of the programmes. Halsey, Stuart & Co. will appear in programmes only incidentally. Our effort will be directed towards the promotion of the listener's interest by telling him in an interesting way some of the steps necessary toward safeguarding his funds.

"If the work succeeds, as we have every reason to believe it will, we believe that bond distributors everywhere will benefit from it quite as much as ourselves. The broader the understanding of investments, naturally the greater the market for sound securities, and, that being true, dealers everywhere, no less than the investing public, should be interested in the undertaking."



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