RADIO CONSTRUCTOR

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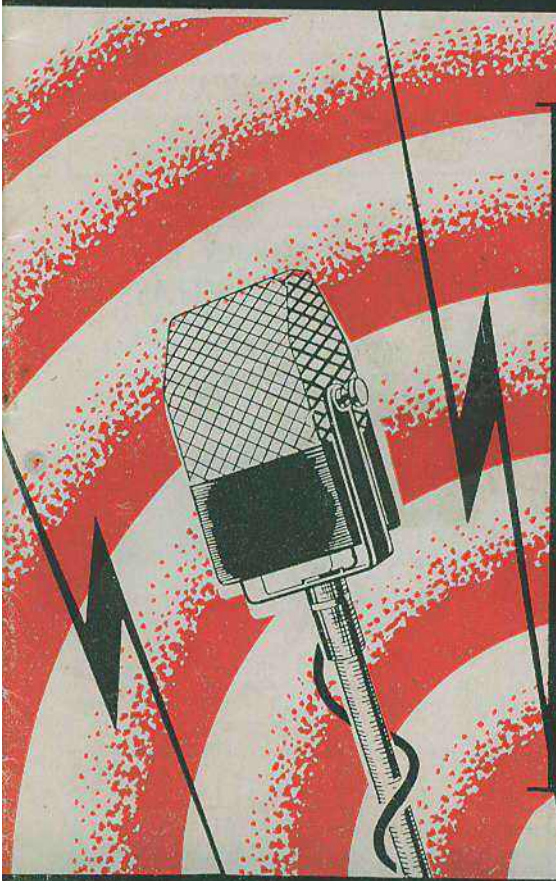
AUGUST

For Every Radio Enthusiast



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EDITORIAL

WITH this issue we start our third year, and to celebrate it we now have an extra four pages, thanks to the recent increase in paper quotas. There will also be more copies available, so that many readers, who hitherto have only managed to get a copy here and there, will now be able to take the magazine regularly. But it is still wise to place a definite order, as supplies are by no means unlimited, even now. We have put in the added pages in the form of a stiff cover of art paper. This will, apart from improving the appearance, give more durability and protection, points which we appreciate—being practical constructors ourselves.

With this issue, too, you will find an index for the last volume. Although this is given mainly for the use of those readers who have their volumes bound, there is no doubt that we shall be asked for back numbers containing particular articles. Owing to the demand for our magazine, however, there are unfortunately very few copies which we can supply. To help such readers we give here details of those numbers which are available, quoting the page numbers for easy reference: pp. 537-561, 563-587, 589-613 and 615-639. We have roughly 30 copies of each, so it will be a case of first come—first served.

We have learned quite a lot from correspondence sent in recently by readers, a selection of which has been printed in our columns. Our whole aim is to give you what you want, as far as it lies within our capabilities to do so. So never hesitate to drop us a line any time you feel like it. We like to feel, and to know, that this magazine is proving of value, and we also like to know whenever you feel that it might be improved. If you have any ideas, shoot them along. If you have built any gear which you think may be of interest to other readers write and let us know about it. We are not a lot of stuff-boxes this end, just ordinary chaps like you, and we'd like to get to know you better.

'Bye for now,

G2ATV

NOTICES

THE EDITORS invite original contributions on construction of radio subjects. All material used will be paid for. Articles should be clearly written, preferably typewritten, and photographs should be clear and sharp. Diagrams need not be large or perfectly drawn, as our draughtsman will redraw in most cases, but relevant information should be included. All MSS must be accompanied by a stamped addressed envelope for reply or return. Each item must bear the sender's name and address.

COMPONENT REVIEW. Manufacturers, publishers, etc., are invited to submit samples or information of new products for review in this section.

ALL CORRESPONDENCE should be addressed to *Radio Constructor*, 57, Maida Vale, Paddington, London, W.9. Telephone: CUN. 6579.

MODIFICATIONS TO THE

18 SET

BY E. S. SYMONDS

THE main object of these modifications was to extend the original tuning range of this popular receiver and it was decided that the most satisfactory method would be to rebuild the frequency-changer stage as a triode hexode with series-fed oscillator.

Firstly, it was decided that home-made coils were to be wound for ranges 1 and 2, and to use Wearite " P " type coils for range 3. For those who do not wish to wind their own coils, they will find suitable substitutes in the Wearite range. The writer rendered the BFO and AVC circuits inoperative, and these are *not* shown on the circuit diagram. The " high-low " switch mounted on the left of the front panel may be retained as a stand-by switch, and the 4.7K Ω resistor that was originally soldered across this component may be used as a bias resistor in the cathode of the second detector valve. Do not forget to take the earthy end of R10 to the cathode end of the bias resistor. Capacitors C12 and C15 may be omitted with a slight loss in audio output. For those who have access to a signal-generator, the adjustable cores are arranged as follows: upper core is the secondary winding, the lower core being the primary winding. For those in doubt about the intermediate frequency, it is 465 kcs. One of the reduntant capacitors from the original frequency changer will be found in the first IF transformer screening can, and it will be marked 80$\mu\mu$F; the other capacitors are marked 90$\mu\mu$F and these should be left undisturbed. For those who do not wish to dismantle the IF transformer, it is only necessary to clip the wire that runs from the third tag on the right hand side of the unearthed rear trimmer, mounted on the underside of the main variable capacitors.

This pair of trimmers are removed from the set, as each grid coil is fitted with its own parallel trimmer. It will be helpful if the base connections of the original VP23 frequency changer valve are traced out before any removing of components is done. This will reveal the IF transformer tag which is unused in the modifications. The main chassis is extended each end by means of an aluminium plate, measuring 3" by

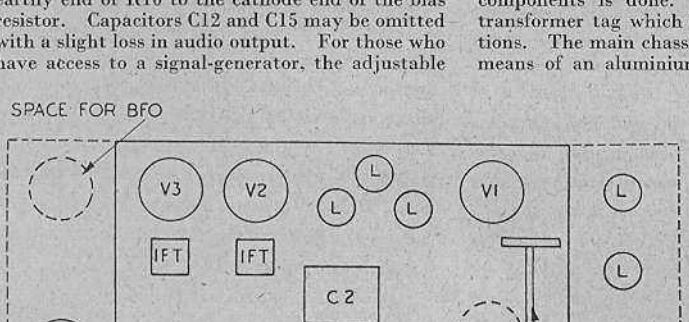


Fig. 1. Sketch showing layout of chassis and main components. The dotted lines indicate the added chassis at either end.

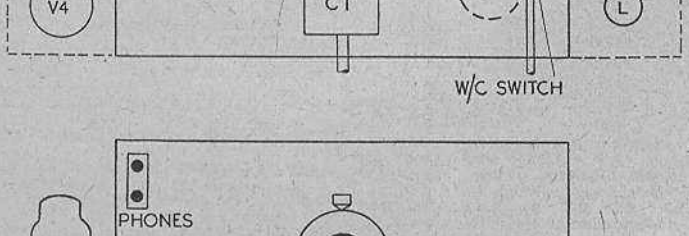
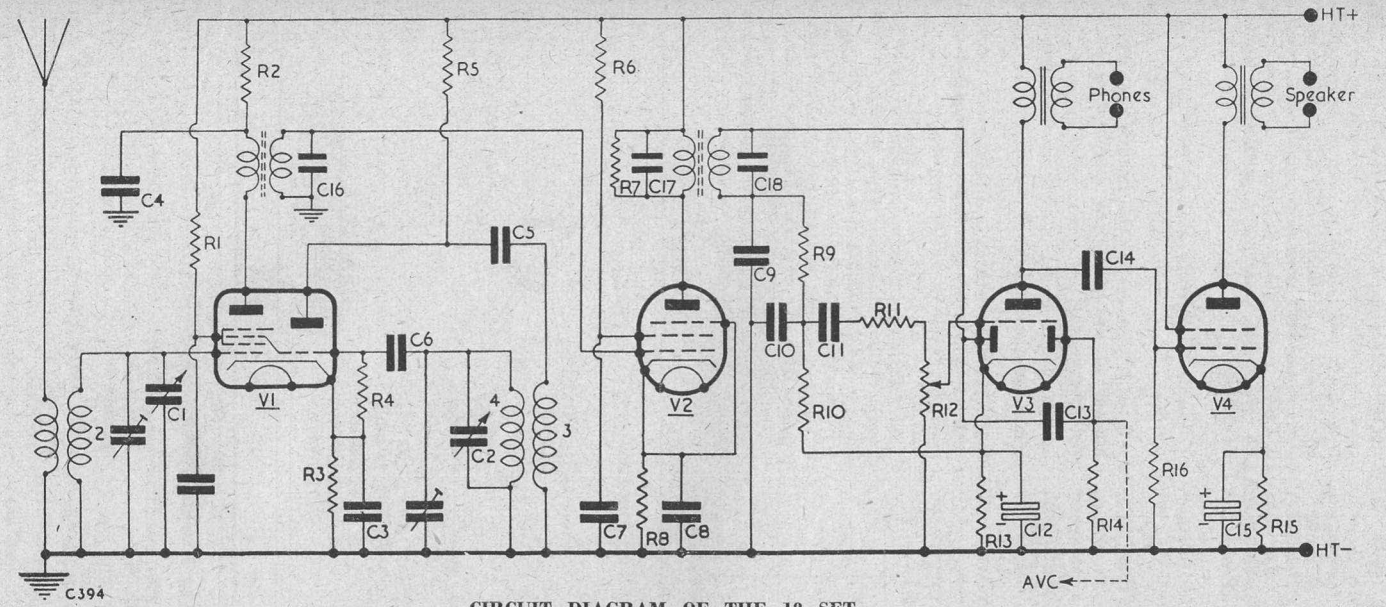


Fig. 2. Layout of front panel showing the various controls.



CIRCUIT DIAGRAM OF THE 18 SET

Components not marked are items which are not modified or removed.

List of Components

Capacitors

C1, C2, 120$\mu\mu$F variables.
C3, 4, 7, 8, 14, 0.1μF 350v paper.
C5, 11, 0.002μF mica.
C16, 140$\mu\mu$F mica.
C6, 100$\mu\mu$F mica.
C17, 130$\mu\mu$F mica.
C9, 100$\mu\mu$F mica.
C10, 500$\mu\mu$F mica.
C12, 15, 25.0μF 25VW.
C13, 5$\mu\mu$F mica.
C18, 90$\mu\mu$F mica.
TC (trimmers), 30$\mu\mu$F Phillips trimmer

Resistors

R1, 33 K Ω
R2, 1 K Ω
R3, 220 Ω
R4, 47 K Ω
R5, 82 K Ω
R6, 47 K Ω
R7, 470 K Ω
R8, 470 Ω
R9, 100 K Ω
R10, 500 K Ω
R11, 47 K Ω
R12, 1 M Ω
R13, 4.7 K Ω
R14, 1 M Ω
R16, 500 K Ω
R15, see valve list.
R17 (For 6V6) 240 Ω 1 watt.
R17 (For 6F6) 400 Ω 1 watt.
R17 (For KT63) 420 Ω 1 watt.

All resistors are half-watt carbon, unless otherwise stated. C19, 20, are inside the IF transformer cans and are not shown on the circuit diagram.

4½" (16 swg). The right hand plate carries the mixer coils. The left hand plate carries the output pentode valve holder, and allows space at the rear for a BFO valve when required. The plates overlap the main chassis by about ½", and 4BA bolts used to affix to the main chassis. The more advanced builder may bend a flange on the outer edges to make a more rigid structure. The writer has not re-panelled his set as yet, but the original friction drive was retained for preliminary tests. It was found, however, that the tuning range was fairly sharply tuned owing to the increased bandwidth. For those who listen solely to the amateur bands, the main tuning capacitors may be changed for a two-gang 25$\mu\mu$F, so that the bands are well spread over the dial. The new dial will depend on the builder's choice and his financial resources.

The home-made coil data is as follows, and includes ready-made substitutes:—

	(Aerial or Mixer)		*(Oscillator)*		
	Grid	*Coupling*	*Grid*	*Coupling*	*Padders*
Range 1 ..	7	4	6	4	—
Range 2 ..	16	9	15	8	.0014μF
Range 3 ..	PA6		PO6		900$\mu\mu$F

All windings are close-wound and 26 swg enamelled wire may be used throughout for the home-made coils. Four paxolin or waxed cardboard tubes 1⅛" diameter x 2½" long. These may be anchored by a brass strip tapped 4BA, details of which may be obtained when a pair of Wearite P6 type coils are purchased, as these are similar in design.

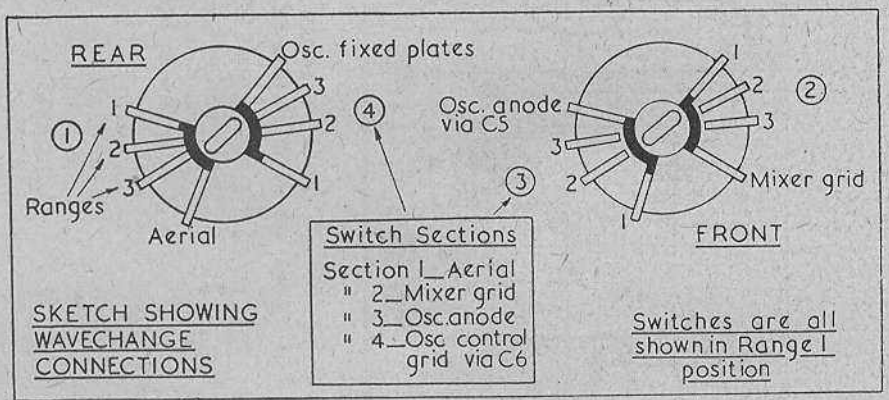
Range 1. Wearite PA3—PO3
Range 2. Wearite PA5-PO5

It will be necessary to remove the anchor bracket at rear to provide space for oscillator coils (see sketch).

Additional Components

A wavechange switch, a 4-pole 3-way Yaxley, with a 3" spindle or equivalent extension rod with mounting brackets, will be required.

Also needed are trimmers, which may be of the 30$\mu\mu$F Phillips concentric type, similar to that found in the popular RF units, types 24, 25. The wave-change switch can be mounted on the edge of the main chassis, so that the spindle clears the original RF valve position. For those who have no further use for the RF valve-holder, the wavechange switch may be mounted further inboard, but not so far as to foul the capacitor rotors at mid-position.



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THE REAL HAM SPIRIT

An advertiser in the Personal Advertisement Col. of this journal received the following reply recently to an advertisement for a number of valves.

"Dear OM,

With reference to your advertisement . . . I enclose herewith an ex-Service X66, the only valve I have of the types you want. Since the valve cost me nothing in the first place, I am sending it to you with compliments."

We think readers will agree that is a true example of the real ham spirit, and is particularly creditable in these days when sometimes we wonder what has happened to this "ham spirit."

TRIODE CONNECTED PENTODES

BY D. WARNER

A SUBJECT which arouses much interest is that of the design and construction of amplifiers intended for high quality reproduction. It is interesting to note that a large number of experimenters in this absorbing side of our hobby favour the use of triodes in the output stage of the amplifier. There has been much controversy over the triode-versus-pentode question and this preference for triodes is not altogether unfounded. It is possible to prove on paper and also to demonstrate with the aid of laboratory equipment that a pair of pentodes in push-pull are capable of providing a high power efficiency with a total distortion which is fre-

TRIODE CONNECTED PENTODES IN PUSH-PULL

Valve Type	Maker	Vh (V)	Ih (A)	Va (V)	Ia No Sig. (mA)	Ia Max. Sig. (mA)	-Vg1 (V)	Rk (Ω)	Ra-a (Ω)	Vdrive (Vrms)	Dtot %	Wout (W)
CL33 ..	Mullard ..	33	0.2	250	60	65	15	250	4,000	21	4	2.5
C70D ..	Ever Ready	33	0.2									
7D6 ..	Brimar ..	40	0.2									
Pen 36C ..	Mullard ..	33	0.2									
Pen 3520..	Mazda ..	35	0.2									
PTZ ..	Ferranti ..	40	0.2									
AC2/Pen..	Mazda ..	4.0	1.75	250	40	45	8.5	220	5,500	12	5	2
A70D ..	Ever Ready	4.0	1.95									
Pen A4 ..	Mullard ..	4.0	1.95									
7A3 ..	Brimar ..	4.0	2.0									
42MP/Pen	Cossor ..	4.0	2.0									
42OT ..	Cossor ..	4.0	2.0									
EL32 ..	Mullard ..	6.3	0.2	250	45	50	22	440	6,000	30	3	2
OM9 ..	Cossor ..	6.3	0.2									
KT63* ..	Osram ..	6.3	0.7	250	60	65	20	330	4,500	28	4	1.5
6F6* ..	R.C.A. ..	6.3	0.7	350	50	60	37	730	10,000	93	3	9
EL33 ..	Mullard ..	6.3	0.9	250	40	45	8.5	220	5,500	12	5	2
KT61 ..	Osram ..	6.3	0.95	250	50	55	5.5	120	5,000	8	5	1.4
EL31 ..	Mullard ..	6.3	1.4	300	100	110	25	245	4,500	35	4	9
EL37* ..	Mullard ..	6.3	1.4	400	140	160	34	245	4,000	54	4.3	20.5
6L6* ..	R.C.A. ..	6.3	0.9	250	110	120	20	360	2,500	30	2	4.5
KT66* ..	Osram ..	6.3	1.27	400	125	140	38	600	4,000	60	3.5	14.5

Types marked with an asterisk (*) are particularly suitable for triode connection.

The optimum load quoted is the anode to anode value.

The drive voltage quoted is the grid to grid value.

The anode currents quoted are for both valves.

Symbols employed :—

Vh, Va, Vg = Heater, anode, grid voltage respectively.

Ia = Anode current.

Rk = Bias resistor, common to both valves.

Vdrive = Signal drive voltage.

Dtot = Total harmonic distortion.

Wout = Output power.

quently less than 2 per cent, but the design of such an amplifier is not as straightforward as it might at first appear.

For example, the operating point of the valves must be carefully chosen and the load line so positioned that it permits the maximum output power to be obtained without driving the valves into the non-linear part of their characteristics. Also care must be taken in the design and construction of the output transformer and it is most desirable that the leakage inductance of this component be as low as possible. These points are, of course, present but to a somewhat lesser extent, when triodes are employed, but the main advantage to be gained from the use of such valves lies in their low impedance. In an output stage the valve impedance is effectively connected across the loudspeaker and has the effect of damping unwanted vibrations of the speaker cone. The necessity for such damping may be readily appreciated when it is considered that if the cone of the speaker is suddenly shock excited by a transient in a musical passage it may, as a result, set up an unwanted train of vibrations. Such vibrations are of extremely short duration but they tend to mar the transient response of the amplifier. In severe cases this gives the reproduction a woolliness which considerably reduces its realism.

These brief notes should suffice in showing the need for a relatively low output impedance. Such a low impedance may be obtained when pentodes are used by employing a negative feed-back arrangement but when making use of triodes their inherently low impedance normally suffices without the added complications of a carefully designed feed-back circuit. In other words, it is easier for the home constructor who is desirous of obtaining quality reproduction to make use of triodes in the output stage of the amplifier, rather than pentodes. Now as there is a large number of output pentodes available and relatively few output triodes it is frequently convenient to triode connect a pair of pentodes for use in a push-pull stage. The following table provides operating data for some of the more popular pentodes when triode connected for use in a push-pull output stage.

"RADIO CONSTRUCTOR" QUIZ

Conducted by W. Groome

(1) An indoor aerial feeding a superhet is replaced by a good outdoor one. Apart from effect on volume (which may increase despite AVC) what improvements would you expect ?

(2) How would you make use of the household electric wiring as an aerial ?

(3) A power-pack smoothing circuit consisting of a series choke followed by a reservoir capacitor gives a smaller voltage than one having a capacitor followed by a choke. Right or wrong ?

(4) What simple test would you make to check whether the 'gram motor was introducing hum into your amplifier via the pick-up ?

(5) Negative current feed-back, like negative voltage, has the effect of reducing distortion, but is more easily arranged by merely omitting the cathode by-pass capacitor. Why, then, is current feed-back not used in output stages ?

(6) The signal at a valve anode is of opposite phase to that at the grid. Right or wrong ?

(7) Removal of the 25μF cathode by-pass capacitor of an AF voltage amplifier stage results in reduced gain. If a capacitor of .05μF is fitted in place of the large one the reproduction becomes shrill. Why ?

(Answers on page 22)

THE EDITORS INVITE . .

- **Constructional articles suitable for publication in this journal. Prospective writers, particularly new writers, are invited to apply for our "Guide to the writing of Constructional Articles" which will be sent on request. This guide will prove of material assistance to those who aspire to journalism and will make article writing a real pleasure !**

BABY WATCHER

by J. F. DEAN

WELL, boys, here's the chance to make your hobby really useful in the sight of the ever-cynical wife. Most of them are tolerant of our efforts but regard them as being more of a keeper-under-the-eye (or keeper-out-of-the-pub !) than really useful. This little unit will change their minds for them and at the same time not take up much time, effort or expense. No doubt you are placed, like myself, with a bedroom away from the general living-room. When the infant goes to bed and one is seated by the fire listening to the radio or watching the TV, one is continually up and down to lower the volume in order to listen out for a usually imagined howl from the little horror. Well, those days are now over for me. The radio is on a comfortable volume level and we are both assured that at the first peep we shall know all about it—our baby watcher is on the job !

The main component is the relay—a high resistance job with a quick action. I got mine and most of the components already wired up in an ex-U.S.N. unit which I bought, as advertised in the " Radio Constructor," for nine bob. It is the BC357H—a radio-controlled beacon unit which, as wired, operates on a modulation note being applied to an RF signal.

Two valves are used in the watcher, both duo-diode-triodes, the first as a small amplifier and the second to operate the relay. It is a perfectly simple and straightforward circuit and needs no explanation. A volume control is shown but this is not really necessary, it depends on the output being delivered by the infant. Its main use is to prevent the unit from triggering on a little murmur. No mains unit is shown—only a small one is required, the watcher only taking about 15 milliamps, but the smoothing must be good or else the hum will operate the relay.

All resistances are ½-watt. The capacitors C2 and C3 must be capable of holding the HT voltage. Layout is not critical, the smaller the better. I made mine on the BC357 chassis with a small extension for the mains unit. One little point to those who may get a BC357H—the valves supplied, of which only the second is used, are 12 volt and the base will have to be re-wired if you use 6 volt valves in your watcher. The HF section can be removed entirely and thus will leave plenty of room for the amplifier to be inserted—using the existing spare valve-holder.

For a microphone I am using a small PM speaker and an input transformer. Screened or co-axial cable is advised to connect the microphone to the watcher and from the volume control to the grid of the first valve.

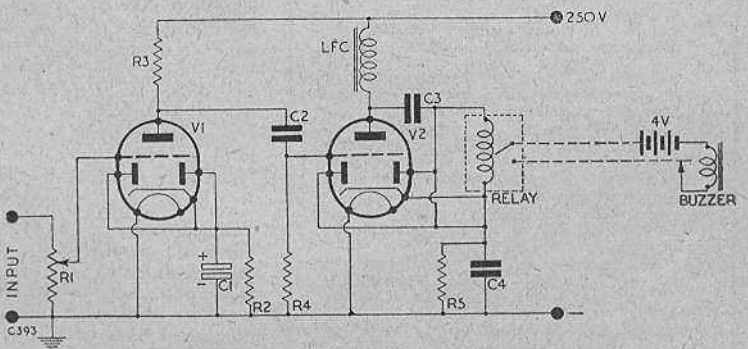
The circuit shown responds better to high notes than low ones (just the job !) and is very sensitive. When I first tried it out I used a 5 watt amplifier and it worked on the clicks from my wife's knitting needles from the other side of the room. When testing don't use the buzzer near your bench or else you will find, as I did, that the thing won't keep quiet—the microphone picks up the sound and you get a feed-back effect.

The distance between the infant and microphone is not critical—anything around 3-4 feet will operate the watcher on a medium-volume howl. The watcher will not be heard by the baby as it only works when the baby cries. (Explain that to the wife.)

A 4 volt battery (or bell transformer), a buzzer and a length of wire complete the watcher. Good baby watching to you all.

Component List

R1, 1*M* Ω
R2, 2.2*k* Ω
R3, 250*k* Ω
R4, 2.2*M* Ω
R5, 1,000 Ω
C1, 25μ*F* 25*V*
C2, .0015μ*F*
C3, .034μ*F*
C4, 500*pF*
V1, *V2*, *VR55*, *EBC33 or 6Q7G*



Circuit diagram of Baby Watcher utilising the BC357H Beacon Unit.

Query Corner

A "Radio Constructor" service for readers

Faulty Output Pentode

"I have a battery powered portable superhet receiver which employs the miniature range of valves. Recently the maximum volume which could be obtained became seriously reduced and although I tried retrimming the RF and IF tuned circuits and have checked the battery voltages and currents, I cannot trace the cause of the trouble, can you help?" *L. Riches, Birmingham.*

The more modern portable receivers, whether intended for battery or battery/mains operation employ an output pentode of the type which has a centre tapped filament. The miniature or button based valve of this type has its filament joined between pins 1 and 7 with the centre tap taken to pin 5. When the filament is fed from a single 1.4 volt cell pins 1 and 7 are connected together and taken to the negative terminal of the cell, whilst pin 5 is joined to the positive terminal. By this method of connection the two halves of the filament are joined in parallel, and thus should one section become open circuit the valve may continue to operate on the remaining section at reduced strength.

"Query Corner" Rules

(1) A nominal fee of 1/- will be made for each query.

(2) Queries on any subject relating to technical radio or electrical matters will be accepted, though it will not be possible to provide complete circuit diagrams for the more complex receivers, transmitters and the like.

(3) Complete circuits of equipment may be submitted to us before construction is commenced. This will ensure that component values are correct and that the circuit is theoretically sound.

(4) All queries will receive critical scrutiny and replies will be as comprehensive as possible.

(5) Correspondence to be addressed to "Query Corner," Radio Constructor, 57, Maida Vale, Paddington, London, W.9.

(6) A selection of those queries with the more general interest will be reproduced in these pages each month.

It would seem most possible that a fault of this nature has occurred in the receiver in question and it may quickly be verified by checking for lack of continuity between pins 1, 5 and 7 of the output valve, if this is of the type which has a centre tapped filment.

Measurement of Inductance

"I have a number of smoothing chokes but unfortunately I do not know their inductance. Will you please suggest a simple method by which inductance measurements may be made."
G. Parker, Fulham.

The simple apparatus which is about to be described can be used for measuring inductance values between 1 and 100 henries and it is therefore ideal for taking measurements on smoothing chokes, main transformers, speaker field coils, inter valve transformers, etc. The required components consist of a converted mains transformer, two potentiometers, a switch and two AC meters. These latter are readily obtainable from Government surplus stock, and are offered at the moment at prices which are most reasonable. The circuit diagram of the apparatus is shown on Fig. 1. The mains transformer is of non-standard type but an old discarded component may readily be adapted for use, the secondary of the transformer required must be capable of providing 40 volts at a few milliamperes. For those who have never attempted to rewind part of a mains transformer, a few words upon the method employed may be of assistance. Having found the transformer to be converted, it must of course have an intact primary wound for the mains voltage to be used, the laminations which form the core should be carefully removed. Next remove the outer insulation and unwind one or more of the secondaries to make space for the winding which is to be added. The primary will normally be found to be the innermost winding on the bobbin.

When removing one of the low voltage secondaries the number of turns should be carefully counted in order that the turns per volt of the transformer may be determined. For example, if twenty turns are found on a 4 volt winding the number of turns per volt will be five. Thus the number of turns which must be wound on the bobbin to provide 40 volts will be 40 x 5=200.

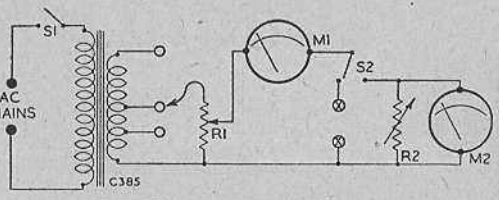
Now having made space on the bobbin for the new winding a layer of thin paper should be wrapped around the remaining windings. Paper for this purpose may be obtained by unrolling an unwanted filter capacitor; this paper is ideal for the job on account of its thinness and high insulating properties. Everything is now ready for the winding of the new secondary and a suitable length of 30 swg enamelled wire should be obtained for the purpose. The first layer of wire having been carefully wound into position should be covered by a single layer of paper before the winding is continued. The procedure should be repeated, paper between each layer until the required number of turns has been wound on to the bobbin. Care must be taken not to scrape any enamel from the wire during this progress as shorted turns lead to overheating of the transformer and eventually to complete breakdown of the insulation. Two tapping points must be made on the secondary whilst it is being wound, these two points are respectively one quarter and one half the total number of turns from one end of the winding. The lead out wires are passed through holes suitably drilled in the end cheeks of the bobbin and are firmly anchored to a tag board or terminal strip. This is important because if the leads are allowed to remain unanchored it is possible that one of them may be accidentally broken off at the bobbin. This is, of course, most infuriating and often leads to the necessity of unwinding part of the newly wound secondary. The transformer is now complete and the apparatus should be connected up as shown in the circuit diagram.

The apparatus may now be employed for taking a measurement, the procedure being as follows: Connect the unknown inductance across the terminals marked X and set the secondary tap switch to its lowest voltage tapping. The potentiometer R1 must be turned to a minimum and the switch set to bring the inductance into circuit. Now connect up the mains supply and adjust R1 in conjunction with the secondary tapping switch until 5 mA flows in the circuit as indicated on the milliameter. Next set the resistor R2 to its maximum value and turn the switch to bring it into circuit. Adjust R2 once again until 5 mA is indicated on the milliameter. The voltage across R2 is shown by the voltmeter and must be noted in order that the value of the resistance of R2, which is actually in circuit may be calculated. Thus making use of our old friend Ohms Law we have

$$R2 = \frac{\text{Voltage reading}}{\text{milliameter reading}} \times 1{,}000$$

The multiplier 1,000 is to convert milliamperes into amperes for the purpose of the calculation.

Having followed the procedure so far it will be realised that the value of R2 in circuit must equal



R1, 5K Ω. R2, 25K Ω, 1 watt. S2, change over switch. M1, Milliameter (see text). M2, AC volt meter of the high resistance type (see text). S1, Mains on/off switch.

the reactance of the unknown inductance, and thus the following equation is true

$R2 = 2\pi fL$ where f = supply frequency, normally 50 c/s.

$R2 = 314 \times L$

$$\text{or the inductance } L = \frac{R2}{314} \text{ henries.}$$

When making measurements on inter-valve transformers or small chokes it may be necessary to reduce the test current from 5 mA to the lowest value which may conveniently be read on the current meter, say 1 mA. This precuation may be necessary in order to avoid magnetic saturation of the core of the inductance under measurement. If the core is saturated a false reading will be obtained. It will be realised that air core coils, on account of their relatively low inductance, cannot be measured on an apparatus of the type described.

Noisy Volume Control

" My superhet receiver which has been in use for some time recently developed a noisy volume control. Thinking that the control was faulty I replaced it by a new one and was disappointed to find that when the knob was operated the noise was still present. Surely both controls were not faulty? " *K. Bates, Cambridge.*

It is assumed that the volume control is connected in the normal manner in the audio side of the receiver. Now although the control probably has good contact to the audio signal its RF resistance may be somewhat variable when the sliding arm is rotated. Unless RF is present on the control this is of no importance, but it is quite possible that due to a faulty filter or decoupling capacitor a certain amount of RF is getting through to the AF side of the receiver. This may be cured by checking and replacing if necessary, the filter capacitors in the detector diode circuit and also the decoupling capacitors in the RF stages. Should this fail to effect a complete cure additional filtering may be obtained by connecting a 300$\mu\mu$F capacitor across the volume control.

Radio Miscellany

ONE sometimes hears of enthusiasts who claim they have followed the hobby from way back to the crystal set days, but they all admit that their interest has diminished for some period at least—usually to return with a still stronger appeal. My own interest was born long before broadcasting, and although I cannot perhaps fairly describe myself as an "average enthusiast," I must confess to two lapses when my interest was temporarily eclipsed. These episodes, both comparatively brief, were more or less in the nature of short holidays. It would be interesting to know of the longest sustained purely amateur interest. Among the old-timers there will, of course, be some who have held their transmitting licences since pre-1914 days, but even they have had their spells of voluntary QRT and constructional inactivity.

Variety

Readers will have noticed that in writing Radio Miscellany I never settle down to write in any particular vein. For my part, I attribute this to an uncertainty of knowing the type of enthusiasts who I am addressing, or even the proportion of each class making up the readership. In the course of correspondence from readers there may be a succession of those from beginners, or perhaps from SW fans, enthusiastic TV constructors, or high fidelity merchants. These might easily lead one to think that their particular interest is of a higher percentage than is actually the case. Nothing short of an actual census would really show the true position.

A few weeks ago readers in widely separated areas who had converted the various RF Units invited me to form a club for enthusiastic Conversionists. The best I could do was to put them in touch with one another to form a sort of Correspondence Group, whence several pen-pal-ships came about. Their enthusiasm, based on so limited a sphere, could hardly be regarded as having a sufficiently permanent interest to maintain a Club, but a good time was had by all in swapping experiences, and perhaps a few lasting friendships have been founded.

Generally speaking, the only consistently flourishing groups seem to be among the SW fraternity; chiefly by virtue of their large number. Others with specialised interests, such as Recording, Quality, Amplifiers, Model Control, Ionospheric Observation, etc. are rarely locally sufficiently numerous to be able to form into personal contact groups. This is a serious handicap, and leaves them without an organised voice, but they are all, at some time, catered for in the pages of the "Constructor," and if their letters do not seem to bring immediate results, they do help to maintain a fair balance.

Opportunity for the Miniaturists

It is unfortunate that among those who are primarily interested in a specialised subject, there are few who feel able, or willing, to write of their experiences or constructional work. I know of one particular case—a very keen and capable constructor whose aim is to build midget and personal receivers, each smaller than the last. They are, of course, not simply "novelty" sets, but very practical receivers capable of standing up to hard usage and to frequent travelling. Attempts to get him to describe them are invariably countered with the excuse that he has got a still better idea for his next—perhaps then he will get down to writing about it.

There is, by the way, plenty of scope for the development of vest-pocket personal receivers, with the availability of almost microscopic components and valves used in deaf-aids, and those interested in this aspect of the hobby should be in their element.

Gadget Merchants

One runs into the Gadgeteer in all hobbies. As an amateur photographer you find him building tripods from discarded curtain rods, lens hoods from pill boxes, and an enlarger from an old biscuit tin and a reading glass. When he takes to motoring he busies himself with windscreen defrosters, foot warmers, or lighters powered by the battery.

As a radio constructor he finds the hobby a wonderful background in which he can indulge his strange urge to the full.

(*continued on page* 29)

CENTRE TAP

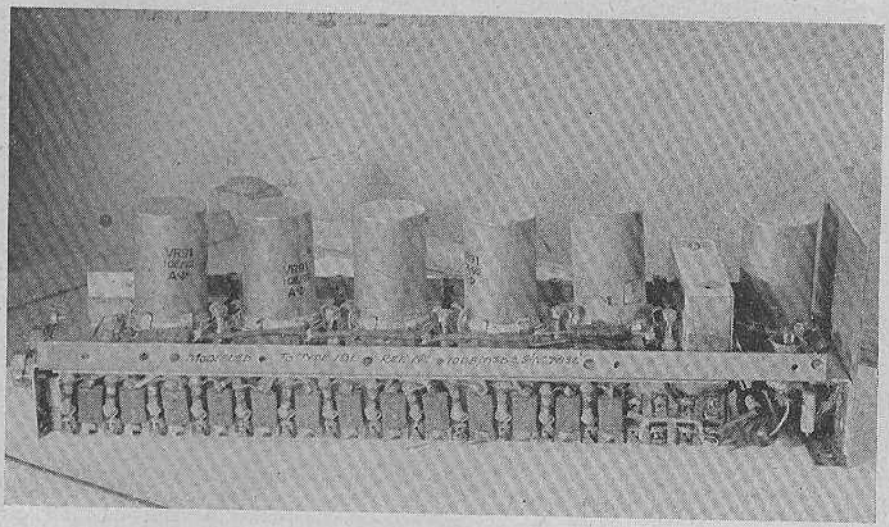
DISCUSSES

RECEIVERS — ENTHUSIASTS — GADGETS

Home Constructed Televisor

Using 45 Mcs. Strip (T.R.F.) as Vision Receiver

(PART I) by W. SHORTRIDGE



This article describes the use of a 45 Mcs TRF strip for a vision receiver. These strips are usually contained in a larger unit, such as the 3531, 3553 and 3583 units, and have proven very popular.

TO those who are rather afraid to venture into the television construction field I say " Do not be put off by the thought of thousands of volts (but treat them with respect), line and frame time bases, sync separators, DC restorers, and other terms strange to the normal home constructor. Get down to it, and you will be surprised how simple it is, and what grand entertainment you and your family will enjoy. Finally, do not omit to take out a licence ! "

I am not a technician, and my sole instruments have been a DC meter (Avominor) plus the usual screwdrivers, pliers, twist drill, and soldering iron.

The Vision Receiver

First, get your vision signal by sound and you are half way to success.

The " straight " 45 Mcs strip obtainable on the surplus market is ideal. It is compact, measuring 14" x 4" x 4", and consists of 5 RF stages (EF50's), a diode detector (EA50) and a video amplifier (EF50). This strip may be obtained separately, but is more likely to be found incorporated in a larger unit, such as the 3531, 3553 and 3583 sets. It is readily recognised by the six EF50's in line, with the EA50 enclosed in a rectangular screening box between the last two EF50's.

If purchased in a large unit, first locate a group of eight terminals (2 rows of 4) near the output end, and almost under the diode screening box. Detach any external wires running to these terminals, and the strip can then be removed completely on unscrewing four easily located fixing bolts. Be careful not to move any of the ten upright threaded rods protruding from the chassis on either side of each RF valve, as these control the dust cover of the tuning circuits.

Under the chassis it will be seen that six compartments are each enclosed by individual screening covers. These are a press fit, and can be removed by gripping firmly and first raising the side furthest from the row of resistors.

Many liberties can be taken with this strip, and few essential modifications are needed.

The suppressor grids of the first 3 RF valves are taken to terminal 8 (of the group of terminals mentioned above) each via a small choke. These suppressor grids (pin 4) should be earthed at the valve-holder, and the wiring to terminal 8 removed. Alternatively, it suffices to earth terminal 8.

The main modification is to the video amplifier stage, and is as follows :—

(a) Detach all connections from the pye plug near the valve.

(b) Replace the 100,000 Ω resistor from control grid (pin 7) to earth by one of 2,000 Ω or thereabouts.

(c) Directly couple diode stage by connecting the small choke (visible on the chassis) to video amplifier grid.

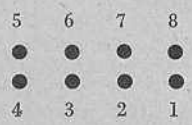
(d) Insert a 50-100 Ω resistor from cathode (pin 6) to earth, by-passed by a .05μF capacitor. (*Note:* There is room for experiment here, and I personally used a variable 500 Ω resistor in the cathode circuit. The by-pass capacitor, theoretically, should be no larger than .001μF or even omitted, but in practice it may be found desirable to increase even to .1μF.)

(e) Insert 5,000 Ω resistor from Anode to HT+

(f) Connect .1μF capacitor from anode to the Pye plug which now becomes your video output.

The modifications are now complete and it only remains to test on the aerial.

The eight terminals mentioned and shown on the enclosed photograph may be numbered :—



1 and 4 are connected together, and become HT+ input. 2 and 3 are the feeds to the screened grids of valves one and two, and three and four respectively, as will be seen on the circuit diagram, but the photograph shows 2 and 3 temporarily connected to terminals 1 and 4 for test purposes only. 5, 6 and 8 are not used, and 7 is the heater input (one side of all heaters is already earthed at each valve, and one side of heater input must be similarly earthed).

A somewhat straggly lump of bare wire is visible on the photograph near the right-hand end of the chassis. This is a temporary earth connection and is, of course, subsequently removed.

On connecting the HT and Heater Supplies, aerial, earth and pair of phones from output Pye plug to earth, and assuming a transmission is on the air, a really hefty vision signal should be heard. It should be almost uncomfortably loud and its characteristic " burr " should be clearly audible throughout the room if headphones are placed on the floor. You now know that your vision signal is O.K. and you can go ahead with confidence.

In the unlikely event of failure to obtain a signal proceed as follows :—

1. If set sounds " dead," *i.e.*, no valve or other noises audible in the phones,
   (a) Test HT voltage at valve anodes and screened grids. You should have almost 250v input, at each point. (Assuming 250v input, as required.)
   (b) Make sure all valve pins are making contact. It is a good idea to clean up all pins of EF50 valves, and make sure the valves are seating properly.
   (c) Remove cover of diode compartment, and see if valve is alight. If not, check your heater supply.
2. If set sounds lively, but no signal or weak signal, your aerial is probably at fault, but again make sure the valves are firmly seated.

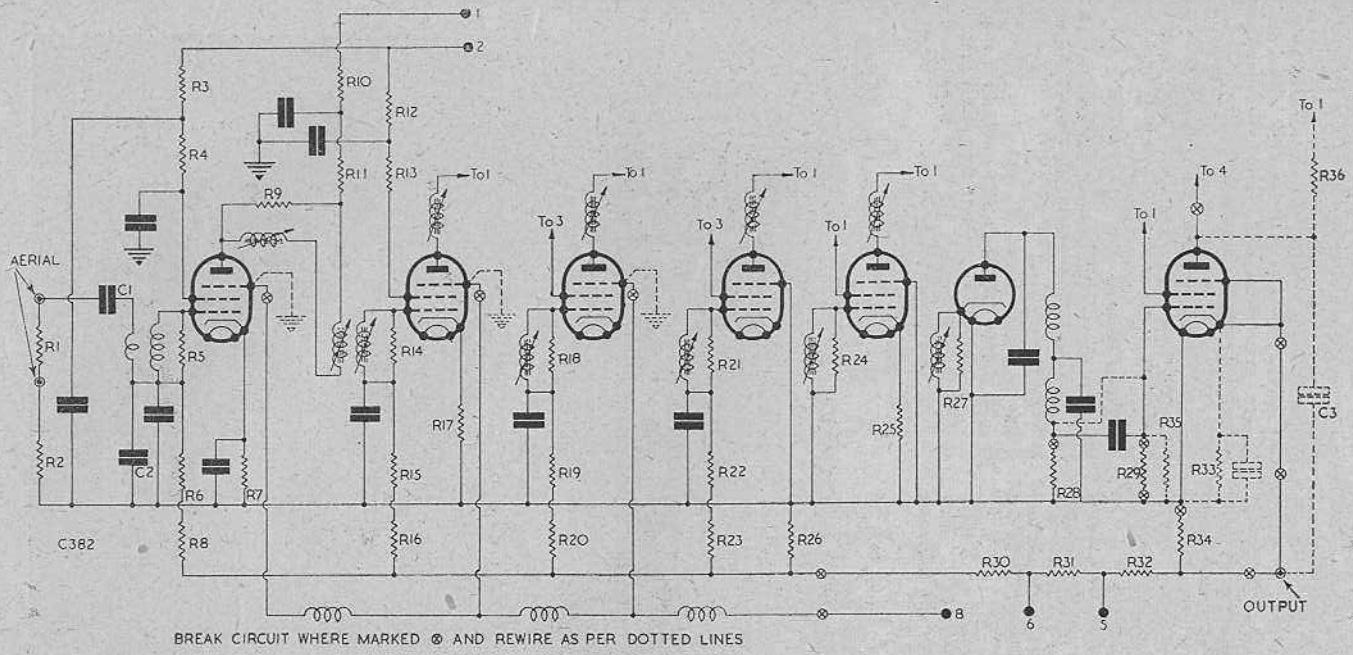
I may say that one of these strips gave me trouble which took some time to locate. The HT voltage dropped rapidly, and it was obvious that a " short " had developed. It was eventually found to be caused by a blob of solder in one of the RF stages. The HT is taken to an insulated bracket in each stage ; at one of these the solder had run, and was making intermittent contact with the chassis on the slightest pressure. This is unlikely to crop up again, but should be borne in mind.

Contrast Control

Several methods of contrast control will be apparent on examination of the circuit, but I adopted the simplest, though theoretically not very correct, method of variation of screened grid voltage. This is simply done by taking terminals 2 and 3 to HT via a 50,000 Ω variable resistor. It has proved quite satisfactory and will be retained.

General Note

A paxolin strip containing 4 resistors is mounted on the upper chassis of the strip as a rule. The modifications outlined result in these resistors being disconnected and unrequired, and they may therefore be removed or left in situ as desired. The same applies to the three chokes mounted on the upper chassis. These are out of circuit if the suppressor grids of the first three stages are earthed



Skeleton circuit of 45 Mcs TRF strip. Modifications: Break circuit where marked "X." and re-wire as per dotted lines.

Capacitors:

C1, 0.001μF
C2, 10μF
C3, 0.1μF

Resistors:

R1, 82 Ω
R2, 270 Ω
R3, 250 Ω
R4, 270 Ω
R5, 1,000 Ω
R6, 270 Ω
R7, 33 Ω
R8, 230 Ω
R9, 10,000 Ω
R10, 250 Ω
R11, 270 Ω
R12, 250 Ω
R13, 270 Ω
R14, 10,000 Ω
R15, 270 Ω
R16, 250 Ω
R17, 33 Ω
R18, 10,000 Ω
R19, 270 Ω
R20, 250 Ω
R21, 10,000 Ω
R22, 270 Ω
R23, 250 Ω
R24, 10,000 Ω
R25, 220 Ω
R26, 150 Ω
R27, 15,000 Ω
R28, 10,000 Ω
R29, 100,000 Ω
R30, 15,000 Ω
R31, 15,000 Ω
R32, 33,000 Ω
R33, 100 Ω
R34, 15,000 Ω
R35, 2,000 Ω
R36, 5,000 Ω

The capacitor shown across R33 should be marked C4, the value of which is 0.05μF.

at the valve-holder. The photograph shows all these components removed.

The Aerial

Before investing in an outdoor H aerial, constructors utilising the 45 Mcs strip described would be well advised to experiment on simple indoor aerials.

Originally, I used a dipole erected in the loft, and composed of ordinary aerial wire. The dimensions were about three inches short, owing to lack of space, but results were satisfactory and it remained for some months. The co-axial feeder comes down the outside of the house, and in through the window frame, and so to the set.

In order to obtain adequate bandwidth however, the aerial should, of course, be of larger diameter, and I have now erected two telescopic aluminium rods, which have resulted in an improvement in picture detail. These telescopic rods are obtainable on the surplus market at a couple of shillings each, and are each of seven sections, extending to over seven feet with a diameter of over half an inch. Only five sections are extended for television purposes.

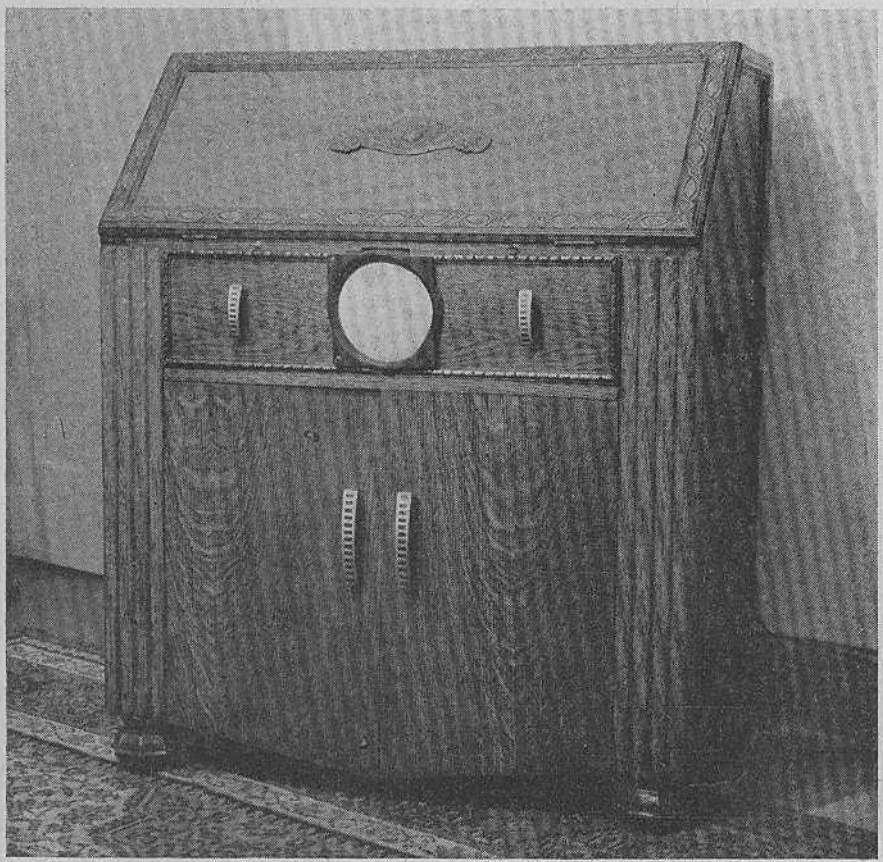
An alternative, well worth trying, would be a cage dipole composed of, say, eight wires to give an effective diameter of up to one foot.

The Power Supplies

Three power supplies are used, but with suitable transformers available, two should prove sufficient generally.

The three used are :—

No. 1 250v 100mA ; 6.3v 5 amp ; 5v 1 amp.
No. 2 350v 100mA ; 4v 2 amp ; 4v 1 amp.
No. 3 EHT supply ; 450-0-450 transformer 5v 2 amp ; 6.3v 3 amp.



Photograph of finished televisor.

No. 1 supplies :—

(a) HT to vision receiver, phase inverter, sync separator, screen grid of line time base and sound receiver *except anode* of output valve.

(b) LT to associated 5v rectifier. LT to vision receiver, DC restorer, phase inverter, sync separator, line and frame time bases, and deflection amplifiers.

No. 2 supplies :—

(a) HT at 350v to anode of line time base, and completely supplies frame time base and deflection amplifiers.

(b) HT at 270v (approx.) to anode of sound receiver output valve through 2,000 Ω resistor.

(c) LT to Cathode Ray tube (4v).

(d) LT to HVR2 half wave EHT rectifier (4v).

No. 3 supplies :—

(a) EHT by half wave rectifier utilising whole secondary, *i.e.*, 900v which is estimated to deliver 1,100v peak to CRT.

(b) Rectifier heater for power supply No. 2 (5v).

(c) LT to sound receiver (6.3v).

Feeding the screen of the line time base and sound output valve from one supply, and the anode from another, was found to give a more stable picture, and in the sound receiver removed some inclination to " motor boat."

All power supplies are well smoothed, in fact, particular care has been taken in this respect, and the HT for the sound receiver from No. 1 supply is taken through a choke with an 8μF capacitor to earth on the sound side.

I advise constructors first to get the set going on the 1,100v EHT supply. When settled down, it is a simple matter to button this supply on top of the 350v supply merely by transferring the negative line to 350v and you then have almost 1,500v to EHT. It will be found necessary to break the EHT resistor line and insert an additional 500K Ω resistor. Naturally neither of these or any other operations must be attempted until the set is switched off and reservoir and smoothing capacitors discharged. Nor must this be attempted, of course, if anyone is using half the secondary of the EHT supply in a separate half wave rectifier circuit to provide the HT for the time bases, etc.

Increasing the EHT reduces the size of the picture, of course, but with the deflection amplifiers already described by G2ATV and G3AYA there is ample margin in hand.

In my case power supply No. 2 is on a chassis mounted directly over the CRT, and also embodies the EHT rectifier and EHT resistor network, and smoothing capacitor. A panel (insulated) is mounted on the chassis, and carries the horizontal shift, focus control, brilliance control, and the mains switch, which is common to all the power supplies. The resistor network is wired from component to component, and is quite rigid, but care must naturally be taken to keep all points at EHT potential, well away from other components. A vertical shift control was not found to be necessary.

Housing the Set

If you intend housing the completed job in some article you already possess, it is unnecessary to purchase one of the 6A etc., Indicator Units as you only require the CRT. As these are now available at half the price of the indicator units, or less, some saving is possible.

I did a reconnaisance round my house to see where I might house the finished receiver. First I considered the sideboard. It seemed to me that by removing a drawer, inserting the tube from the rear and fitting a panel with a rectangular hole 5½" x 4½" cut in it a very neat job could be made. The rest of the set could be housed in the cupboard below. My wife did not quite see eye to eye on this, so I reluctantly turned elsewhere, and finally fixed on an old writing bureau. The panel where, as seen in the photograph, the tube is inserted was originally a drawer, but had been a false panel for some time. A piece of wood had to be removed from the crosspiece above to allow sufficient room, and the panel is now in two pieces. The right-hand portion is readily removed to allow easier access to the sound receiver controls behind, if necessary, and the photograph shows the two screws holding the right-hand side of the mask removed for this purpose.

The only external control is on the right side, and is the sound volume control.

Two small brackets shown mounted on the crosspiece just above and to the inside of the panel handles are for one of the excellent magnifier lenses. Normally a wooden shield is slipped on to the same brackets when not " looking in " and the magnifier is substituted when required.

Connections to sound receiver are by an octal plug, the removal of which enables the sound receiver to be removed from the front without difficulty. Similarly, either the vision or deflection amplifier chassis are each readily removable, all connections being to plug, with the exception of the deflection capacitors, and in their case the unsoldering of four very accessible wires enables the amplifier chassis to be removed.

The only shielded wires are the CRT heaters (probably quite unnecessary) and the CRT grid leak from the phase inverter.

OUTPUT TRANSFORMERS

for valve heater supplies

by A. H. Taylor

ONE of the most expensive items in the home constructed mains receiver is the mains transformer and probably more sets are left unbuilt through the cost of this one component than for any other cause. Further, the part must, of necessity, be relatively bulky and greatly increases the size of chassis needed to carry the receiver. This, in the case of a simple straight three, might otherwise be very compact and of the handy, semi-portable type for use as a companion set.

The " universal " form of circuit therefore has much to commend it for such a set, but the use of high voltage filament valves, which usually have to be purchased specially as they do not normally feature in the radio constructor's " parts box," and the fact that considerable power has still to be wasted in a " dropper " resistance or line-cord renders this type of circuit uneconomical both to build and to operate.

One solution to the problem which has been successfully tried by the author is the use of a standard output transformer to obtain filament voltages in conjunction with a metal rectifier for HT as in Fig. 1.

The filament current drawn by three 4 volt valves of suitable types for use in a small straight three is approximately 2.5 amps. This is a current which is quite normally encountered in the secondary winding of a pentode matching transformer working with a three ohm speaker.

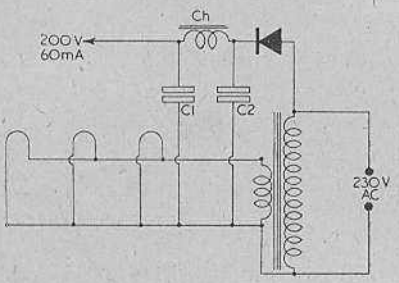


Fig. 1. *C*1, 16μF, *C*2, 8μF, *Ch*, 10 *Hy.*

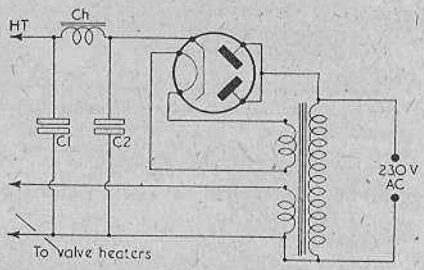


Fig. 2. *C*1, 16μF, *C*2, 8μF, *Ch*, 10 *Hy.*

The turns ratio of such a transformer is equal to the square root of the primary impedance divided by the secondary impedance, thus:—

$$n = \sqrt{Z1/Z2}$$
$$= \sqrt{8{,}000/3}$$
$$= \sqrt{2{,}666} = \text{approx. } 50 : 1$$

By connecting the primary to the 230 volt 50 cycle mains as in Fig. 1, the voltage on the secondary will be 230/50 which is, approximately, 4.5 volts. This will fall sufficiently on load to supply the 4 volt valve heaters direct without a dropping resistor.

The type of transformer used to match a valve of 3,500 ohms optimum load, such as the Mullard PenB4, to a three ohm speaker will have a turns ratio of 34 : 1 which will give an output voltage of 6.5 volts. This could very conveniently be used to supply the heaters of three 6 volt 0.2 amp. valves from the E series which would be very suitable for use in the type of receiver which we are considering.

If one of the multi-range type of output transformer with separate secondaries is available, a suitable winding could be used to feed the filament of the more conventional valve rectifier of Fig. 2.

The very small transformers found in use with tiny speakers should be avoided, but any medium-sized component such as would be employed in the output stage of the usual 3 to 4 watt set will be quite happy under these conditions and should not show any signs of overheating.

LOGICAL FAULT FINDING

The fifth in a series of articles to assist the home constructor in tracing and curing faults

By J. R. DAVIES

5: NO SIGNALS (cont.)

Checking the Detector Stage (Straight Set)

NOW, checking the detector stage of a straight set usually involves checking a circuit of the leaky-grid or anode-bend type. Reaction can be ignored, it being assumed that the set is sensitive enough to pick up a few local stations without it, using a good aerial. The leaky-grid circuit shown in Fig. 19(a) combines an AF amplifier with a detector. Therefore it should be first treated as an AF amplifier. This means using the grid-touching procedure described in the last article. Should the valve work satisfactorily as an AF amplifier then we may start to check the tuned circuit, etc.

Should signals be received with the aerial connected in this manner it is obvious that the fault lies in the RF stage which then needs the usual voltage checks and examination.

Checking the IF Valve(s) of a Superhet

When we come to checking the pre-AF amplifier stages in a superhet, those who are not fortunate enough to possess a signal generator are put immediately at a disadvantage. There is, nevertheless, a quite simple procedure that can be adopted ; and one which gives reasonably reliable results.

Fig. 20 shows the circuit of an IF amplifier stage feeding into the second detector of a

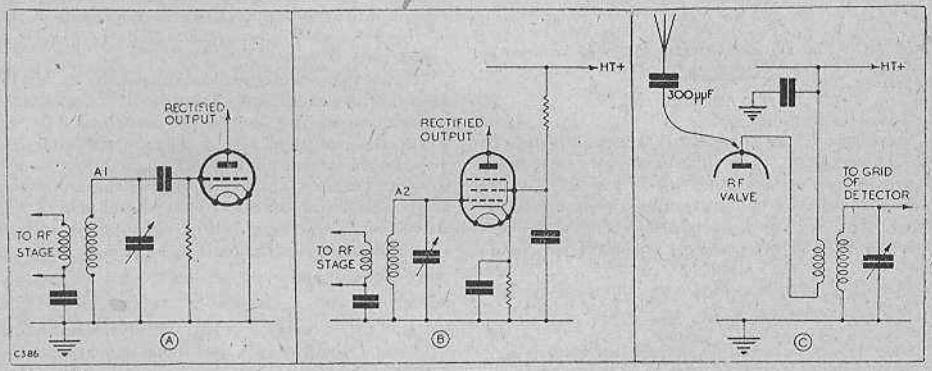


Fig. 19

The anode-bend detector shown in Fig. 19 (b) can be checked as an AF amplifier if the coil in the grid circuit is disconnected. This is hardly worth the trouble unless the following test on the tuned circuit shows that the detector stage is not functioning.

The tuned circuits are checked by the simple process of applying a signal to the anode of the previous RF stage, thereby cutting that stage out. If a signal generator is available the job is easy. If not, a good aerial should be connected to the RF anode lead and the detector tuning capacitor rotated to see if any signal is received. Alternatively, the aerial may be connected to the "top" end of the detector coil (A1 or A2 in Fig. 19 (a) and (b)), whereon a very tight coupling will exist. In all the tests mentioned in this paragraph, the aerial should be applied via a 300$\mu\mu$F. capacitor. See Fig. 19 (c).

superhet. We shall assume that the AF stages of the set have been checked and found serviceable. We can proceed with the AF check as far back as the volume control, finding that, if we touch point "A" (Fig. 20) with the volume control turned to full, we get the necessary grid hum. We then know that the fault lies somewhere between that point and the aerial...

This infers that, proceeding backward, we should next check the detector circuit. However, in practise, we usually take the diode circuit for granted, as it is extremely rarely that it causes trouble. (This observation does not apply to home-constructed receivers that have never worked since completion !) So we next proceed to test the IF amplifier stage.

And, here, a word of warning is again necessary. The trimmers of the IF transformers, in fact, any of the trimmers in the set, should never be touched

whilst the set is receiving no signals at all. If a signal generator is available, this point is not so important. But, if we do not have a signal generator, we have to use a certain amount of guesswork in the repair of the set ; and there is no point in making the job harder by altering things that are, very probably, in perfectly good order.

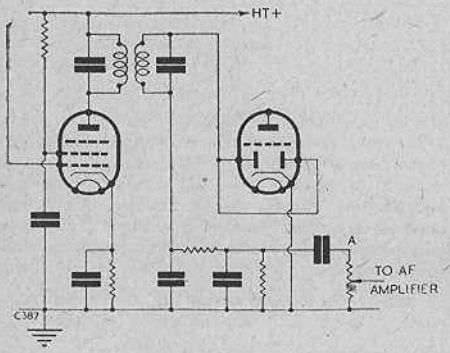
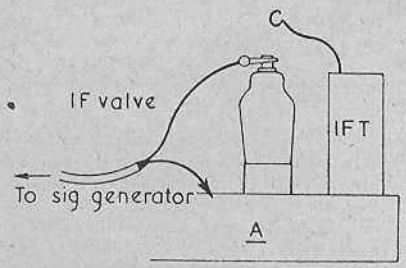


Fig. 20. The IF and detector stages of an average superhet.

And now, let us proceed to the actual testing of the IF amplifier. If a signal generator is at hand it can be connected as shown in Fig. 21 (a). If not available, we can still make a pretty reliable test. The IF valve control-grid should be disconnected from the previous stage. Then, holding a piece of shiny metal (such as the blade of a screwdriver) with the hand, the grid of the valve should be lightly scraped with the metal, causing an intermittent contact. The other hand should be free. This should cause what can best be described as a " rustling crackle " in the loudspeaker, which, although perhaps not very loud, will serve to indicate that the IF stage is working reasonably well. (See Fig. 21 (b)).



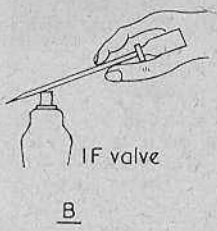


Fig. 21. (A) Connecting the signal-generator to the grid of the IF valve. (B) Checking the IF valve and stage without a signal-generator. Note that the fingers are in contact with the metal of the screwdriver.

If no indication at all is given, the valve voltages should be checked, and the valve replaced, if necessary.

Checking the Frequency—Changer Stage

Checking the frequency-changer stage involves several operations ; those of checking the valve as an IF amplifier and as an oscillator, in addition to checking the stage's signal tuned circuits.

Fortunately the process is not too complicated. The first job is to check the valve as an IF amplifier. This is best done by applying a signal generator (at the intermediate frequency), or by using the " scraping " process with the screwdriver, mentioned in the previous section, to the signal-grid of the valve. This grid should be disconnected from the RF coils for this test ; but, since most types of frequency-changer have the signal-grid brought out to the top-cap, this is a very simple process and just necessitates the removal of the top-cap connection.

Should no rustling noises, etc., be heard, then the fault should lie in the cathode, screen-grid or anode circuits, or in the valve itself. (Apart from the fact that they may become open-circuit, or—occasionally—short-circuited, both facts easily checked on the ohmmeter, the IF transformers will give little trouble, and the serviceman is not advised to spend much time chasing obscure faults in them. Most of the faults occurring in the anode circuit of the frequency-changer, and, incidentally, of the IF amplifier as well, will be of a " DC " character.)

If the valve functions satisfactorily as an IF amplifier then the fault should lie in the oscillator section, or in the RF tuned circuits. Fig. 22 shows the circuit of a typical frequency-changer. Now let us assume that the RF tuned circuits are in some manner faulty. If we cut them out and apply the aerial directly to the signal-grid of the valve we should be able to tune in some sort of signal by means on the oscillator tuning capacitor.

A very simple method of doing this is shown in Fig. 23. An aerial lead is held pressed against the top-grid of the frequency-changer by the first finger of the hand. The thumb is then pressed against an adjacent earthed point, usually the top of a nearby IF transformer. That part of the hand between first finger and thumb supplies the necessary grid-leak in the circuit ! As the oscillator capacitor is rotated, one or two signals should be heard (probably with plenty of whistles and hum), and, if this is the case, then the oscillator section is obviously functioning, and the fault lies in the oscillator tuned circuits.

If, however, no signals of any sort are heard, then it is almost certain that the oscillator is not working. This point may be confirmed in the following manner. A testmeter should be connected between the cathode of the frequency-changer and earth (see Fig. 22), and switched to a suitable voltage range. The grid of the oscillator section should then be touched with the finger. This may necessitate using a thin screwdriver with the finger touching the blade as the connection to this grid will be below the chassis. When the grid is touched, the load presented by the body will be sufficient to stop the valve from oscillating, particularly if the other hand is touching the chassis. When oscillation stops, the oscillator will proceed to take more current and the voltmeter reading will increase. Thus, when the oscillator grid is touched the reading increases, when the hand is taken away the reading decreases. If there is no change in reading, the oscillator is not working. A battery-type frequency-changer will not have a cathode bias resistor. The test can still be carried out, however, connecting the testmeter between the screen-grid of the valve and earth. In this case, readings will not vary so greatly as did the cathode readings when the valve goes in and out of oscillation. If no change whatsoever is found, however, then it can be safely assumed that the oscillator is not functioning.

The various faults that may beset the oscillator are usually quite simple and can easily be located with the testmeter. It should not be forgotten that the valve itself may have lost its emission and be not capable of oscillating.

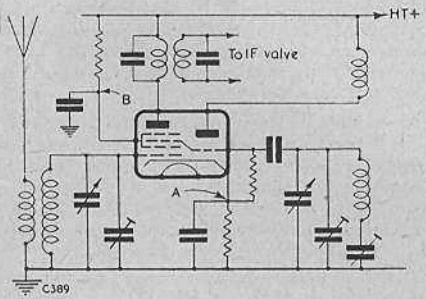


Fig. 22. A typical frequency changing stage. Voltage checks for oscillation as described in the text may be carried out at points "A" or "B" (the cathode and screen grid respectively.)

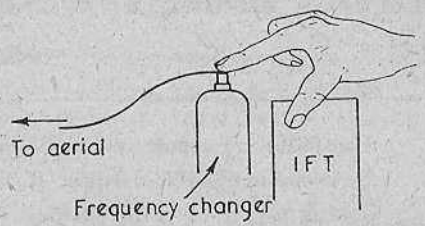


Fig. 23. A quick method of checking the signal frequency circuits of a superhet. Note the thumb touching the metal case of the IF transformer. Where grid top cap is used!

SUMMARY

"No Signals"

(a) Check power supplies.
(b) Check output stage by touching its grid.
(c) Check AF stage(s) by touching its grid.

For Straight Sets

(d) Check detector (if leaky-grid type) as for an AF amplifier.
(e) Apply aerial to detector tuned circuit, thereby by-passing RF stage.
(f) Look for fault in RF stage.

For Superhets

(d) Check IF amplifier.
(e) Check frequency-changer as IF amplifier.
(f) Isolate RF tuned circuits (and previous RF stage, if fitted), by applying aerial to signal-grid of frequency-changer.
(g) Check oscillator.

SHORT WAVE NEWS

Our companion journal "Short Wave News" has many items of interest, and this month includes the following: A 145 Mcs Converter by R. J. Appleby, Around the Shacks (G6XP), Ham and Broadcast Band News, VHF News, RAF Distress Call Methods, An Efficient Straight Three Receiver by Centre Tap, and a list of the month's Short Wave Broadcast programmes, and many other interesting items. Available from your local newsagents, price 1/3.

Hogwash-Major calling !

The following report received from the Hon. Sec. of the Society for the Development of Electronic Research shows that members are now getting down to some serious (?) activity. And how !

Myrtle Cottage,
Hogwash-Major.
August, 1949

Dear Sir,

I have great pleasure in submitting a further account of the activities of the Society for the Development of Electronic Research (Hogwash-Major).

You may remember in my last month's report that the Society was successfully inaugurated and that the Junior Section, Master William Westinghouse, had already started work on his apparatus to measure the time taken for centimetre wave pulses to be reflected from the moon.

After several weeks had elasped the Founder Members of the association were informed that the equipment was almost ready. All members were present for the first experimental try-out.

Several members offered useful advice to the Junior Section. In particular, Lieut. Jonathan Needy (ex-R.N.), our treasurer, was able to give invaluable assistance in the construction of the EHT supply pack. There were, however, several minor breakdowns before the appartus was finally got into working order : the most spectacular case being that in which Lieut. Needy found himself transfixed in an awe-inspiring network of flashes and sparks. Our Female Member, Miss Lavinia Twittering, was extremely impressed and stated that she hadn't realised that radio could give such beautiful effects. Fortunately a fuse blew, whereupon our treasurer lost his agonised stiffness and immediately commenced to express himself in a series of extremely forceful phrases directed mainly against our Junior Section.

Our Female Member handed in her resignation from the Society there and then.

It was only after a stern reminder from the President that she had joined for instruction and that the expressions used by our treasurer were simply Naval versions of technical terms which were fully understood by everyone else present that she consented to remain as a member.

After only a few more *contremps* of this nature the Junior Section finally announced that the gear was all ready. As there was a full moon almost immediately above us we decided to commence straight away. There was dead silence as the Junior Section adjusted his knobs and made quick calculations with his slide rule.

Finally he announced that there was something only four miles above us.

This immediately caused a stir and as there was definitely no aircraft or any similar object in the vicinity there was a certain inclination to scoff at the results obtained. This was firmly suppressed by the Junior Section who stated that it had been known for small meteorites to hover over the earth for many days before actually dropping, in which case they caused widespread havoc. This evidence was discounted by all present, except for the Female Member who promptly went into hysterics and immediately left to see if her Anderson shelter was still habitable.

The meeting then broke up in some gloom. Repeated checks on three successive evenings revealed, however, that the readings were correct. It was not long before the residents of Hogwash-Major heard the news and a certain amount of panic was caused in the countryside. The information, indeed, reached one of our National Dailies and there was quite a little stir in scientific circles. On the fourth night, however, the object seemed to have disappeared and the district began to settle down again.

At an Extraordinary Meeting of the Society which was held a few days later, the Founder Members decided that the news of the dismantling and removal of a large W.D. water tank at the top of a nearby hill several miles away (which, curiously enough, was completed on the fourth night of our observations), should be suppressed in our talk with the villagers.

We cannot, however, state that our measurements of the distance of the moon have as yet been entirely successful. Meanwhile, we are pressing ahead with the construction of a balloon (using Radio-Sonde principles) to enable readings of atmospheric conditions in the stratosphere above Hogwash-Major to be taken.

Therefore, until next month when I hope to have some more news,

I remain

Yours sincerely,

J. Jorum, Hon. Sec. S.D.E.R. (H-M).

EX-R.A.F. COMPONENTS

We print below a list of ex-RAF components, which we have compiled. In all cases the numbers are preceded by the reference 10C/. For example, No. 14, .001μF would read 10C/14. This list is by no means complete, and we would be pleased to receive details of any other markings which readers may be in a position to supply for publication in a future issue.

Ex R.A.F. Capacitors

14	.001 μF
15	5 pF
16	10 pF
18	80 pF
24	.002 μF
94	500 pF
96	100 pF
97	.002 μF
347	.01 μF
626	500 pF
627	.001 μF
792	500 pF
793	1,000 pF
796	.05 μF
799	.15 μF
958	500 pF
960	2.5+2.5+1 μF
962	As above
963	100 pF
964	.005 μF
967	.1 μF
968	75 pF
969	800 pF
970	.5 μF
971	600 pF
972	200 pF
974	10-115 pF Trim.
976	5-60 pF Trimmer
978	15 pF
979	4 μF
1006	100 pF
1122	.005 μF
1135	.005 μF
1271	.02 μF
2001	2 pF
2002	4 pF
2005	4,550 pF
2006	100 pF
2007	25 pF
2008	240 pF
2009	80 pF
2011	.002 μF
2013	1,320 pF
2014	537 pF
2015	1,670, pF
2016	6,170 pF
2017	300 pF
2027	5 pF
2066	3-18 pF Trimmer
2070	3-20 pF Trimmer
2071	3-18 pF Gang.
2072	2-8 pF Trimmer
2073	10 pF
2075	30 pF
2077	30 pF
2078	50 pF
2079	50 pF
2082	2-6.5 pF Vari.
2083	.05+.05 μF
2084	.1+.1 μF
2108	5 pF
2167	0.1 μF
2189	1 μF
2192	.1 μF
2205	25 pF
2237	.004 μF
2238	.25 μF
2239	2 μF
2240	4 μF
2335	.5 μF
2403	25 pF
2428	100 pF
2599	25 μF
2624	.1 μF
2625	.01 μF
2626	.005 μF
2627	.005 μF
2629	.02 μF
2630	.05 μF
2649	65 pF
2920	30 pF
3025	50 pF
3027	25 pF
3043	50 pF
3055	.01 μF
3064	300 pF
3100	.001 μF
3124	30 pF
3129	5-60 pF Vari.
3192	.0025 μF
3195	.01 μF
3196	300 pF
3200	20 pF
3303	10 pF
3396	.001 μF
3399	1+1+1 μF
3397	80 pF
3401	.5 μF
3402	8-105 pF Vari.
3434	30 pF
3436	.0001 μF
3503	8 pF
3671	2 pF
3787	16 pF
3788	.005 μF
3789	60 pF
3790	160 pF Vari.
3791	160 pF Vari., 2 Gang.
3957	.002 μF
3961	.001 μF
4099	.0003 μF
4100	.0001 μF
4232	25 μF
4250	.001 μF
4260	93 pF
4268	200 pF
4271	100 pF
4478	10 pF
4501	50 μF
4502	500 pF
4572	1 μF
4632	3 pF
4633	2 pF
4870	50 pF
4909	.5 μF
4917	3-30 pF
4922	30 pF
4923	160 pF
4995	100 pF
5056	30 pF
5144	500 pF
5168	25 pF
5352	.005 μF
5477	350 pF
5484	250 pF
5598	16+8 μF
5645	.01 μF
5874	9-175 pF Vari.
5704	.02 μF
5764	.1 μF
5875	3-8 pF
5970	250 pF
7901	.001 μF
7906	.01 μF
8009	.0005 μF
8010	.002 μF
8275	2 μF
8286	8 μF
8382	.25 μF
9097	1 μF
9629	.05 μF

9755	.01 μF
10164	.005 μF
10165	.1 μF
10221	.05 μF
10226	.0005 μF Vari.
10227	3-35 pF Vari.
10228	160 pF
10229	1,050 pF
10230	3-17 pF Vari.
10301	3 pF
10552	50 pF
10554	.1 μF
10568	50 pF
10607	15 pF
10629	.01 μF
10948	20 pF
11121	.002 μF
11122	.005 μF
11123	.01 μF
11124	.02 μF
11125	.05 μF
11126	.1 μF
11127	.1 μF
11128	.25 μF
11130	.5 μF
11131	.5 μF
11140	.004 μF
11156	.05 μF
11157	.1 μF
11263	400 pF
11476	.1 μF
11482	4 μF
11485	50 pF
11555	.03 μF
11557	.1 μF
11558	15 pF
11560	30 pF
11563	300 pF
11564	500 pF
11565	500 pF
11568	13-541 pF
11569	11.5 pF
11571	Unit containing 11560 & 1006
11573	Unit containing 11122 & 2205
11658	200 pF
11694	.003 μF
11748	.125 μF
11753	.01 μF
11754	.05 μF
11755	4 μF
11756	.25 μF
12074	25 pF
12095	.0025 μF
12113	35 pF
12114	40 pF
12384	25 μF
12497	.03 μF
12505	.1 μF
12574	1 μF
12884	.002 μF
13057	.03 μF
13194	8 μF
13212	16 μF
13218	.02 μF
13258	4 μF
13260	4 μF
13275	7 pF
13364	.001 μF
13599	3.5-13.5 pF
13600	2.5-6.5 pF
13601	7-75 pF 2 Gang
13602	7-75 pF
14211	40 pF
14582	.01 μF
14609	47 pF
14616	.5 μF
14719	2 pF
14757	4 pF
14770	470 pF
14834	470 pF
14877	390 pF
Potentiometers	
1438	20 K Ω
1439	20 K Ω
1440	2 K Ω
1478	500 K Ω
1567	100 K Ω
1568	2 K Ω
1569	60 K Ω
1807	5 K Ω
1808	20 K Ω
6076	100 K Ω 2 watts
7935	500 K Ω 2 watts
8023	500 K Ω
8086	10 K Ω
8924	1 K Ω 3W WW Linear
8925	5 K Ω 3W WW Linear
8926	10 K Ω 3W WW Linear
8927	25 K Ω 3W WW Linear
8928	50 K Ω 2W Carbon Linear
8929	5 K Ω 3W WW Linear
8931	100 K Ω 2 watts
10714	100 K Ω ¼ watt
16245	200 K Ω 1½ watts

ANSWERS TO THE QUIZ

(1) More stations, of course, but the most welcome improvement is the reduction (elimination, on local stations) of background noise, due to the improved "signal-to-noise" ratio and the action of AVC. A weak signal causes the set to operate in its most sensitive condition, and, unfortunately, some interference and all of its own random noises receive the benefit of full amplification. With a strong signal AVC reduces the sensitivity and the set's ability to magnify "slush."

(2) The aerial coil can be coupled to a mains lead through a capacitor of .0005μF, 500V working. It is not a very efficient substitute for an aerial, and a few yards of wire in the attic would be better.

(3) Right. The choke input arrangement delivers RMS voltage, but with capacitor input the capacitor charges to peak voltage, and this, less drops in subsequent smoothing components, is the voltage delivered to the set. The enquiring constructor may wonder how the output from the rectifier can have a peak or RMS value. It is pointed out that the rectifier delivers 50 or 100 half-cycles per second, which, although unidirectional, have much the same form as when they were each part of a full cycle.

(4) Switch the motor on, and turn the volume control up. Hold the pick-up just clear of the turn-table and swing it across it. If the motor is guilty the hum will vary in intensity as the pick-up is used.

(5) Current feed-back introduces an increase in the apparent output resistance, which in the cases of tetrodes and pentodes is already too high. To obtain the benefit of low output resistance negative voltage feed-back should be used.

(6) Right. Phase reversal occurs between grid and anode.

(7) Absence of cathode by-pass capacitor allows negative current feed-back to occur. A small capacitor allows only high frequencies to by-pass the resistor. The high frequencies suffer no attentuation, but the middle and low frequencies are still subject to feed-back. This effect is sometimes used deliberately to modify the response of an amplifier.

A NEW STYLE CHASSIS

By N. F. WEBB

CENTRE TAP'S "free deck" chassis idea is certainly ingenious, but the fact remains that he would have to drill holes in his steel chassis sides for potentiometers, switches, capacitors, etc., and holes drilled for his first experimental hook-up might not be in the correct position for his second effort.

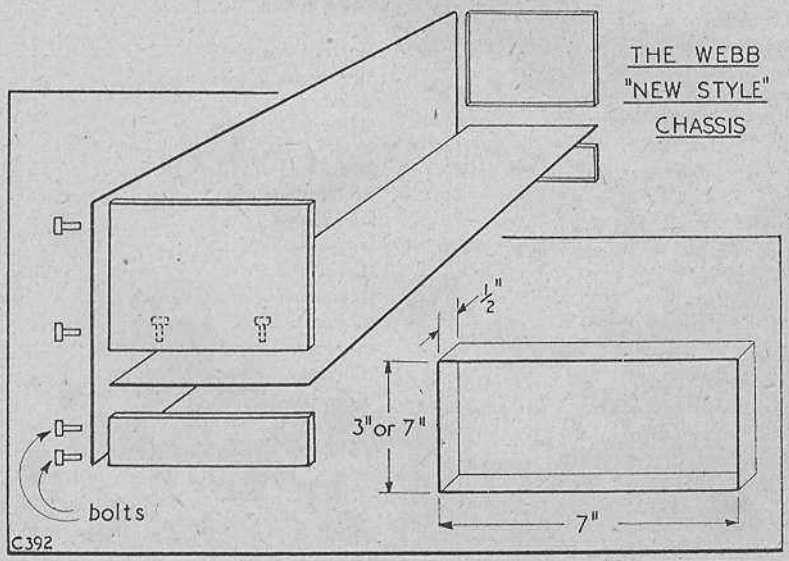
I have solved this experimental chassis problem in what I consider to be the simplest and most effective way. I have had four "frames" made of strip brass. Two are 7" x 3" x ½", and the other two 7" x 7" x ½". The strip brass is ⅛" thick.

To rig up an experimental chassis, all I have to do is to bolt a front panel to the ends of the two smaller frames; bolt another sheet of aluminium on top of the small frames; and then bolt the two larger frames to the front panel and the smaller frames. The diagrams, I hope, make this clear.

In this manner a chassis can be assembled without the blood, sweat and tears that shearing and bending involve. Any two flat sheets of aluminium can be used. The holes for potentiometers, switches, capacitors, etc. are made in the front panel, which is changed for the next job.

Apart from the ease of construction, this chassis has another advantage. You can turn the chassis upside down to solder joints, or make measurements or adjustments, and the chassis will remain rock-steady while you do it.

Oh yes, I'm very proud of my chassis back in the shack!



RADIO TERMS and Abbreviations

VALVE DATA TERMS

Ra, Ro, Ri	Anode Impedance
Ea, Va	Anode Voltage
Ia	Anode Current
Eg, Vg	Control Grid Voltage
Ig	Control Grid Current
Lg	Control Grid Circuit Inductance
Esg,Vsg,Vg2	Auxiliary or Screening Grid Voltage
Isg, Ig2	Auxiliary or Screening Grid Current
Ec, Vc	Cathode Voltage
Ic	Cathode Current
Ef, Vf	Heater or Filament Voltage
If	Heater or Filament Current
G, μ	Amplification Factor
S, Sc, gm	Mutual or Conversion Conductance
Wo	Audio Output, watts

RADIO AND ELECTRICAL ABBREVIATIONS

Aerial	Ae
Alternating Current	AC
Ampere	A
Amplitude Modulation	AM
Audio Frequency	AF
Automatic Gain Control	AGC
Automatic Volume Control	AVC
Automatic Volume Expander	AVE
Automatic Volume Limiter	AVL
Beat Frequency Oscillator	BFO
Centimetre	cm
Continuous Waves	CW
Crystal Oscillator	CO
Cycles per second	cs, cps
Decibel	dB
Direct Current	DC
Double Cotton Covered Wire	DCC
Double Silk Covered Wire	DSC
Double Pole Change-Over Switch	DPCO
Double Pole Double Throw Switch	DPDT
Double Pole Single Throw Switch	DPST
Earth	E
Electromotive Force	EMF
Electron Coupled Oscillator	ECO
Frequency	f
Frequency Changer	FC
Frequency Doubler	FD
Frequency Modulation	FM
Grid Bias	GB
Henry	H
High Frequency	HF
High Tension	HT
Intermediate Frequency	IF
Interrupted Continuous Waves	ICW
Joule	J
Kilocycles per second	kcs
Kilohms	k Ω
Kilovolt	kV
Kilowatt	kW
Low Frequency	LF
Low Frequency Choke	LFC
Low Tension	LT
Master Oscillator	MO
Megacycles per second	Mcs
Megohm	M Ω
Metre	m
Microfarad	μF
Micro-microfarad	$\mu\mu$F
Microhenry	μH
Microampere	μA
Microvolt	μV
Microvolt per metre	μV/m
Microwatt	μW
Milliampere	mA
Millihenry	MH
Millivolt	mV
Milliwatt	mW
Modulated Continuous Waves	MCW
Ohm	Ω
Picofarad	pF
Potential Difference	V
Power	P
Power Amplifier	PA

Power Factor	PF
Radio Frequency	RF
Radio Frequency Choke	RFC
Radio Telephony	R/T
Screen Grid (valve)	SG
Short Waves	SW
Single Pole Change-Over Switch	SPCO
Single Pole Double Throw Switch	SPDT
Single Pole Single Throw Switch	SPST
Single Signal Superhetrodyne	SSS
Superheterodyne	SH
Standard Wire Gauge	swg
Thermocouple	TC
Tuned Plate Tuned Grid	TPTG
Tuned Radio Frequency	TRF
Ultra High Frequency	UHF
Ultra Short Waves	USW
Very High Frequency	VHF
Volt	V
Watt	W
Wavelength	λ
Wireless Telegraphy	W/T

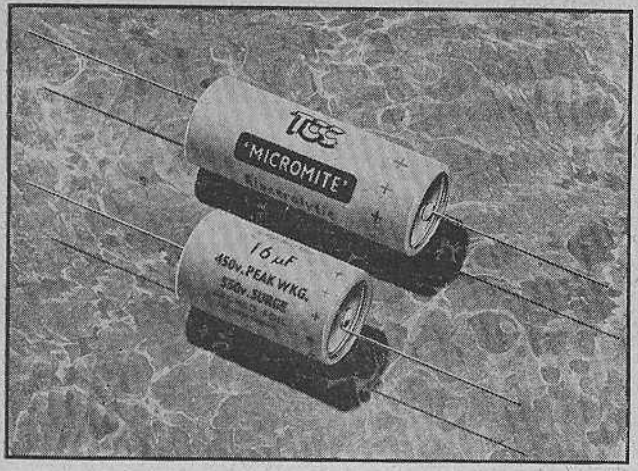
SYMBOLS OF QUANTITIES AND CONSTANTS

Admittance	Y
Angular Velocity	w
Capacitance	C
Capacitive Reactance	X_C
Coil Amplification Factor	Q
Conductance	G
Current	I
Dielectric Constant	K
Electro-motive Force	E
Energy	W
Flux Density	B
Frequency	f
Impedance	Z
Inductance	L
Inductive Reactance	X_L
Magnetic Intensity	H
Magnetic Force	F
Magnetic Reluctance	S
Mutual Inductance	M
Permeability	μ
Phase Displacement	0
Potential Difference	V
Power	P
Quantity of Electricity	Q
Reactance	X
Resistance	R
Voltage	E

EQUIVALENT EXPRESSIONS

The following is a list of commonly used English terms with the equivalent American expression.

Accumulator	Storage cell
Aerial	Antenna
Anode	Plate
Anode AC Resistance	Plate Impedance
Atmospherics	Static
Coil pin	Coil prong
Coil former	Coil form
Detector	Demodulator
Dynamic Resistance	Anti-resonant
Earth	Ground
Fixed Vanes	Stators, stator plates
Frame Aerial	Loop antenna
GB Battery	" C " Battery
Gramophone	Phonograph
Hand capacity	Body capacity
HT Battery	" B " Battery
Laminations	Core pieces
LT Accumulator	"A" Battery
Magic Eye Indicator	Electron ray tube
Mains plug and socket	Power plug and receptacle
Mains supply	Power line
Mains transformer	Power transformer
Modulation hum	Tunable hum
Moving coil speaker	Dynamic Speaker
Moving vanes	Rotor, rotor plates
Mutual conductance	Transconductance
Quality	Fidelity
Reaction	Regeneration
Reaction winding	Tickler
Screen	Shield
Speech coil	Voice coil
Tags	Lugs
Terminals	Binding posts
Theoretical Drawing	Schematic
Tuned anode circuit	Tank circuit
Valve	Tube, Vacuum tube
Valveholder	Tube socket
Wavechange switch	Band switch



Trade Notes

INSTRUCTION FOR TELEVISION ENGINEERS

The series of television instruction courses organized by the Radio Gramophone Development Co. Ltd., Bridgnorth, Shropshire, and announced on June 30th last, are now suspended until September. Applications to attend these future courses, which are limited to R.G.D. dealers, should be addressed to the Company at Bridgnorth.

"REDIFON"

Rediffusion Ltd. has changed its name to Redifon Ltd.

Redifon has always been the company's registered trade mark, and has during the past few years been very closely identified with its products. The name Rediffusion on the other hand was originally applied to the system of wire broadcasting operated on a very wide scale in this country and Overseas by the Broadcast Relay Group of Companies, and has become very closely identified with that system.

It is therefore felt that since the main business is the manufacture and world-wide sale of radio communication equipment, industrial radio frequency heaters and allied products, this change of name will be appropriate and more in keeping with their activities.

T.C.C. INTRODUCE THEIR NEW "MICROMITE" CAPACITORS

Frequently, in replacing faulty capacitors, or including additional ones where circuit modifications are necessary to older sets, the radio service man finds difficulty in accommodating capacitors of the required value in the spaces available. T.C.C. have now designed a range of dry electrolytic capacitors in which particular attention has been given to meeting these difficulties, without any compromise to efficiency and reliability.

The T.C.C. "Micromite" dry electrolytic capacitors are the smallest and lightest yet offered, the reduction in size and weight having been made possible by using a high-gain etched foil.

Of non-corrosive all-aluminium construction, they are hermetically sealed to ensure long and trouble-free service and are completely protected in a cardboard tube. They may therefore be fitted immediately adjacent to other components without fear of causing short circuits.

Voltage ratings are conservative and the general high quality of T.C.C. products has been maintained.

The "Micromite" is recommended for smoothing after the choke or for any de-coupling circuit.

Capacity	Voltage		Dimensions (Overall)		Price
	Peak Wkg.	Surge	Lgth.	Diam.	Retail
8μF	450	550	$1\frac{13}{16}$"	$\frac{13}{16}$"	3/6
16μF	450	550	$1\frac{13}{16}$"	$1\frac{1}{16}$"	5/-
32μF	450	550	$2\frac{13}{16}$"	$1\frac{1}{16}$"	7/6
16μF	350	400	$2\frac{5}{16}$"	$\frac{13}{16}$"	4/-
32μF	350	400	$2\frac{5}{16}$"	$1\frac{1}{16}$"	6/-

MULLARD VALVE DIVISION NAME CHANGE

The title of the Transmitting and Industrial Valve Division of Mullard Electronic Products Ltd. has been changed to " Communications and Industrial Valve Department."

The change has been made to bring the name of the Department more into line with the scope of its activities. It has been felt for some time that the word " Transmitting " gave a limitation to the uses of Mullard valves which was, in fact, not the case. In recent years the use of valves in line communication work has increased enormously and it is to include this field, in addition to the transmitting (*i.e.*, radio) sphere that the new name is designed to cover.

TELEGRAPHIC ADDRESS CHANGE

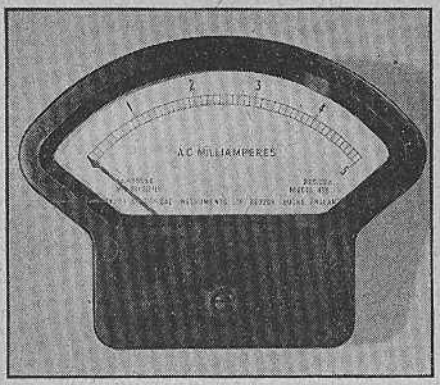
The telegraphic address of the Mullard Radio Valve Company at Mitcham, in Surrey, has been changed from Emvalco Phone London to Emvalco Souphone London. It is claimed that this alteration will speed up the delivery of telegrams.

SILICONE RUBBER INSULATED CABLES AND WIRES

The decision has now been reached to raise the maximum working temperature of silicone rubber insulated cables and wires manufactured by British Insulated Callender's Cables, Ltd., to 150°C. It is pointed out that these cables and wires may also be employed at temperatures considerably below freezing point.

Typical applications of cables with silicone rubber insulation include their use as thermocouple leads, as instrument leads and connections in boiler houses, for wiring drying kilns, furnaces, ovens, ships' engine rooms, and gas turbine aero-engines. B.I.C.C. manufacture cables and flexibles, with this type of insulation, having conductor sizes to B.S.7, and also radio connecting wires. Insulating sleevings in a wide range of sizes and colours can be supplied.

The principal reasons why silicone compounds possess remarkable temperature stability are the presence of the silicon atoms and the strength of the silicon-oxygen bond. Further, compared with asbestos and glass ias nsulants for high temperatures, silicone rubber combines greater flexibility and resistance to moisture as well as the ability to withstand continuously, without deteriorating, a much wider range of working temperatures.



THE NEW TAYLOR SERIES 415 SECTOR INSTRUMENTS

The tendency with modern measuring instruments is for a reduction in size. At the same time there is a demand for long and clear scales. These two apparently incompatible features have been effectively achieved in the new Taylor Series 415 sector shape instruments. Occupying little space (four instruments can be mounted in 1 ft. square), modern in design, and in attractive mouldeed cass, they are ideal for charging boards, control panels, electronic and electro-medical equipment.

These instruments are now available as moving coil ammeters in ranges from 0-10 micro-amps upwards; as moving coil voltmeters from 0-5 milli-volts upwards; as rectifier ammeters from 0-25 microamps upwards and as rectifier voltmeters 0-1 volts upwards.

Thermocouple instruments are also available and shortly the series will be extended to cover moving iron ranges.

How To Re-Build a Commercial Receiver

By H. DUDLEY STILTON

DAVE, our salesman, called me over the other day. "Have a look at the radiogram in the demonstration room, will you?" he asked. "I switched it on for a customer to listen to, yesterday, and it still hasn't come on."

"Well, perhaps it hasn't warmed up yet," I wisecracked. If I expected a laugh from that, I was bitterly disappointed. Still, I thought it was funny, and it was me that laughed, anyway.

We got the set upstairs, and I took the chassis and speaker out and rigged them up on the bench. To be perfectly honest, the set did play, but it was so weak that you could hardly hear it. They always say "The set was playing before it went off, therefore one component must have gone wrong. Localise it, find your defective component, replace it, and there's your repair, 10/6, next please!!!" If only it were so!

I worked according to plan. Rigged up the "Genny" (in working order by now, thank you), injected an AF signal into the grid of the output valve, and got a bigger and better one out. Amazing, isn't it? Next, transferred the signal to the grid of the DDT, and got, as they say, a "bigger and betterer one still." So far, so good. Changing to RF, I slapped 465 of the best into the IF bottle, and what came out could have been heard in China—if the set had been there and you had a pair of phones on.

So that was the trouble—Trimming! I rigged up the output meter and got cracking. Whichever way I turned those slugs, the meter went down, until I came to the second IF secondary—then the pointer never even moved. The winding checked OK for resistance, so that left only one thing—the fixed trimmer was open circuited. It was! Have you ever tried soldering Litz wire back into place? Fun, isn't it?

Having got the IF can back into place and melting all the plastic covering of all the other wires in the near vicinity whilst doing so, I tried trimming it again. Still the signal was not anything like as loud as it should have been. So I checked the only thing left between the IF can and the detector, namely, the detector circuit. That is, the RC coupling network, which always reminds me of a roundabout. You start at one point and trace through, but always land up where you started. So, true to form, I went round and round on the circuit diagram, then I went round and round on the set—funny thing, they both went round and round OK, but, somehow, something seemed to be different.

Then it dawned. I was going round from left to right on the diagram, but to get the same result on the set I was going round from *right to left*! Some bright spark had put the unit, which is generally built up separately, in the wrong way round. You didn't think it could make any difference? Well, to tell you the honest truth, neither did I, but my signal now came out a heck of a sight stronger than it went in, and that, they tell me, is the whole secret of radio.

I unstrapped the "Genny," tuned in the local station, and whipped open the throttle—gosh, what an unholy row!—distortion?—a pure sine wave after emerging from the output bottle looked about ten times worse than Hiroshima after the atom bomb.

The obvious thing to do was to check the automatic bias. Instead, I found the negative feedback resistor had been forgotten, or perhaps someone had wanted a one-and-a-half meg resistor and thought nobody would notice it was missing. Anyway, after that, I did check the bias and found the capacitor (good word, that) was short-circuited. I whipped it out and left it out. (I've heard it said, and it's true, I'm sure, that too much bias will weaken you.) Regardless, it does tend to introduce a certain amount of negative feedback, if the bias capacitor be omitted, but, with accompanying loss of volume. And believe me, I'd plenty of volume which I wanted to lose—and plenty of distortion too!

Swapping from radio to gram, I found the distortion was conspicuous by its absence. Therefore, logic says, the valves are being overloaded. Confucius, he say "Too much grid swing, too much signal. Too much signal, no AVC." Good old Confucius, another bull's-eye. There *was* no AVC. Checking the AVC decoupling capacitor, it was obvious why—a dead short!

Having now put the set in order—what a hope!—I tuned in the other local station. If I could whistle like that set did I should be on the radio myself. I don't know what the inductance of the oscillator coil should have been, but I do know that, by the time I'd got rid of the whistles, the set was trimmed 15 kcs lower than it should have been. And they turn to you and say "Life gets Teedjus, don't it?"—Huhhh!!!

SURPLUS GEAR CONTEST

The award of the prizes to the winners of the Surplus Gear Competition was a matter of great difficulty, owing to the excellence of many of the entries. Many factors had to be considered—originality, the idea, layout, presentation, etc. After careful consideration it has been finally decided that Mr. R. A. Seal's article "Improved Vision Unit" (May, 1949) takes the first prize. The second is awarded to Mr. C. Summerford for his article "A Surplus Superhet," which also appeared in the May issue.

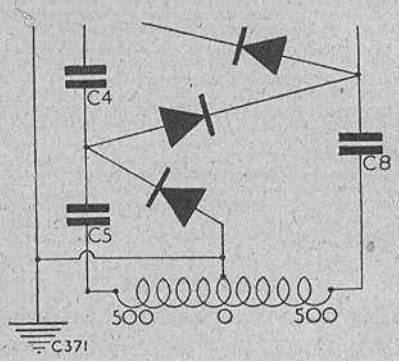
Other competitors, whose entires have been paid for publication at the usual rates, are to be congratulated on their excellent efforts, and we hope that the publication of their articles will encourage them, and other readers, to submit manuscripts to us.

The response to this Competition has been gratifying to us, and of great interest to readers, who will no doubt endorse our congratulations to the winners and other entrants. We look forward to announcing a competition based on similar lines in the early future.

ERRATUM

We regret that an error appeared in the article on a "Two-Valve, Push-Pull Amplifier" in last month's issue of this journal. In the sentence beginning "The present circuit will work very efficiently if the valves are connected as . . ." substitute "tetrodes" for "triodes."

Apologies again, as there appeared a mistake in the circuit diagram of the article "EHT for £2 or less." We regret any inconvenience caused, and we reproduce the corrected circuit diagram in part herewith.



RADIO MISCELLANY—continued

I have now discovered radio's "Gadgeteer No. 1" and his radiogram, as you might well guess, was far more fascinating to *watch* than to listen to. It simply bristles with bits and pieces, most of which seemed to serve a highly improbable purpose, and all of which seemed to have an indicator light, and their constant flashing on and off reminded me for all the world of a pin-table machine clocking up a record-breaking score.

Among the gadgets were to be found :—

Concealed turn-table lighting which came on automatically on raising the lid.
A spot light beamed on the pick-up to assist needle changing.
A three-speed stroboscope lit by neon lamp to make "daylight" use more effective.
A brush fitted to the pick-up arm to sweep the record grooves before the needle reached them.
A cup for used needles from which they ran down a length of hose-pipe into a large internally fitted container—for easy and less frequent emptying.
Clock-controlled on/off switch.
Scratch filter.
Extension speaker network for maintaining different volume levels on each extension.
Remote volume control operated from beside the telephone.
A front-door-bell indicator.
Room intercommunication system.
Magic eye in a masked recess.
Coloured dial-lamps for the 4 wavebands.
Push-button tuning.
Tone control ganged to switch-in tweeter when set to maximum top.

This list by no means catalogues *all* the gadgets. Indeed, only by the hardest thinking could I imagine any device he had not included. That, I finally decided, was a press-button which would blow a note of disapproval in the broadcast studio to signify the radio artiste, or items, which he did not like !

SMALL ADVERTISEMENTS

Readers' small advertisements will be accepted at 2d. per word, minimum charge 2/-. Trade advertisements will be accepted at 6d. per word, minimum charge 6/-. If a Box Number is required, an additional charge of 1/- will be made. Terms: Cash with order. All copy must be in hand by the 10th of the month for insertion in the following month's issue.

PRIVATE

EXCHANGE—1155 OK. for 1,000 volt Power Pack and Modulation Transformer.—G3DXF, 74, Smith Street, Coventry.

EDDYSTONE 358X, Valves Crystal, 5 Interchangeable Coil Boxes for rewinding to amateur bands—instruction supplied. Very good condition, no power pack £10.—Box 139.

POWER PACK, No. 3. 250-300 volts 80-100 ma. Input 250v AC. Fuse panel missing. Standard rack panel 7in. wide. Perfect 45/-.—ISWL/G1044, 1, Culross Buildings, Battlebridge Road, London, N.W.1.

RF26 UNIT. Converted to 10 metres. Can be used as 2HF Preselector as well as converter 35/-.—Box 140.

149 CRYSTAL CONTROLLED WAVEMETER. Instrument in very good working condition. 1.5v valves. Fundamental output 2.5-5.0 Mcs. Operates on harmonics up to 25 Mcs. Complete with battery £8.—Box 141

WESTON 692 SIGNAL GENERATOR. 4.5v and 45v dry battery supplies. Very good order. Complete with full range plug-in coils and calibration charts. With batteries £4/10/-.—ISWL/G15, 64, Cavendish Road, London, N.W.6.

CLASS C WAVEMETER with 1 Mcs crystal unit 35/-.—J. B. Nunn, 12, Midland Terrace, London, N.W.2.

BC 348 RECEIVER. Internal power pack. Good condition and working order £15/10/-. With LS to match £17.—W. Jordi, 103, Gloucester Road, London, S.W.7.

B2 TRANSMITTER AND RECEIVER. No power supplies, but otherwise in good shape £16. Halcyon AC/DC Radiogram s'het medium and long wave chassis. With speaker, both in good condition £5/10/-.—Box 142.

2-ELEMENT 200 MCS BEAM (ex-R.A.F.) with approx. 2 yards coaxial cable 10/-. 1481 VHF Receiver. Brand new model as on mobile radio vehicles, 6V6 output, 70-90 Mcs £3. Official Army R107 Manuals, 40 pages circuits and diagrams 5/- each.—Box 143.

TRADE

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This is the second Data Booklet and it describes the construction of a television receiver, employing Government Surplus components and units. Complete details are given of the conversions, which are simple to the constructor of average experience. There are now hundreds of these television receivers now in use throughout the country. If you are not "technical" yourself tell your technically minded friends of this publication—they will be highly interested! **Price 1/8,** post paid

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