# The Correct Reading of Eliminator Voltage

### Valuable Explanation and Data on Valves and Socket Powers



ONTINUING the discussion of "B battery eliminators," or "socket powers," it is proposed to explain a rough and ready method of testing the voltage output of the

without the use of voltmeter. As has been explained, a voltmeter is quite unwhen used in this conreliable nection, owing to the fact that the average voltmeter uses more actual current in showing a voltage reading than is taken by several valves, and in the majority of cases the readings given will be entirely misleading. The method of voltage check most easily appied is that of finding at what bias on "C" battery voltage on the grid of the power valve, for instance, the signals become scratchy. Valves are allowed the power valves are allowed to the power valves are allowed t ways sold now-a-days with a pamphlet showing their characteristics, and if this is examined it will be found that either a "characteristic curve" is given to show the performance of the valve under various conditions, or else there is a list of plate voltages with the corresponding recommended bias or grid voltages to be used.

#### CHARACTERISTIC CURVES.

In the case of the characteristic curve a horizontal and a vertical line will be shown, and either one or several curves will be drawn, according to the voltage or voltages on the plate at which the curve or curves have been taken. These will commence on the left-hand side of the vertical line, and mount in a curve, and then, after becoming relatively straight, after crossing the vertical line, either finish or hend over before finishing. The horizontal line represents C battery voltage, the readings along the horizontal line to the left being volts negative on the grid, while readings to the right represent positive grid volts from the C battery. The grid volts from the C battery.

By "M.I.R.E."

Radio listeners who appreciate the value of technical efficiency in maintaining the tonal qualities of their sets will value the simplicity and accuracy of the explanation here given by M.I.R.E. of the factors which contribute to the correct handling of their valves, B. battery eliminators, etc. This article is so comprehensive and valuable as to be worthy of clipping and reperusing.

Examining an actual valve curve, therefore, it will be seen that in the case of a typical general purpose amplifying valve the curve leaves the base line at about 6 to 9 volts negative bias, and slowly bends until at about to 5 volts negative, it assumes a relatively straight line until it cuts the vertical line at the point corresponding to somewhere between 5 and 12 milliamperes current flow and zero volts on the grid. It is noticed, of course, that as the grid becomes less negative the current in milliamperes through the valve increases, and the rate that the latter increases relative to a decrease in grid volts defines the efficiency or performance of the valve.

It should be noted in passing that the amount of current passing through the valve is no indication of performance or amplification because this latter is dependent soleiy on the amount of variation of current occasioned by the voltage variation on the grid due to incoming signals.

In other words, because one valve passes 5 milliamperes with 3 volts negative bias and another of milliamperes under the same conditions it does not necessarily mean that the latter is twice as good a valve or even a better valve. If, however, a voltage variation

vertical line shows the amount of current passing through the valve, this current to vary one milliampere in the term "Battery Eliminator" has so far current being zero at the point where the vertical line joins the horizontal in the case of another, then this latter which give B power only. This is valve is twice as good as an amplifier. As a matter of fact, the average performance of a good amplifying valve is one milliampere variation for each one volt change on the grid. This is termed a "slope" of one. Valves of somewhat inferior performance are as low as point is done automatically when the receiver five, while others are as low as point five, while others are as high as one point five. The latter are invariably power valves, while the former are either obsolete or else definitely designed for such purposes as resistance capacity amplification, and can therefore the could to be interior when used is switched on and off and to all intents and purposes therefore it is a "Battery Eliminatory" although a better term would be "Battery trouble eliminator." Seeing that the drawback it, the eliminator part of the equation may be audited as correct. The American term of 'socket power' will be not be said to be inferior when used as they are intended.

#### TESTING THE VOLTAGES.

To return to the checking of "socket power" voltages it will be seen at once that providing a curve of the perform-ence of the valve in question is available, sufficient excessive bias may be applied in order to cut off the current passing through the valve to such an extent as to cause easily-detected scratchiness of signals. It is somewhat difficult to give any definite guides as to values owing to the large numbers of valve types available on the market. As a rough guide, however, it may be stated that the purity of signals should be unaffected with a rise of 25 per cent. above the bias recommended for the particular plate voltage in use. Above this value distortion will set in. This check is contingent on only medi-

(Continued below table.)

The introduction of apparatus designed to entirely eliminate batteries is inevitable, but even though new receivers may be introduced having features rendering battery elimination a simpler proposition, there are so many millions of highthere are so many infinites of light-ly-efficient multi-valve receivers of orthodox design in use to-day that there will always be apparatus of "socket power" design available. THE THREE PRINCIPLES OF SOCKET POWER.

which give B power only. I'ms is due to the fact that there are really It very few straightout A aliminators as the yet available. The majority amount to a "Trickle charger" and A battery ers. It is of definite interest to discuss the three main divisions of principles involved in the design of socket powers. The basis of operation depends on the conversio of current of an alternating nature so far as direction of flow is concerned into one which flows continuously and smoothly in a single direction. Rectifiers must therefore be employed which reverse the direction of flow of one pulsation, thus causing two pulsations in the same direction. These pulsations are "ironed out" into a smooth flow by passing the current into condensers or electrical reservoirs, from which the receiver draws its power.

> Smoothing is carried out by standard methods in all types of apparatus, but rectifying is not. The two main methods are electrical or thermionic, i.e., by means of valves or by chemical means. The latter method may be carried out by solids or liquids, and the liquid is at present more widely in use than the former because the principles of operation of liquid rectifiers have been in use a long time and a good deal is known about them. Dry chemical rectification has only just been applied, and undoubtedly it will eventually supplant the former.

Thermionic rectification by means of gaseous valves has been in use for many years and a very reliable technique has been built up round it. A wonderful, if not incredible, length of life is obtainable from the bulbs.

hesitate to purchase apparatus employing any of these principles, providing the chemical rectifier is made up and sold under a well-known brand. Amateur-made chemical rectifiers

The prospective purchaser need not

should be avoided at all costs or a ruined accumulator will be the price to be paid.

Bulb rectifiers are less prone to mishandling and there is little damage likely to be sustained by the battery, but unless the outfit is designed correctly the life the bulbs will be short, and these are not exactly inexpensive items. Any rectifier, whether the bulbs are of seeket power. it be in a charger or socket power, will give complete satisfaction if it falls under the heading of the apparatus described in this article and is made up by a recognised firm.

BUILT **BATTERIES** 

### Radio Valves and Their Varying Characteristics

USEFUL TABLES FOR FILING AND REFERENCE

WD-11 WX-12 UX-120 UX-280-A UX-112-A	Recommended use. Det. and Amp. Det. and Amp. Let. and Amp. High Mu Det. and Amp. Let. and Amp. Det. and Amp. Det. and Amp. Power Amp. Det. Power Amp.	terminal current voltage, amperes.  5 .25 .25 .25 .25 .25 .25 .25 .25 .25 .2	Detector plate voltage. 45 45 45 . 195 800 45 45 45 45 45	Maximum amplifier plate voltage. 195 90 90 195-180 135 135 135 135 157 150	& 64 64 60 64 83 20 83
TX-271	Power Amp. Power Amp. Det,Amp. Det. Power Amp. Power Amp. Power Amp.	6 7.5 125 5 25 5 25 5 5 5 7.5 125	22 45 22 45	425 125 135 180 500	7.7 9 30 8 3 7

OPERATING CHARACTERISTICS OF THE P.M. SERIES.

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7) 35 1	
T. R 18 01 18 000 8 9 0 5 8 0 0 7 1 7 3 2 5 0 1 5 1 0 2 3 2 0 3 3 2 5 5 3 0 5 3 0 5 3 0 5 5 5 5 5 5 5 5 5 5	
P 1 7 8 0.15 8 750 5.4 0.62 20.0 4.0 2.6 7.0 4.0 10.0 5.0	
P.M. 3.7 0.1 16,000 13.5 0.86 20.0 0.7 1.7 3.4 5.5 1.2 2.5 4.4 1.0 0.7 2.0 1.3 3.0 1.70 3.0 0.30 2.0 0.30	
P.M.4 3.7 0.1 7,000 7.0 1.0 20.0 1.4 3.45 6.9 11.2 3.5 6.5 10.0 2.5 1.75 4.0 3.25 7.0 3.75 7.0 12.0 14.0 17.0 16.0	
P.M.5A 5.5 U.1 19,000 17.5 U.94 50.0 U.4 U.65 1.5 5.4 5.5 2.6 5.4 5.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	į
P.M.5B 5.5 0.1 74,000 37.0 0.30 20.0 0.1 0.3 0.5B 4.0 0.2 0.30 0.0 12 0.0 0.0 12 0.0 0.0 4.5	
P.M.D 0.0 0.1 0,100 1.1 1.30 0.00 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	
Note.—We have assummed an anode resistance of 100,000 ohms in all cases except the P.M.5D, where we have as-	
sumed 200,000 ohms.	

RESISTANCE CAPACITY VALVE ADDITIONS TO THE "MULLARD P.M." SERIES.

The Mullard P.M.1a and P.M.3a, recently added to the range of P.M. Receiving valves, are the equivalents of the P.M.5b, described above, but for use with 2.0 volt and 4.0 volt accumulators respectively.

						tree am tracer o		
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				Valve	Filam	ent Fil. eurren	t fication	Impedance
				type.	volt	s, (amps).	factor.	(ohms).
				P.M.1a	2.0	0,1	30	72,000
				T' 31 3n	4.0	0.1	35	63,000

	PHILIP	S VALI	ies: 9	TYPES	AND	SERIES.		
Characteristics.	olt Series A109. 1.0	A141. 1,3 volts	B105.	,	A225	2 Volt Seri A200 2 volts	es. B205	B203
Fil current Plat volts Amplification facto	.06 . 20-150	.08	.15 20-150 5	20	)-150 26	.06 20-150 20-150	$20-150 \atop 5$	20-150 3
Slope Impedance Purpose	20,000 $1, 2, 3$	4,500 1, 2, 3	.8 6,200 2, 3, 5		.6 41,000 1, 2, 4	.6 15,000	1.4 3,500 2, 5, 5	$\frac{1.4}{2,100}$
Fil. supply Characteristics.	1 A430.	dry cell A425.		Series.	A409	accumulator . A441.	cell, B406,	B103.
Fil. volts Fil. current Plate volts Amplification fac-	50-150	<b>15-1</b> 50	.06 20- <b>1</b> 50	)	4 vol 10-150	·	.1 20-150	.15 50-150
tor Slope Impedance	30 .5 60.000	$25 \\ 1 \\ 25.000$	10 .5 20.000	<b>.</b>	9 1 9,000	4.5 1 4.500	6 1.4	3 1.4
Purpose Fil. supply	1	1, 2, 4	1, 2, 3		1, 2, 3	1, 2, 3	4,300 2, 3, 5	2,100 5
				Philip	na "foi	ır-fifteen" sı	mer-detect	or and

Characteristics. 6 Volt Series.
Characteristics. A609. BC05. A620.
Fil. current .00 1 Plate volts Amplification Ampuneation 9 5 30 Slope ... 1.5 1.6 1 Impedance ... 6,000 3,100 35,000 Purpose .... 1, 2, 3 2, 3, 5 1, 2, 4 Fil. supply ... 3 accumulator cells

first audio—A415, til. 4r. 08 amps., ampli. 15, slope 2mA/V. 1—H.F. amplifier, two-detector; 3—audio, 4—resistance coupling,

detector; 3—audio, 4—resistance coupling, 5—loudspeaker.

"Miniwat!" valves are systematically classified by a character and a number of three figures. The filament current is indicated by one of the following letters:—A for a filament current of from 0.66-0.08 amp: B for a filament current of from 0.1, 0.15 amp.

The first figure of the number following the letter indicates the filament voltage; the two last figures indicate the amplification factor. In this way a reliable method of classification of the valve types is obtained, and, moreover, the type-letter and number give some information regarding the qualities of every particular valve to which they apply. For instance, A600 means: "Miniwatt" valve, with a filament current of about 0.06 amps., a filament voltage of 6 volts, and an amplification factor of \$\frac{1}{2}\$.

(Continued from above.)

um strength signals being used for the test. It should be realised also that these figures do not apply exactly to batteries, because as the bias is in-creased and there is less drain from the socket power, the voltage will tend to rise. This will not be the case with Latteries unless run-down dry cells are

Before passing to other considerations, it should be noted that the scratchi-ness of signals with excessive nega-tive bias is due to the current passing through the valve being cut off to such an extent as to not permit the full characteristics of the signal to pass the valve. In other words, instead of passing current of a value equal to that half-way along the straight portion of the curve the valve is working with characteristics represented by that portion of the curve at the bottom bend. In passing it is interesting to note that this latter position of adjustment is where rectification or "detection" takes place best.

SOCKET POWER ELIMINATORS.

Socket powers or battery eliminators are now appearing on the market in numerous forms. The term "Socket Power" is being more generally applied to outfits which supply both filament and plate (A and B) power and



Good Quality

combination. In at least one type the

change-over from charge to discharge

to a battery is the necessity to charge

seen to be an apt one because the power comes from the power socket

So far as A battery eliminators are

concerned, using the term in its strict sense, the only really successful ones are those used in power amplification

where the use of alternating current

in the filament is inconsequent or else those supplying a limited number of dall emitter valves and consuming a

small amount of current. (Usually in-

sufficient to run more than 3 or 4 valves). Where the filaments of the valves are wired in series so that the same current passes through several valves in succession, considerable, if not total success is obtainable at an

not total success is obtainable at an economical cost of eliminator outfit

but unfortunately standard radio sets are not wired with their filaments in

parallel to series is invariably imprac-ticable because of complications caused

through the grid returns having been designed by the set manufacturers to

go to certain points to cause bias voltages to be picked up and these are

Summed up the position at pre-

sent is that eliminators requiring series filament wiring are highly recommended where the receiver

is series-wired to suit. Otherwise best left alone where the receiver is a multi-valve factory built ma-

As has been stressed frequently in this column on previous occasions, there is so much capital invested in

radio apparatus that revolutionary improvements which would result in too rapid obsolescence of equipment are

out of the question

dependent on parallel wiring.

A change-over in wiring from

via the battery.

BATTERIES AND SERVICE Are the Backbone of a

RADIO SET.

"A" Battery.



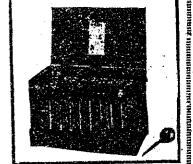
Here's two that will save you endless trouble and expense.

Type Tw 13-plate, 85 amps. capacity, fully charged. Complete with removable carrying handle.

PRICE £6

Type H.T. 5, 90 volt, 2500 milliamrs. capacity-takes place of two 45 v. drys-only needs recharging every two months. Fully charged.

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