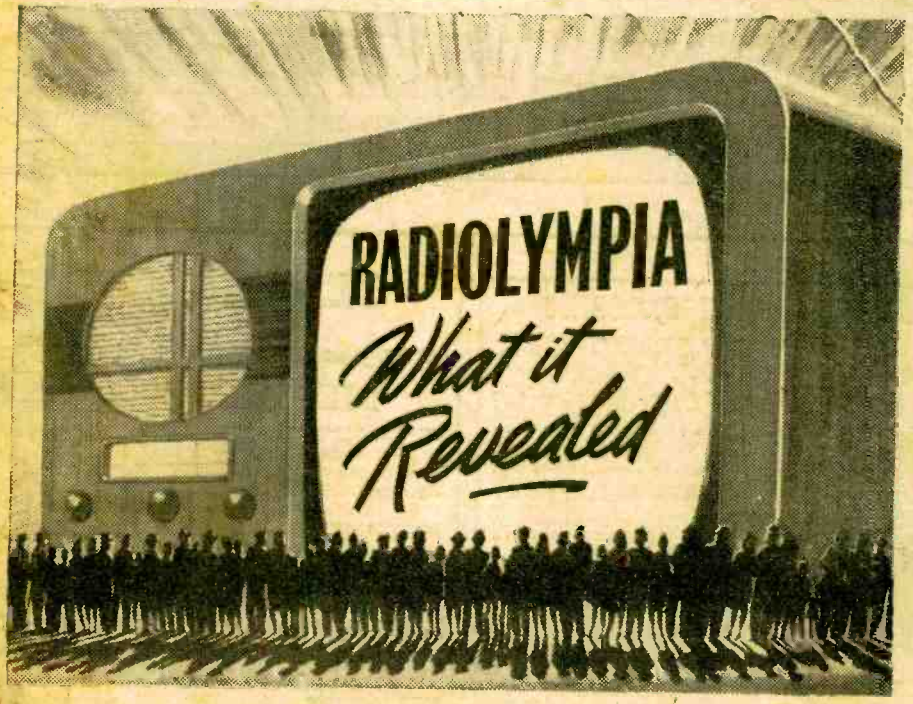
ECONOMY S.W. RECEIVERS

Practical Wireless

9D EVERY MONTH

Vol. 23. No. 496. || Editor: F. J. CAMM || NOVEMBER, 1947



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PRINCIPAL CONTENTS

Practical Wireless and PRACTICAL TELEVISION
15th YEAR OF ISSUE
EVERY MONTH
VOL. XXIII. No. 496. NOVEMBER, 1947.
Editor F. J. CAMM

COMMENTS OF THE MONTH

BY THE EDITOR

About Radio Olympia

AN inspection of the models exhibited at Olympia did not reveal any radical changes. This was to be expected in view of the restrictions on materials and the labour shortage. The designs largely were those of 1939 vintage in a new dressing. Plastics, of course, are well to the fore, timber being in short supply. With minor exceptions, however, there were no novelties. The stylists had been at work improving the shapes and the aesthetic appeal. We are not suggesting that receivers of 1939 design had very much wrong with them.

Hundreds of thousands of them have been in regular use during the war and for longer periods than in peace because of the anxiety of the public to hear the war news. Most of them are still in use, and we found that whilst manufacturers had little difficulty in disposing of their output there was a natural caution on the part of the buying public. Some preferred to wait a little longer.

Sir Stafford Cripps' announcement that more goods must be exported naturally affected the number of receivers available for the home market. As this announcement was made some weeks before the Show opened it caused manufacturers to revise their marketing programmes. We feel, however, that as radio to-day is a necessity in every home the home market should be supplied first, and our exports should be the overspilling into the export markets of production in excess of home requirements.

In view of the unstable currency position and our ban on imports from other countries, which quite naturally are indulging in "reprisals" by refusing to import from us, it is not surprising that manufacturers are finding it difficult to find export markets. The high cost of raw materials over here and the rise in cost of labour coupled with the shortages which add further to the unit cost because tooling and overheads are spread over a small instead of a large quantity, do not permit the manufacturer in any case to compete on a fair price level with our foreign competitors.

In our discussions with manufacturers we learned that they expected, in view of the coal shortage and power cuts, that they would not reach their production targets, and that receivers would not be in plentiful supply.

A large number of the new models exhibited were prototypes only intended to give the public a foretaste of future production. Orders were not being booked for these. We are of the opinion that it is a mistake to exhibit goods before they are in production. When a prototype is passed out to the shop modifications are bound to be made, and the receiver exhibited in the prototype stage may not bear a true resemblance to the production model. Nor does it impress foreign buyers who come over here to spend money when they are told either that the firm is not ready to book orders or that delivery cannot take place for at least a year. Such practice does great harm to other manufacturers who are able to deliver ex-stock.

As was to be expected, the television receivers attracted a great amount of attention, and a goodly number of orders were booked. The demonstrations indicated the enormous strides this country has made in this new science. This new industry, however, has suffered another blow in that the programme for erecting a chain of transmitters throughout the country must inevitably be delayed in view of the crisis. It is possible, therefore, that America may be able to make up some of the leeway she has lost. At present she is a long way behind Great Britain in television technique, although we know that she is busily buying up patents and arranging for manufacturing licences.

Radio components for constructors were in evidence but not markedly so. The component industry, like every other industry, is finding it difficult to get into full production.

Attendances at the Show were excellent, and the general design of the exhibition reflected great credit upon the organisers. We feel, however, that future exhibitions need to be housed in a building a little more up to date than Olympia. The catering arrangements there are totally inadequate to deal with the large crowds attracted by the national publicity given to the exhibition.

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The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Wireless." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

ROUND THE WORLD OF WIRELESS

Postage Stamp Control Marks

THE Postmaster-General announces that the control mark hitherto printed on the margin of sheets of unified stamps ½d. to 1s. is being abandoned as opportunity occurs. The last control mark to be used will be U/47. The cylinder number, which is printed in small type below the control mark, will continue to appear.

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended July 31st, 1947.

Region	*Number*
London Postal	2,042,000
Home Counties	1,431,000
Midland	1,553,000
North Eastern	1,671,000
North Western	1,437,000
South Western	933,000
Welsh and Border	620,000
Total England and Wales	9,687,000
Scotland	1,039,000
Northern Ireland	157,000
Grand Total	10,883,000

The above total included 21,200 television licences. The G.P.O. also announced that prosecutions in July for operating wireless receiving apparatus without a licence numbered 589.

A link with the past. Peto Scott are showing the above 1922 receiver on their stand to remind the public that they are one of the oldest names in the radio trade. "Old hands" will remember the fun which we got out of the loose-coupled bright-emitter detector stage of the day.

R.M.S. Queen Mary

WELL over seven miles of extruded plastic (named Tenatube) has been used in the covering of many rails and rods in the *Queen Mary*. In all cases the tubing used has been of Polyvinyl Chloride (or P.V.C.), well-known to radio amateurs, and the extrusions were made at the Upper Basildon (Berks) works of Messrs. Tenaplas, Ltd., the entire job being all British.

Liner's Temporary Wireless Operator

THE wireless operator of the Union Castle liner, *Roslin Castle*, was taken ill during the ship's recent homeward voyage and had to be disembarked at Freetown, Sierra Leone. Mr. Alfred Henry Rooks, a Cable and Wireless, Ltd., operator, was on his way home from Ascension Island on the *Empire Duchess*, which had been delayed at Freetown for a week.

Hearing of Mr. Rooks' presence, the captain of the *Roslin Castle* asked him if he would take on the wireless operator's job. Although he had had no previous experience of working ships' radio, Mr. Rooks readily agreed and, after obtaining permission from the management at home, signed on as a member of the crew at the nominal pay of 1s. a month.

Throughout the journey Mr. Rooks maintained the normal watches, receiving weather reports from Rugby, ascertaining the ship's position, sending messages from the captain to the owners and handling public telegrams for passengers. After leaving Las Palmas his work became more involved owing to the greater number of ships, mostly foreigners, in the area. Switching to short-wave, he disposed of messages to Portishead radio. Occasionally he contacted the *Empire Duchess*' wireless operator, who helped him whenever necessary.

He has since received a letter from the Union Castle Line offering him compensation for helping the *Roslin Castle* by working his passage home.

Television Avenue

ABOUT two dozen firms are showing approximately 40 television receivers in "Television Avenue," which occupies the whole of the east side of the Grand Hall Gallery at Olympia. Passing down the 250ft. long avenue, the public has plenty of room to see the programmes "pipe-lined" from the B.B.C. studio in Olympia or received by aerial on the roof from Alexandra Palace, and can compare one set with another.

British Sound Recording Association

THE opening lecture of the season took place at the Royal Society of Arts, John Adam Street, Adelphi, Strand, London, W.C.2, on Friday, September 26th, 1947 at 7 p.m., when the president, Dr. L. E. C. Hughes, lectured on "Sound, and Its Relation to Recording."

A television studio of the future as depicted in the new film "Something in the Wind," shortly to be released.

"Something in the Wind"

A NEW Universal-International picture, "Something in the Wind," starring Deanna Durbin, Donald O'Connor and John Dall, has a finale which takes a peep into the future with a full-scale television studio. Technical advice was sought from the leading American television people before this set was built and the equipment designed.

Deanna Durbin, who plays the part of a radio record programme announcer in the film, was coached by Al Jarvis, who is famous in America as a "disc jockey." The film is being released this month.

"British Radio for the World"

"BRITISH Radio for the World" is the title of a booklet issued by the Radio Industry Council, representing all sections of the industry, to interest buyers overseas at Radiolympia.

The booklet marks the jubilee of the British radio industry, the silver jubilee of broadcasting and the tenth anniversary of television transmissions in Great Britain. During the war, it is stated, the British radio industry was trebled in size, and since the war its exports have been increased four-fold.

The booklet is being distributed abroad only through official channels and manufacturers' agents.

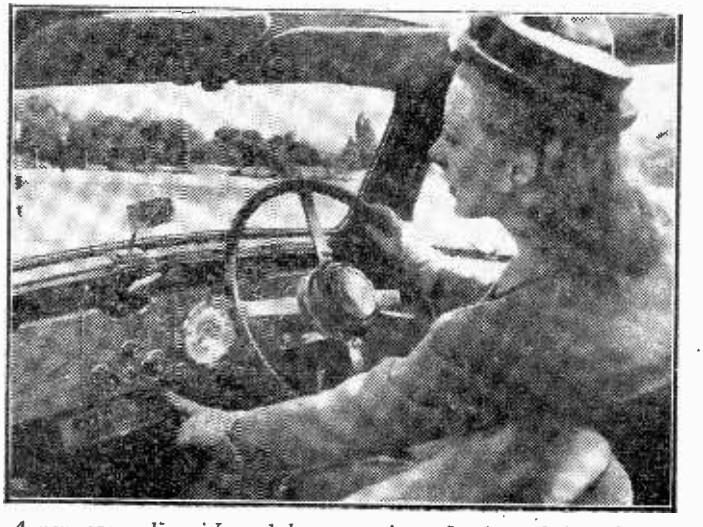
Light Programme Wavelengths

THE B.B.C. ask us to point out that it does not seem to be fully recognised that the main transmission of the Light Programme is on 1,500 metres, and that 261.1 metres is an auxiliary transmission only.

There are no auxiliary Light Programme transmitters in either the Welsh or Midland B.B.C. Regions.

A Television Idea

A NOVEL idea was recently proposed in the U.S.A. to ensure payment for television programmes received. According to the idea, which was proposed by the president of the Zenith Radio Corporation, the signals would be scrambled and sent out in the usual way. The necessary unscrambling signals would be sent over the telephone wires to which the set would have to be connected. To see the pictures, the viewer would have to ask the telephone operator for "Phone-vision," and could then be charged for his period of looking-in. Tests have shown that the scheme is practicable.



A new car radio with push-button tuning. It gives choice of four stations and has an unobtrusive panel fitting beneath the dashboard. This is a "Radio-mobile" and may be seen on Stand 144 at Olympia.

Some Suggested "Economy" Short-wave Receiver Circuits

Details of Construction of Efficient Three-valve Receivers.

By C SUMMERFORD

IT has been pointed out in recent articles that, whereas in the old days, sensitivity was considered the first consideration in the design of efficient short wave receivers, with selectivity an "also ran," the position now is that (due to the large increase in the number of short wave stations) the two have become of equal importance.

To achieve the requisite selectivity, a superhet circuit is generally used having at least six tuned circuits, while in order to achieve reasonable sensitivity, receivers using up to five valves before the second detector are becoming a commonplace. These receivers are usually rather expensive and are out of reach of many enthusiasts for economic reasons.

The choice then has to be made between a "cheap" superhet and a T.R.F. receiver. Not a very satisfactory state of affairs because it really amounts to choosing between good selectivity with poor sensitivity on the one hand or good sensitivity with poor selectivity on the other.

It is to cater for the needs of readers who have to make this unenviable choice that these circuits have been evolved.

Regeneration

Let us first look at the circuit, Fig. 1. Three valves only, excluding the rectifier, are used in this circuit, but by careful design they are made to do the work of six.

We begin the good work right at the aerial input, where a wavetrap circuit consisting of a tapped inductance in parallel with a variable condenser boosts the signal appreciably before it reaches the first valve.

The frequency changer (vi) is used in a normal manner with the exception of the regeneration circuit. Regeneration is obtained by inserting Ch.1 in series with the primary winding of the I.F. transformer to effect an impedance at R.F. The circuit is completed by L.3 and VC.4.

This form of regeneration has been found to be quite effective when used with a 6K8 valve which is therefore suggested as first choice in this circuit.

In the interests of economy the normal I.F. amplifier has been dispensed with, and to make up for the loss in gain a regenerative leaky-grid detector is used. This valve, a 6C5, actually has to perform two extra functions besides doing its normal duty of

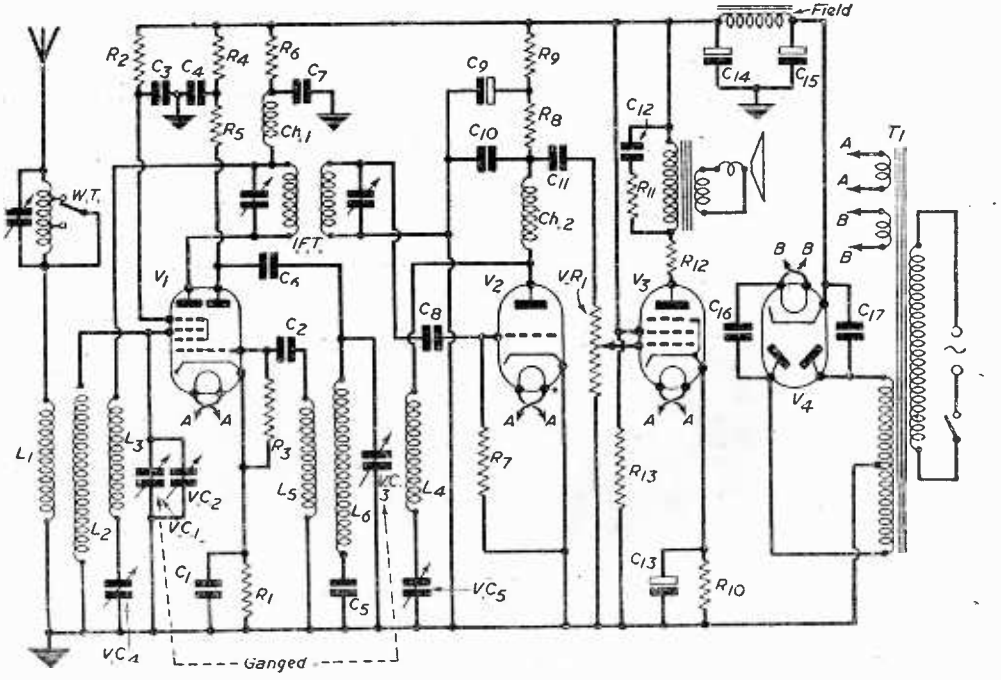


Fig. 1.—A.C. Mains Short-wave Three as described.

detector-L.F. amplifier. They are that of I.F. amplifier and B.F.O., both of which necessitate the use of regeneration.

This regeneration is very easily accomplished by using a Bulgin C51 I.F. transformer, as this transformer is provided with a third winding which is

As mains transformers having secondaries of 350 volts 80 mA, 6.3 volts 3 amps and 5 volts 2 amps are easily obtainable, one of these has been selected —it should, however, have a screened primary.

Excess current (about 20 milliamps) is bled away by a 10 watt power resistor (R13), and this

LIST OF COMPONENTS FOR FIG. 1.

RESISTORS

R1. 300 ohms ½ watt.
R2. 35,000 ohms 1 watt.
R3. 100,000 ohms ½ watt.
R4. 5,000 ohms ½ watt.
R5. 30,000 ohms 1 watt.
R6. 5,000 ohms ½ watt.
R7. 1 meg. ½ watt.
R8. 20,000 ohms 1 watt.
R9. 10,000 ohms 1 watt.
R10. 90 ohms ½ watt.
R11. 10,000 ohms ½ watt.
R12. 100 ohms ½ watt.
R13. 12,500 ohms 10 watts.

TUNING COILS

L1, 2, 3. Eddystone 6-pin.
L5, 6. Eddystone 4-pin.

WAVE TRAP CIRCUIT

50 turns 22 s.w.g., d.s.c. spaced thickness of wire, wound on 1½in. former and tapped at 6 and 20 turns.
1-150 pF Variable condenser.
1 S.P. three-way switch.

VALVES

	6.3 volt.	4 volt
V1.	6K8G	X41
V2.	6C5G	MHL4
V3.	KT61	KT41
V4.	5Z4G	MU12/14.

VOLUME CONTROL

½ megohm carbon type.

FIXED CONDENSERS

C1, 3, 4, 7, 11. .01 μF mica.
C2, 8. .0001 μF mica.
C5, 6. .001 μF mica.
C9. 8 μF elec.
C10. .0005 μF mica.
C12. .05 μF mica.
C13. 50 μF elec.
C14. 16 μF elec.
C15. 8 μF elec.
C16, 17. .01 μF mica.

VARIABLE CONDENSERS

VC1, VC3. two gang 150 pF.
VC2. 25 pF.
VC4. 500 pF.

I.F. TRANSFORMER

Bulgin. C51.

R.F. CHOKES

2 Eddystone, cat. No. 1010.

MAINS TRANSFORMER

200-250 volt screened primary.
H.T. Sec. 300-0-300 at 80 mA.
L.T.s. 6.3 volt 2 amps. and 5 volt 2 amps.
or
4 volt 4 amps. and 4 volt 2.5 amps.

normally used in conjunction with a variable resistance as a means of obtaining variable selectivity. In this circuit, however, it is used as an ordinary reaction winding and is connected to the 6C5 anode at one end and to earth via a .0005 variable condenser at the other.

By increasing the capacity of VC4 until the circuit is just below oscillation point, at least as much (and quite possibly more) I.F. amplification will be obtained as in a circuit using an average I.F. amplifying valve.

Despite the fact that there are only two tuned circuits at intermediate frequency, the selectivity obtainable with fairly critical setting of VC4 will probably be higher than in the "cheap" superhet using four tuned circuits at I.F. VC4 should be a well-made variable condenser with integral slow-motion drive, or alternatively, could be one of ordinary type, in which case a slow-motion head would have to be used. If this condenser has its capacity increased until the I.F. circuit gently oscillates, a modulated note will be obtainable on C.W. signals at a frequency that is dependent on the setting of VC4.

The 6C5 is resistance-capacity coupled to a Marconi/Osram KT61 output tetrode which needs a grid swing of only 4.4 volts to load it fully to give its maximum output of 4.3 watts.

The whole receiver consumes roughly 60 milliamps, and the power pack can, therefore, be of moderate size.

is an asset in that it helps to keep H.T. voltage variations within very small limits. It is intended that as a further economy an energised loudspeaker be used so that the field winding can be used for smoothing purposes. The actual field resistance should be 1,250 ohms, but any resistance between 1,000 and 1,500 ohms would be quite in order. Smoothing condensers are of large capacity and in conjunction with the high inductance field winding ensure a ripple free H.T. supply. C16 and C17, which are connected from *each* anode to *each* heater pin of the rectifier, are inserted to counteract modulation hum. Although not shown in the diagram, a further condenser of .0005 μF may have to be connected from one side of the frequency changer heater to earth for the same reason.

Those readers who prefer 4 volt valves may use the following line up without changing any of the component values shown in Fig. 1: Marconi Osram X41, MHL4, KT41, MU12/14. It will, of course, be necessary in this case to employ a mains transformer having two 4 volt L.T. windings.

Battery Version

The battery version of this circuit is shown in Fig. 2, and so closely follows that of Fig. 1 that it calls for little further comment. There is, however, one variation—an intervalve transformer is parallel coupled between V2 and V3 in order to make up for the slight loss in amplification encountered when using battery valves. Suitable valves for this

circuit are: Marconi/Osram X24, Mullard PM2DX, Cossor 220 OT. These have been chosen as being the nearest battery equivalents of those used in Fig. 1.

There are probably some constructors who dislike obtaining R.F. regeneration in the manner shown in Figs. 1 and 2, and who have a strong preference for the use of a separate valve for this purpose. The circuits of Fig. 3, show how this may be done.

Electron-coupled, cathode controlled regeneration circuits are shown at Fig. 3, A and C, while B and D show circuits of the well-tried capacity controlled system. With capacity control there is some tuning shift which can, however, be easily corrected by retuning VC2. This tuning shift will be less when using a separate valve than in the original circuit.

One other disadvantage with this system is the restriction of the tuning range at the high-frequency end; but this can be obviated by shortening the grid coil winding slightly.

Cathode controlled regeneration, however, has, in the writer's opinion, many advantages over the capacity controlled system. To enumerate some of them: (1) There will be hardly any tuning shift, (2) no curtailment of range at the H.F. end, (3) extreme smoothness of control, (4) no necessity to employ more than a two winding coil.

The two cathode controlled circuits of Fig. 3 are identical except for the R.F. chokes and the method of obtaining bias. In Fig. 3, A, Ch. 1 can be any good short-wave choke, while in Fig. 3, C, Ch.1 and Ch.2 must be special filament short-wave chokes having a low D.C. resistance.

It is recommended that the valves be given the same bias as would be required were they to be

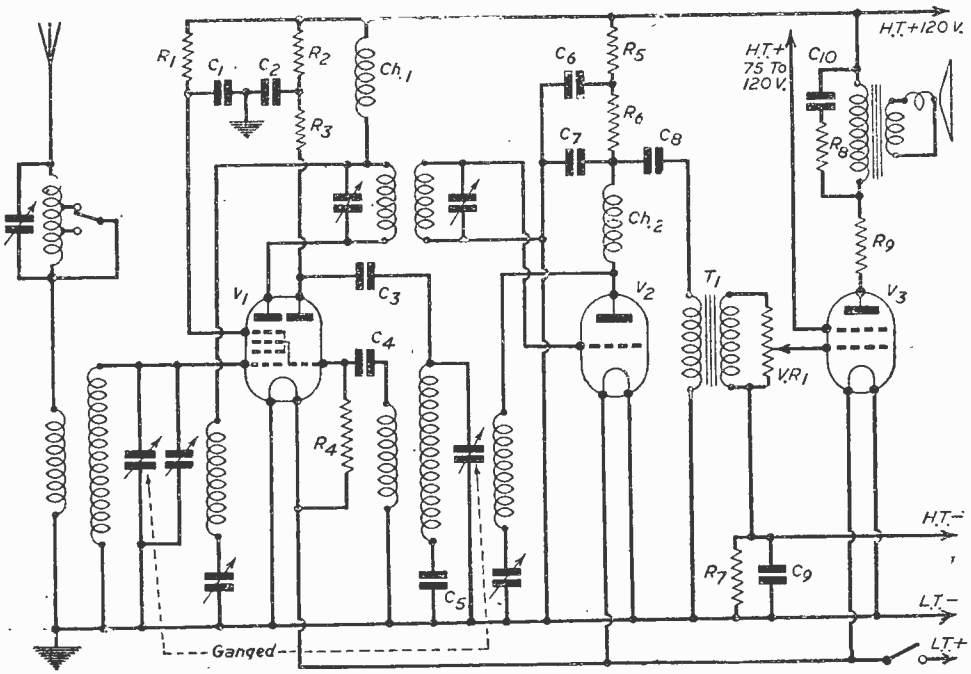


Fig. 2.—Battery version of a circuit on the lines of Fig. 1.

LIST OF COMPONENTS FOR FIG. 2.

RESISTORS

R1. 20,000 ohms ½ watt.
R2. 5,000 ohms ½ watt.
R3. 20,000 ohms ½ watt.
R4. 100,000 ohms ½ watt.
R5. 10,000 ohms ½ watt.
R6. 40,000 ohms ½ watt.
R7. 450 ohms ½ watt.
R8. 10,000 ohms ½ watt.
R9. 100 ohms ½ watt.

INTERVALVE TRANSFORMER

Midget type 4-1.

VALVES

V1. X24.
V2. PM2DX.
V3. 220 OT.

FIXED CONDENSERS

C6. 4 μF 250 volt.
C8. .05 μF 250 volt.
C9. 25 μF 12 volt.

VOLUME CONTROL

½ megohm potentiometer.
All other components as in Fig. 1.

used as L.F. amplifiers—in the case of A and B by the normal cathode method, and by a 3 volt grid bias battery for C and D. Regeneration will be much smoother whichever system is used with the valves correctly biased.

A medium-impedance triode such as the Marconi/Osram L63, or its 4 volt equivalent MHL4, is suitable for the circuits of Fig. A and B, while a Mullard PM2DX is ideal for the battery versions of Fig. 3, C and D.

The extra expense incurred by using a separate regenerator is quite low—around 15s. to 16s. in either case.

Cost

For the benefit of those readers who like to know the approximate cost of receivers built from designs such as these, the following figures are given and are inclusive of all components (including the loudspeaker), except the plug-in tuning coils, which are a matter of choice.

Fig. 1. £10 10s.
Fig. 2. £6 10s.

It will thus be seen that receivers built around these circuits compare very favourably in an economic sense with the average T.R.F. receiver, apart from their many other advantages.

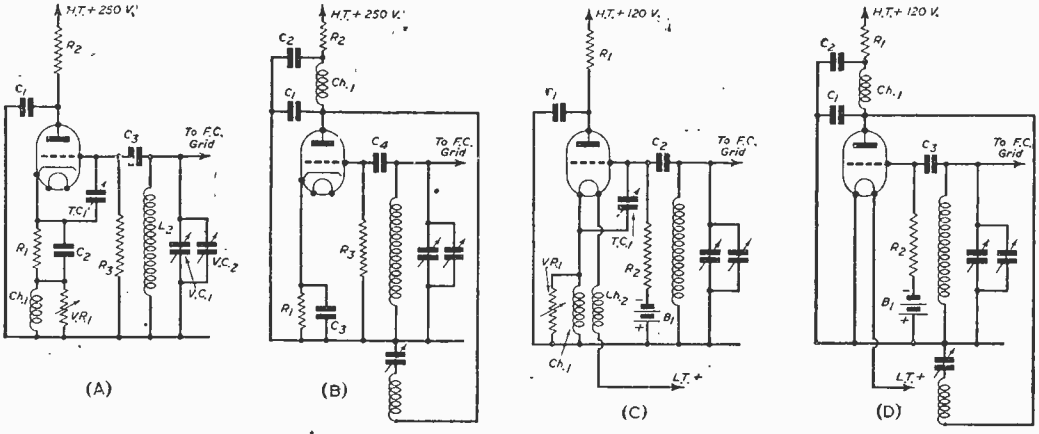


Fig. 3.—Electron-coupled cathode controlled reaction circuits.

R1. 1,000 ohms ½ watt.
R2. 10,000 ohms 1 watt.
R3. 1 megohm ½ watt.
C1, 4. .01 μF mica.
C3. .00005 μF mica.
TC1. 30 pF trimmer.
Ch.1. Std. S.W. choke.
Valve. L63 or MHL4.

R1. 1,000 ohms ½ watt.
R2. 10,000 ohms 1 watt.
R3. 1 meg. ½ watt.
C1, 4. .00005 μF mica.
C2, 3. .01 μF mica.
Ch.1. Std. S.W. choke.
Valve. L63. or MHL4.

R1. 10,000 ohms ½ watt.
R2. 1 meg. ½ watt.
VR1. 10,000 carbon Pot.
Ch. 1, 2. S.W. fil. chokes.
C1. .01 μF mica.
C2. .00005 μF mica.
TC1. 30 pF trimmer.
B1. 3 volt G.B. battery.
Valve. PM2DX.

R1. 10,000 ohm. ½ watt.
R2. 1 meg. ½ watt.
C1, 3. .00005 μF mica.
C2. .01 μF mica.
B1. 3 volt G.B. battery.
Valve. PM2DX.

Atlantic City Conference

Final Frequency-allocation Decisions

WE give here, in summarised form, the final frequency-allocation decisions reached at the Conference in so far as they may affect U.K. amateurs:

Main Effects

The principal effects of these decisions are summarised as follows:

(1) "Top band" held.
(2) Gained 50 kc/s at 3.5 Mc/s.
(3) Lost 150 kc/s at 7 Mc/s.
(4) Lost 50 kc/s at 14 Mc/s.
(5) Gained a new band at 21 Mc/s (15 metres).
(6) Lost 300 kc/s at 28 Mc/s.
(7) Lost the 60 Mc/s band.
(Whilst on paper the 5-metre band has been lost, there is every reason to believe that frequencies around 60 Mc/s will be allotted later, on a national basis. There is also a strong possibility that permission will be given to use the I.S.M. (Industrial, Scientific and Medical) band around 11 metres.)
(8) Gained a new band at 144 Mc/s (2 metres).
(9) Gained 4 new V.H.F. bands.

The figures given represent the final decisions of Committee 5 and are due to be confirmed after we go to press.

Band.	*Width.*	*Remarks.*
1,715–2,000 kc/s	200 kc/s	200 kc/s shared (max. power 10 watts).
3,500–3,800 ,,	300 ,,	Shared.
7,000–7,100 ,,	100 ,,	Exclusive.
7,100–7,150 ,,	50 ,,	Shared.
14,000–14,350 ,,	350 ,,	Exclusive, except that U.S.S.R. proposes to operate internal Fixed Services between 14,250 – 14,350 kc/s.
21,000–21,450 ,,	450 ,,	Exclusive.
28,000–29,700 ,,	1,700 ,,	Exclusive.
144–146 Mc/s	2 Mc/s	Exclusive.
420–460 ,,	40 ,,	Shared (harmful interference clause inserted concerning interference with Air Navaids).
1,215–1,300 ,,	85 ,,	Exclusive.
2,300–2,450 ,,	150 ,,	Exclusive.
5,650–5,850 ,,	200 ,,	Exclusive (I.S.M. equipment will operate at 5,850 Mc/s —tolerance plus or minus 0.6 per cent.).
10,000–10,500 ,,	500 ,,	Exclusive.

Constructing Television Equipment

An Explanation of Modern Television Receivers and the Problems of the Home Constructor.

By W. J. DELANEY (G2FMY)

IN spite of the fact that we have repeatedly announced that our Query Service is temporarily suspended, we continue to receive general types of query, amongst which quite a large proportion are requests for television receiver designs, circuits, constructional data, etc. Many readers have obtained ex-Government C.R. tubes and associated equipment and wish to know how this may be adapted to receive the present television transmissions. Let us, therefore, examine the modern television receiver and see what problems it presents to the home constructor. So far we have refrained from publishing constructional data for two reasons: One is that the full details for construction would occupy several complete editions of this paper in view of the large amount of equipment which is required, and secondly, even when constructed, the actual setting up of the equipment calls for rather elaborate test gear.

Surplus Equipment

First of all let us deal with the television receiver as it stands to-day. In Fig. 1, is a block schematic of the arrangement which is used, from which it will be seen that it is divided into a number of separate parts. The tube unit (which in the case of the now popular magnetically-focused type can include incidental equipment such as the focus and deflection coils), is fed by the line and frame time bases as well as the actual vision receiver. It is customary to build a short-wave receiver which in its early stages picks up both sound and vision, and then the two signals are separated, sound going through additional stages as required and so to the loudspeaker, and the vision signals feeding the tube. Synchronising impulses are separated by a unit which can be on its own or included with the line time-base.

In addition to these sections there is the power supply which may, or may not, include the E.H.T. for the tube anode. Starting from the tube it may be stated that practically all of the tubes now being sold as surplus are unsuitable for modern television picture reception. Some of these tubes have a long persistence or after-glow and would give a blurred picture. Others have too short a time lag. In addition to these points the majority are, of course, too small for satisfactory home entertainment purposes.

So far as the remainder of the equipment is concerned there are quite a number of items from valves downwards which may be used with perfectly satisfactory results.

Valves

The time bases may be constructed with standard valves instead of the thyratron, and there are plenty of these from which to choose. On the receiver side the special H.F. pentodes were used in an extremely large amount of Service gear and may now be obtained very reasonably. The VR91 (corresponding to the Mullard EF50), is a most useful item, as is also the VR92 (a small diode equivalent to the EA50). There are, of course, many others. In addition to the valves, practically all of the required high-voltage, midget ceramic and silver-mica condensers, resistors, certain types of mains transformer and valve-holders are readily available. At this stage it must be emphasised, however, that a large quantity of such equipment has been removed from complete gear which may have been in use for some time. Consequently, the reliability, life or efficiency of the item may be open to doubt right from the start. Some of the equipment is boxed and new, but care is necessary in making a selection, and, in view of the many circuits which have finally to be lined up, it must be borne in mind that much doubt and many hours of wasted time may be saved by obtaining new rather than surplus equipment.

Special Components

In addition to standard apparatus such as has already been mentioned, and which is used in most modern broadcast equipment, there are, however, quite a number of specialised items, and many of

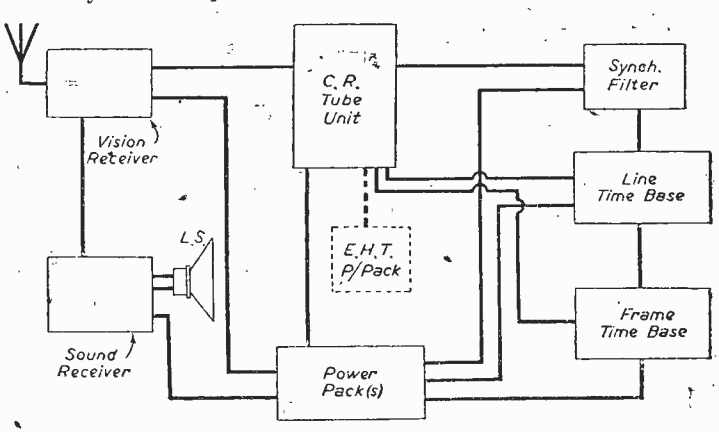


Diagram showing the general arrangement of a modern television picture and sound receiver.

these are not on the market. For instance, dealing with the electro-magnetic type of tube, there is the focusing coil and the deflection coils. These are made up as separate units (by the Plessey company, for instance) but they are not available at the moment for the home-constructor. They can be constructed at home, provided that adequate workshop facilities are available, but when made they have to be tested, and this is not a simple matter unless elaborate test equipment is available. With this same type of tube the simplest and most effective form of line time-base utilises a transformer to feed the line deflector coil in order to obtain adequate current feed. It has been found possible to use one particular make of output transformer with tapped output, but this special transformer is not now manufactured and the ordinary component will not stand up to the extremely high voltage which is generated by the line fly-back, and which may reach 2,000 volts or more.

The E.H.T. required varies from 4,000 to 7,000 volts, and, although the current required is only 1 mA. or less, very high circuit insulation is required, and suitable transformers are not readily available. The commercial manufacturer probably includes the E.H.T. winding on a single transformer supplying the remaining voltages, but a general instrument of this type is not available to the home-constructor.

Special tuning coils are available from one or two sources, but this does not present great difficulty as polystrene or ceramic coil formers with adjustable iron-core plungers are now readily available at about 2s. each and it is not a difficult matter to wind the coils at home, as only half a dozen or so turns of wire are called for.

Adjustments

So much for the actual equipment which is required, and assuming that all the difficulties are overcome and a receiver has been assembled there then arises the problem of putting the equipment to work. The focusing coils and deflection coils in the case of the magnetic type of tube will need adjusting to provide a rectangular raster properly centred on the tube end, and this is not, perhaps, a difficult problem. Both of the time-bases must work correctly, and there will have to be three or four variable adjustments on them to enable proper conditions to be established. The vision receiver must be adjusted to provide maximum band width for good and accurate detail, and the sound frequencies must be properly filtered out. It will thus be seen that when first switching on there is a multitude of possibilities of failure to obtain proper signals, and it would appear that a cathode-ray oscillograph properly designed for television servicing purposes is an essential. However, experiments are being carried out with a view to finding simpler schemes, and details will be given in these pages as and when they are found. In general it may be stated that the actual constructional work is not difficult for any constructor who has built modern superhets, and who has a good knowledge of television technique. It is beyond the scope of these pages to give detailed constructional data of all the equipment needed as it would take over a year at our present reduced paper ration to describe such construction fully, and with the art at its present stage it is recommended that only those with a really sound working knowledge of radio and U.H.F. work, and with adequate workshop facilities, should attempt to build a receiver for home entertainment.

Switching a P.A. Amplifier

Some Details of a Useful Switching Scheme for Public Address Equipment.

By R. SELLING

DURING a long and fairly wide experience of many types of amplifiers, both commercially made and otherwise, it has always been a matter of surprise to the writer that so seldom is any convenient method of switching inputs incorporated. Generally, at least two independent input points are provided, commonly for microphone and gramophone pick-up, each having its own gain control, mixing being carried out either by a simple resistance system or by some so-called "electronic mixing" circuit. In the absence of any switching, a change over from one input to another involves the operation of two gain controls and the necessity for memorising their settings. This can be very inconvenient in P.A. work, when a quick change over is often necessary.

A method which the writer has found extremely useful in practice for many years is shown in Fig. 1, the basic principle being that the inputs are mixed in any desired normal manner, the unwanted ones being shorted to earth as required by the operation of the selector switch. This method retains the practicability of superimposing or fading two or more inputs when desired, but also gives the option of immediate selection of any one input alone when a direct change over is required without disturbing the setting of any gain controls. It also provides a silent position, with all inputs dead. As shown, it is applied to three input channels with simple resistance mixing, but can obviously be extended to any reasonable number of channels by the use of a Yaxley type switch having more poles and more ways. In the case of "electronic mixing," the points to be earthed would usually be the grids of the various input valves.

Remote Control

This leads to the question of performing similar functions by remote control. In the case of certain types of P.A. work, where the microphone must be remote from the amplifier and gramophone playing table, it is often useful to be able to control operations from the microphone point. With a permanent installation there is no difficulty in providing a multi-core cable to a control panel near the microphone, when complex switching may easily be

arranged by suitable combinations of relays, but for temporary installations a simpler scheme involving the minimum of extra wiring is required. In the case of battery-operated equipment, control of the supply to the H.T. power supply unit is also often advantageous from the point of battery economy.

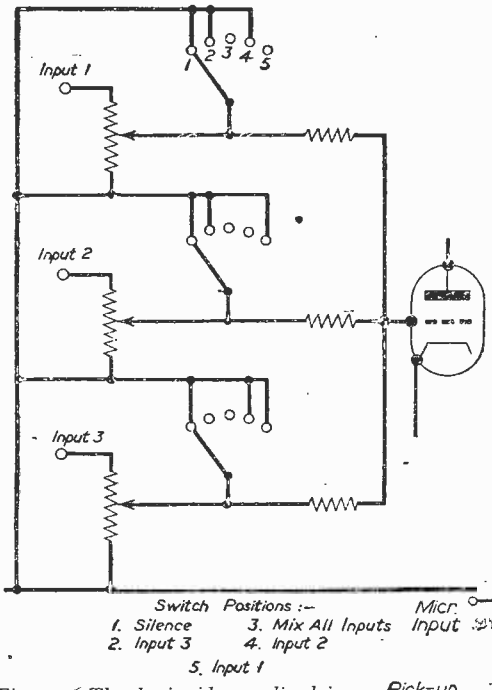


Fig. 1.—The basic idea outlined in this article.

The circuit of Fig. 2 is applied to battery equipment, having two inputs, i.e., microphone and gramophone pick-up, and only involves one additional pair of wires to the microphone point. It permits normal manual control when desired. When remote control is in use, the "mike-mix-gram" switch S1 should be left in the central or "mix" position. The method of operation varies slightly according to requirements, namely :

(a) Frequent gramophone records and complete control by announcer—power supply switching is not feasible here.

(b) Occasional records and partial control by announcer — power supply remotely controlled.

Under conditions (a) the power supply will normally be permanently connected by the manual by-pass switch S3, and the procedure is as follows :

1. Speech. Switch S2 closes the relay circuit. Relay R1 earths the pick-up input and clears the microphone input irrespective of the position of S1. Relay R2 closes but performs no function since it is already by-passed by S3. The pilot lamp lights as an indication to the operator.

2. Silence. S2 closes the relay circuit as in paragraph 1, but also shorts the microphone.

3. Music. S2 shorts the microphone but opens the relay circuit and R1 clears the pick-up input. The signal light goes out as a warning to the operator that a gramophone record is required.

Under conditions (b), the operation is :

1. Speech. S2 is arranged to clear the microphone and close the relay circuits. R1 earths the pick-up and R2 closes the H.T. power supply circuit.

2. Silence. S2 open, therefore R2 opens the power supply circuit.

3. Music. Record playing is now controlled entirely by the amplifier operator who must close S3 to apply power when he wishes to put through a record. But, as in all the other cases, the microphone still has priority of service, and operation of S2 will cut out the pick-up and allow speech.

The Relay

The relay coils and signal lamp may obviously be connected in series, parallel, or sequentially, according to the type of relay available and supply voltage in use. R2 must be of a type the contacts of which will carry satisfactorily the current drawn by the H.T. power unit. In the case of a 20- or 30-watt amplifier working from 12 volt supply, this may be as high as 15 amps or more.

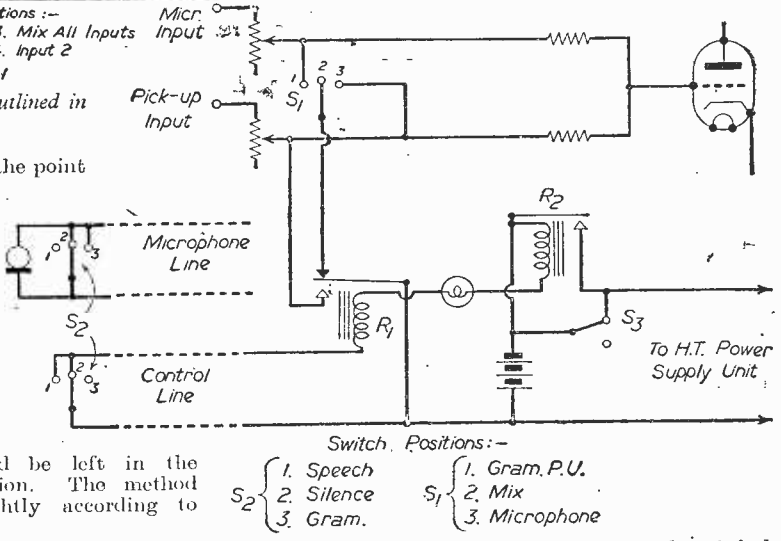


Fig. 2.—Battery-operated equipment may be switched as shown here.

As regards relay R1, since the contacts have to carry no current, there is more latitude of choice.

With mains-operated equipment there is, of course, no point in switching the H.T. supply, and relay R2 may be omitted. Energising current for R1 may be derived from a small metal rectifier unit.

Principles of Frequency Changing—I

Notes on the Superheterodyne Frequency-changing Stage with the Problem of Aerial and Oscillator Alignment

Mathematical Theory

A LINEAR amplifier is one in which the A.C. component of current i is proportional to the A.C. component of input voltage v_i, that is—

$$i = A.v_i$$

A non-linear amplifier is one in which the relation between i and v_i is as follows—

$$i = A.v_i + B.v_i^2 + C.v_i^3 + \ldots\ldots\ldots\ldots$$

where A, B, C, etc., are constants whose values are determined by the characteristics of the amplifier used.

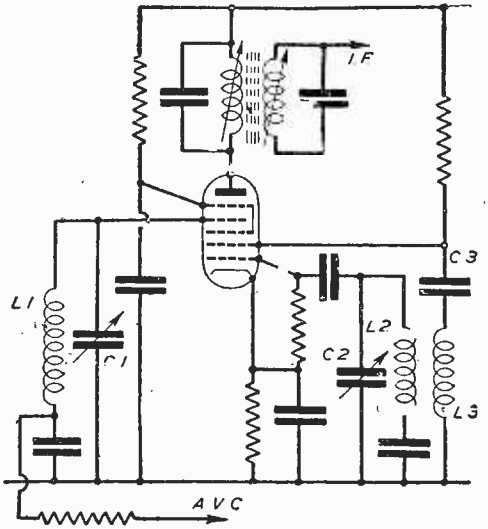


Fig. 1.—A typical modern frequency-changing stage.

Suppose the input voltage to consist of two signals of frequency f_1 and f_2 where $v_1 = \hat{A}.\sin\omega_1 t$ and $v_2 = \hat{B}.\sin\omega_2 t$. Then the instantaneous voltage input v_i is given by—

$$v_i \quad \hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t$$

If this is now applied as the input to a linear amplifier, then the output current i will be

$$= A(\hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t)$$
$$= A.\hat{A}.\sin\omega_1 t + A.\hat{B}.\sin\omega_2 t$$

Thus only the two original frequencies are present in the output. If, however, the same input is applied to a non-linear amplifier, and supposing $i = A.v_1 + B.v_1^2 + \ldots\ldots\ldots$ the other terms being small and therefore neglected, we have, since—

$$v_i = \hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t$$

$$i = A(\hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t) + B(\hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t)^2$$
$$= A(\hat{A}.\sin\omega_1 t + \hat{B}.\sin\omega_2 t) + B(\hat{A}^2.\sin^2\omega_1 t + 2\hat{A}\hat{B}.\sin\omega_1 t.\sin\omega_2 t + \hat{B}^2.\sin^2\omega_2 t)$$

which can be analysed as follows—

$A.\hat{A}.\sin\omega_1 t$ ..... frequency f_1
$A.\hat{B}.\sin\omega_2 t$ ..... frequency f_2
$B.\hat{A}.^2\sin^2\omega_1 t$ ..... frequency $2f_1$
$B.\hat{B}.^2\sin^2\omega_2 t$ ..... frequency $2f_2$
$2B.\hat{A}\hat{B}.\sin\omega_1 t.\sin\omega_2 t$ ..... $(f_1 - f_2)$; $(f_1 + f_2)$

Thus, in addition to the original frequencies f_1 and f_2, the output current contains components which are different from the input frequencies.

In the superheterodyne frequency-changer stage, the input frequencies are as follows: the carrier frequency of the received transmission f_c, the upper sideband $(f_c + f_m)$, the lower sideband $(f_c - f_m)$, the local oscillation f_o. The required output frequencies are $(f_o - f_c)$ the new carrier, or intermediate-frequency, $f_o - (f + f_m)$ the upper sideband, and $f_o - (f + f_m)$ the upper sideband, and $f_o - (f_c - f_m)$ the lower sideband.

The product, $\sin\omega_c t.\ \sin\omega_o t$, as obtained at the output of the mixing amplifier, where $\omega_c = 2\pi f_c$ and $\omega_o = 2\pi f_o$, introduces the sum and difference frequencies $(f_o + f_c)$ and $(f_o - f_c)$, the so-called intermediate-frequency amplifier being tuned to the frequency $(f_o - f_c)$ so that any other frequency components of current produce negligible voltages across the output load.

The Mixing Valve

In the frequency-changing, or mixer stage of the superheterodyne receiver, incoming aerial signals are mixed with the output of a local oscillator, the frequency of the latter being arranged to be a constant number of cycles above the incoming carrier frequency. The aerial signal is thus changed to a new carrier frequency which is constant irrespective of the aerial tuning, and remains modulated to the same depth as the original. This new carrier frequency is equal to $(f_o - f_c)$, where f_c is the aerial carrier and f_o the local oscillator frequency, and appears in the anode circuit of the frequency-changing valve. Here it is tuned by a sharply selective circuit and passed on for further amplification.

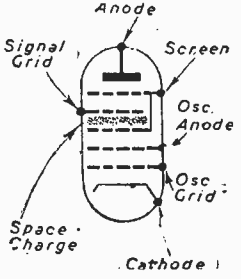


Fig. 2. — Electrode functions of a pentagrid.

In Fig. 1 is shown a typical modern frequency-changing stage employing a valve of the heptode, or pentagrid, variety (such as the 6A8) as mixer. It will be seen that the incoming aerial signal is tuned by the conventional parallel resonant circuit consisting of L_1 and C_1, being then applied to the so-called "signal grid" of the mixer valve. The actual electrode which constitutes the signal grid of a frequency-changing valve varies from type to type, but its purpose in all cases is to provide a means of modulating the received signal upon the electron stream passing from cathode to anode within the valve. At the same time the electron stream

is also modulated by a local oscillation, this being achieved in the case of the pentagrid by employing the first and second grid electrodes from the cathode, and the "anode" and the "control grid" respectively of a separate "triode" oscillator valve. Fig. 2 shows in more detail the various electrode functions of the pentagrid frequency-changer.

The local oscillator, as Fig. 1 shows, consists of a

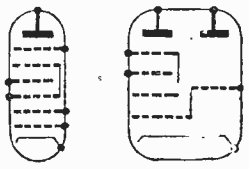


Fig. 3.—Showing (a) an octode, and (b) a triode - hexode type of frequency - changer.

simple tuned-grid triode circuit, the frequency of operation being determined by the product L_2C_2 in the grid circuit. Feedback from the anode through C_3 and the coupling coil L_3 enables continuous oscillations to be maintained in the circuit, and the oscillator anode therefore acts as a modulating electrode for the valve electron stream. Thus the latter is already modulated by the comparatively strong local oscillations before it can be influenced still further by the aerial carrier present upon the signal grid. The third and fifth grids of the valve are generally strapped together internally, and surround the signal grid in such a manner that the oscillator section is completely screened (capacitatively) from the former, the only coupling permissible being by way of the modulated electron stream. As for an ordinary pentode amplifier, the screen is returned to some point on the H.T. supply chain, being decoupled by the usual small condenser to earth.

The exact manner in which the mixing of the signal and the oscillator currents is achieved is rather complex, but briefly the mixer section of the valve depends for its electron supply upon an electron cloud, or space charge, formed immediately before the signal grid, and a virtual cathode, fluctuating at the oscillator frequency, is therefore provided from which the tetrode section (grids 3, 4 and 5 and the anode) can draw its electron stream. The space charge is formed by electrons which have passed through the meshes of the oscillator anode and screen grid and have become accumulated before the negative signal grid. This space charge is constantly varying at a frequency determined by the local oscillator, and so the tetrode section of the valve is carrying, in addition to the fluctuation brought about by the applied signal voltage, the fluctuations due to the local oscillations. The output currents appearing at the mixer anode, therefore, consist of a number of complex frequencies as we have seen, the most predominant of which are (f_o+f_c) and (f_o-f_c) where f_o and f_c have the meanings before mentioned. The other frequencies present will be the result of the combination of the fundamentals and harmonics of the oscillator and signal frequencies, and will be progressively weaker as the order of harmonics involved becomes higher and higher.

Out of these frequencies one only is required, that being the new carrier (f_o-f_c), f_c itself modulated by the speech or musical frequencies f_m. By making the anode circuit of the mixer sharply resonant to the frequency (f_o-f_c), all the unwanted frequencies are easily filtered away, and the remaining amplification can take place at the fixed intermediate-frequency (f_o-f_c). This is the great advantage that the superheterodyne enjoys over the straight receiver, for the bulk of the amplification can be carried out at a fixed frequency over a number of highly selective stages. It is, of course, assumed that the intermediate-frequency chosen by the designer is sufficiently high that (f_o+f_c) is far enough distant from it that the latter can be by-passed by the preliminary tuned circuit, even if this is of only medium selectivity.

In the valve type just discussed—the pentagrid—coupling between the aerial signal and the local oscillation occurs in the actual electron stream of the valve, and so the valve is said to be one of the electron-coupling types. Other valves of this variety include the octode (Fig. 3(a)), which is very similar to the pentagrid with the exception of an additional grid (suppressor) inserted between screen and anode; the triode-hexode (Fig. 3(b)), which employs an entirely separate triode oscillator section, with an injection grid internally connected to the oscillator grid.

(To be continued.)

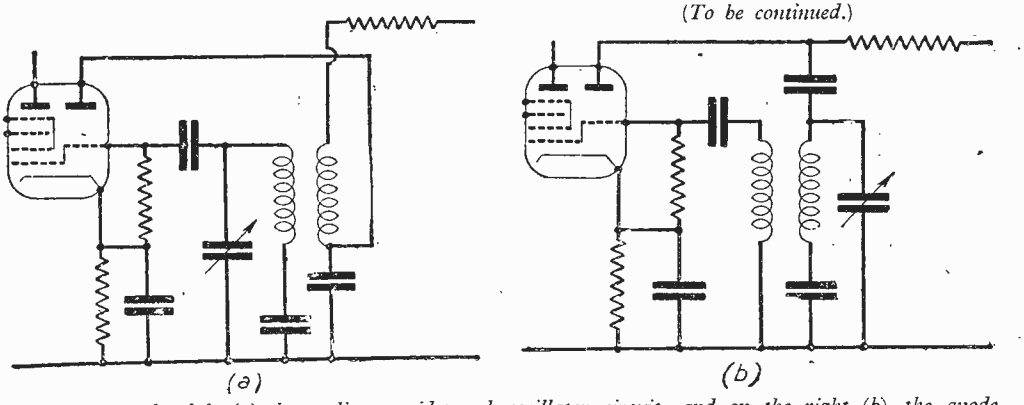


Fig. 4.—On the left (a) is a direct grid-tuned oscillator circuit, and on the right (b) the anode circuit is tuned.

ON YOUR WAVELENGTH

By THERMION

No American Music!

UNDER the latest import ban, it is not possible now for English publishers to import American music. This should give English musicians and composers a chance to achieve by merit what American composers have done by song-plugging. For, of course, it is well known that the American "parpular sarng" does not achieve its popularity by merit but by a subtle process of paying a sufficient number of crooners and so-called dance band leaders to play the miserable tune often enough.

This import from America is the one which will cause us the least concern. We can well do without it, and I hope the ban stays on for ever. Those who like that sort of tripe can listen in to the American programmes. I fail to see why English listeners should have this debased and spurious so-called art inflicted on them.

There are plenty of English composers capable of composing far better melodies and dance tunes than the playboys of Tin-Pan Alley, with their wavy hair and night club manners.

Bilious Attack from a Malady-maker

READERS will remember that in the September issue I dealt with the subject of crooning, and also with a definition of it which appears in the new "Dictionary of Music." A weekly paper which purports to deal with crooning, dance bands, and malady-making generally, saw fit, in a leading article, written in a "willing to wound, but yet afraid to strike" strain, to refer to these notes under the title of a "Bilious Attack," and it endeavours to justify by specious arguments and captious criticism dance music generally, and tap drummers in particular. I should have thought this journal would have been better occupied in answering the criticisms which have been regularly and consistently made against it during the past year by the *Musical Express*.

Apart from the inspissated nonsense which this journal uses to support that lowest form of musical life—the tap drummer, with his trappings—it is rather unfortunate for this malady-maker that a later issue contained an article by an accomplished musician supporting my views! Evidently the malady-maker is eating its own words. Of course, as it circulates largely amongst the crooners and the other parasitic appendages to the musical profession, I suppose one must expect it to support the latter, since it is in the same position as a paid advocate who defends a criminal but does not necessarily believe in his innocence.

Of course, our contemporary, as an expert on bilious attacks promoted by dance bands and crooners, probably looks at every criticism with the same jaundiced eye which is the symptom of the bilious person. It sees everything through the bilious-tinted lenses of the duodenal sufferer.

We advise our contemporary to confine its activities to reporting dance band performances and programmes and to pouring unctuous praise upon unworthy performers. For, of course, to the malady-maker all dance music is superior to Brahms and Schubert, and every dance band leader is ahead of Mozart in technique. I should like, however, to see it devote a little space to answering the well-directed attacks upon it by the *Musical Express*—if it has an answer. Perhaps its silence conveys its answer.

Traffic SOS

TRAFFIC jams and bad accidents are now being specially handled by the Metropolitan Police. Eight traffic accident groups, each consisting of a car with an escort of two Triumph twin motor-cycles, have already been given areas to patrol, and any police officer on duty who has trouble with the traffic or with any smash of more than a minor nature, telephones Scotland Yard, who, in turn, send on the nearest patrol to help him. The patrol car has a two-way radio transmitter to keep in constant touch with headquarters. The intention is to raise the number of patrols.

Eventually, each motor-cyclist in the Metropolitan Police is also to have a two-way radio transmitter with military valves, a handlebar flick-switch, and an upright aerial at the back of his machine. The rider will not wear headphones and, to leave his hands free for control, he will have a mouthpiece fitted round the neck. It is hoped that each machine will carry a loudspeaker to allow the rider to address the general public.

The work of the 76 motor-cycles now on patrol in London has been so satisfactory that the number is being doubled. Apart from these new traffic accident groups, their main job is to patrol a beat in order to keep an eye on erring traffic and to assist in traffic control.

"MAGIC CARPET"

Like magic carpet through the air
My radio bears me on,
And, hovering where the programmes please,
I bid dull care begone.
From land to land I travel on,
No passports are required:
No rigid frontiers prison me
If programmes make me tired.

Some I delete in any case,
For crooning gets my goat;
A form of entertainment(?) this
On which I do not dote!
My tuning knob soon fades it out,
Till it cannot annoy,
Transporting me with speed of thought
To things I can enjoy.

Pray, in what other phase of life
Could I thus chop and change?
Or, suiting my own will alone,
About the world so range?
And thus of all the things I own
Is valued most, you bet!
The "magic carpet" tucked away
Inside my radio set!

"TORCH."

A Versatile Frequency Meter

How to Modify an Old Type Instrument for Modern Use.

By G. MERRIMAN (G6NC)

WHEN starting up again after the war it was inevitable that about the first auxiliary piece of equipment that was built up was the good old-fashioned absorption type frequency meter. It had been a faithful servant in the bad old days and at least it was a devil we knew.

In the form we used it there was a loose-coupled pick-up circuit to reduce the losses in the tuning circuit proper, and the frequency bands were selected by the old-time expedient of plug-in coils. The tuning condenser was a simple but sturdy receiving type

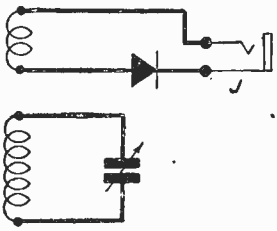


Fig. 1.—Original or simple form of loose-coupled circuit used for monitoring or frequency measurement.

of about 140 $\mu\mu$F, and on most coils the frequency ratio on each coil was better than 4 : 1. That, of course, means that only one coil was needed to tune from 3.5 to 14 Mc/s, and such a tuning ratio, of course, meant that not too many coils were needed to cover the amateur bands.

The Circuit

The circuit is shown in Fig. 1, and the jack was used to receive a pair of 'phones when it was desired to listen to one's own 'phone transmissions, and to plug in a 5 mA milliammeter when it was required to function as a neutralisation indicator, rough frequency checker, or over-modulation indicator.

Of course, when it was used as an absorption type frequency meter on an autodyne receiver, the coil was placed close to the grid coil of the receiver and the resonance point found by listening for the click as the receiver went out of oscillation. Unfortunately, however, as time went on and we expanded our equipment we found that this type of frequency meter was not very satisfactory with a super-heterodyne receiver. One could not get the frequency meter coil near to the oscillator coil of the receiver, and even if one could, there was still the uncertainty of what the intermediate frequency was, and if it was higher or lower than the signal frequency. One obviously needed a meter that would produce a heterodyne beat, and so rather than do this by scrapping the first one we connected a valve to it as shown in Fig. 2. The H.T. is a pair of 9v. grid bias batteries joined in series and is more than adequate for the purpose.

The filament battery will depend upon the type of valve which you use, but the writer used a very old type "30. The new battery valves of the 1.4v. type would be particularly suitable and could then be lit from a single flash-lamp cell.

The two switches sw.1 and sw.2 are self explanatory ; one controls the filament supply and the other puts the instrument in, or out, of oscillation.

Use Existing Coils

Since anyone desiring to use this idea will most probably wish to use his own coils these are not specified in detail.

The old type frequency meter is often used as a simple absorption meter by just forgetting or omitting to switch on the filament. Under these conditions, if one neglects the inter-electrode capacities, which are both small and constant, the remaining circuit is practically the old one undisturbed.

Of course, it needed re-calibrating after the valve was added, but, as you can guess, it was relatively an easy task now that we had a superhet receiver with a wide coverage. The homely B.C. receiver also lent a hand in this operation since it was fairly accurately calibrated on the medium- and long-wave bands.

When the switch sw.2 is open there is insufficient feedback capacity and the instrument can then be

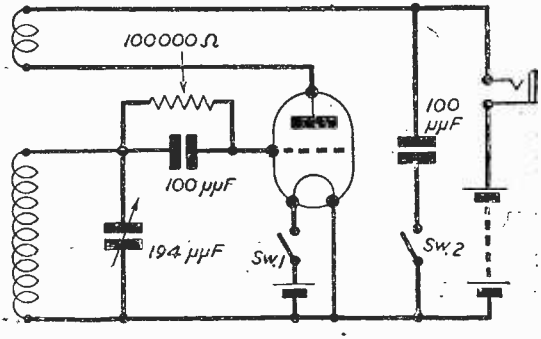


Fig. 2.—An effective conversion of the simple arrangement of Fig. 1.

used in a non-oscillating condition as a 'phone monitor. In this way distortion and hum can easily be noticed and tracked down.

If, when the reaction coil is connected to the anode, the latter is actually taken to the crystal holder, then simply removing the plug-in type crystal will be all that is necessary to prevent the crystal from unnecessarily damping the anode circuit of the heterodyne oscillator.

It will be noticed that when the filament battery runs down, the instrument will still do all its duties except oscillate.

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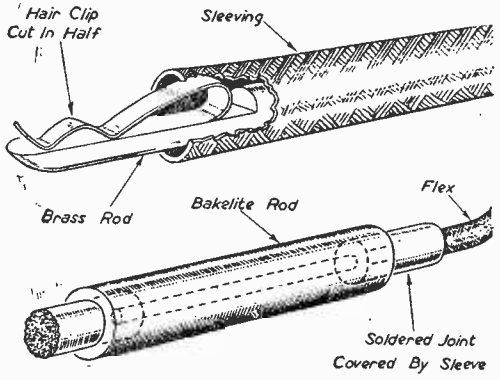
Practical Hints

A Test Prod

THE following idea of a test prod was evolved for use with a multi-range test meter and has proved very successful. It can be clipped on to soldering tags and wires, and is small enough to go into otherwise inaccessible places without "short-circuiting" things.

A 6in. length of $^3/_{32}$in. diameter brass rod had a flat face 1in. long, filed at one end. A hair-clip was cleaned with emery cloth and soldered on to the flat, as shown in the sketch. After soldering, the clip was cut in half to increase the springiness and a piece of sleeving 2¾in. long pushed over it. A 2½in. length of ⅜in. diameter bakelite rod, drilled so that the brass rod fitted tightly, made a suitable handle. The flexible lead was soldered to the projecting end of the rod and a small rubber sleeve slipped on to make an insulated joint.—H. MUMFORD (Epping).



A neat test-prod idea.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints."

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page iii of cover.

"Crackle" Finish

NOT having spraying equipment at home for painting metal cabinets, test gear cases, etc., I have for some time used an ordinary "Flit" type of hand spray with amazingly good results. The jet should be closed slightly for good results as experiment will decide.

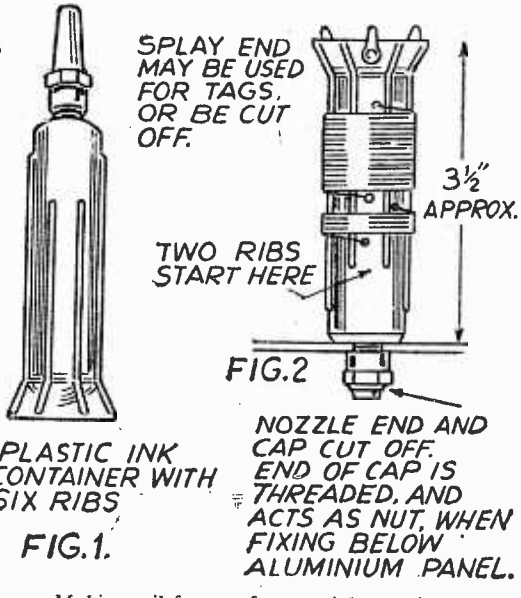
For "crackle" finish, spray cabinet just with an ordinary paint. When this is dry—but only just—spray over in finishing colour with a *cellulose* paint. This paint has a naturally nice finish, and reacts on the first coat of ordinary paint in such a manner as to cause the surface to wrinkle finely, very similar to the popular "crackle" finish. I suggest, though, that the beginner should try the idea out on odd pieces of metal first to decide for himself how dry to allow the first coat to be before spraying on the cellulose. I have "crackled" everything in the house I could lay my hands on—household tins for flour, peas, etc.—all with good results. Note: The "crackle" doesn't *have* to be sprayed, only it is usually neater than when put on with a brush!—C. E. AUSTIN (Winchester).

An Improvised Coil Former

THERE is a plastic drawing-ink container which is ideal for use as a small coil former. The type of container is shown in Fig. 1.

It has six ribs, and although two of them are short ones, about 2in. of space is available for winding. The diameter over ribs is approximately $^{13}/_{16}$in. and the main container is 3½in. long.

If part of the nozzle and the cap is sawn off, the improvised coil may be fixed to an aluminium chassis or panel, by using the screwed end of the cap as a nut (see Fig. 2). The top splayed end may serve as a terminal or tag fixture for connections. Short lengths may, of course, be cut from one of these containers for small short-wave H.F. chokes or small self-supporting coils. It is advisable, before using for the purpose described, to remove the old rubber plunger in the base and thoroughly clean the container of all traces of ink.—R. L. GRAPER (Chelmsford).



Making coil formers from an ink container.

Some A.C. Power Problems—4

"DYNATRON" Concludes his Discussions on the Load Problems

SO far I have given a little more than a "gist" of the relevant points. If any technical reader thinks that I have been "putting-over" any questionable facts, I shall only be too pleased to take part in further discussions in the Correspondence Columns. The whole subject is just one more concerning which the technical press has been silent, whilst I make no claims to omniscience. In particular, the theory that harmonics are "converted" into fundamental-power is worth discussing—I hope to deal with it in full later. It would certainly be of interest to hear what readers who have experience of transmitters think of the idea!

Our consideration of "R_{ac}" will help to show what is signified by an "A.C. load." There are two main types. The one we have been discussing is of the nature of a non-aperiodic load which extracts power only at the fundamental harmonic, rejecting D.C. and higher harmonics. The true type of non-aperiodic load, however, is a resonant tuned-circuit which has a large dynamic resistance R_d to the fundamental-frequency whilst offering a low impedance to and by-passing the harmonics.

The actual load in Fig. 5 (a), of course, was a D.C. resistance taking complex power, including D.C. On the mains side of the rectifier, it "looks like" a sort of equivalent A.C. resistance to the fundamental frequency of the supply.

There is a third kind of "load," an A.C. load which has little or no resistance to D.C., but absorbs power at all A.C. frequencies—fundamental *and* higher harmonic.

Thus, we may suppose that the D.C. resistance of a transformer primary is negligible, or, in any case, does not form part of the "load." The latter may be supposed to be the equivalent of a resistance R_s connected across the secondary, which reappears as a different value of resistance R_p across the primary. R_p is the *transferred load* in parallel with the primary, its value varying as the *square* of the transformer ratio.

If we applied the half-wave current to the primary, a very distorted voltage wave would be induced in the secondary. It would contain many harmonics, and the value of R_s itself, e.g., whether purely resistive or a complex impedance, would depend to some extent on the harmonic content.

The voltage waveform across R_s and R_p would be nothing like the pulsating current. Furthermore, the inductance of the primary, etc., will have an effect on the final shape of the current-pulses in the coil. As you know, inductance tends to delay the rate at which a current rises or falls away.

So this is really a somewhat complicated case of an A.C. load. Nevertheless, the transformer is a pure A.C. device, whose response at various frequencies varies considerably due to self-capacitance, leakage reactances, etc. The load on the primary side will be an *A.C. load*, but an *aperiodic* one which can take power at fundamental and harmonic frequencies.

Incidentally, this explains why it would be out of the question to try to get "undistorted output" from a single valve working in Class B, using transformer output, where the current is of the half-wave pulsating form described.

Frequency-doubling

Full-wave rectification represents an example of complete *frequency-doubling*. We get two pulses for every A.C. cycle, and if two amplifying valves were arranged to deliver a current of this type it would be found impossible to supply power into a resonant circuit at the fundamental-frequency of the grid signal.

After one pulse, the next would be in the wrong direction to maintain a current in an LC-circuit. But if you tuned your circuit to *twice* the fundamental-frequency, a large output would be obtained. You would have an excellent doubler, which could also supply a moderate output at the fourth harmonic of your signal frequency.

Mathematically, analysis of a full-wave pulsating current reveals, as might be expected, *no fundamental harmonic present*. The Fourier Series shows a D.C. term, $0.637I_p$, together with *even* harmonics, starting at the second.

Summary of a Few "Values"

We will conclude with a brief summary of some A.C. values established so far, especially since these are frequently used in connection with rectifying circuits, etc.

Sine-wave

Mean voltage or current	$=0$.
Mean power	$=\frac{1}{2}$ (peak power).
R.M.S. value	$=\sqrt{\frac{1}{2}}=0.707$ peak value.

Half-wave Rectification

Mean voltage or current	$=1/\pi=0.318$ peak value $=$D.C.
Mean power (complex)	$=\frac{1}{4}$ (peak power).
R.M.S. value (complex)	$=\sqrt{\frac{1}{4}}=0.5$ peak value.
Peak value of fundamental harmonic	$=\frac{1}{2}I_p$ or $\frac{1}{2}V_p$.
R.M.S. value of fundamental harmonic	$=0.707$ peak value. $=0.707\times\frac{1}{2}I_p=0.353\times I_p$.
Mean power at fundamental-frequency	$=\frac{1}{2}\times$peak fundamental power $=\frac{1}{2}\times(\frac{1}{2}I_p)^2\times R_{ac}$ $=\frac{1}{8}.I_p{}^2R_{ac}$,

where I_p=peak value of half-wave *pulse* current.
R_{ac}=A.C. resistance to fundamental-frequency component.

Full-wave Rectification

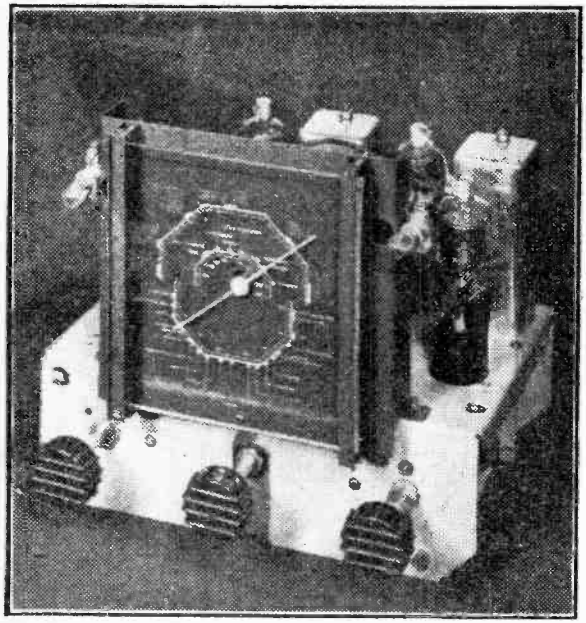
Mean voltage or current $=2/\pi=0.637$ peak value $=$D.C.

Ordinary sine-wave relations apply to complex power and R.M.S. value. There is no fundamental harmonic, so that this type of waveform could not be employed to deliver "fundamental power."

RADIOLYMPIA

Some of the Highlights Discussed, and a Further Review of Some of the Exhibits

AS forecast in recent issues, there was an obvious indication that the majority of manufacturers had concentrated on better quality reproduction. Both complete receivers and separate loudspeaker units were on view in which novelties had been introduced, and to many who have not followed the trend of receiver and loudspeaker design the reproduction given by some of the apparatus was a revelation. Undoubtedly the highspot was the H.M.V. Electrogram-de-Luxe. With 43 valves and 12 wavebands this equipment is designed for either A.M. or F.M. reception and is claimed to have a frequency response from 30 to 15,000 c.p.s.

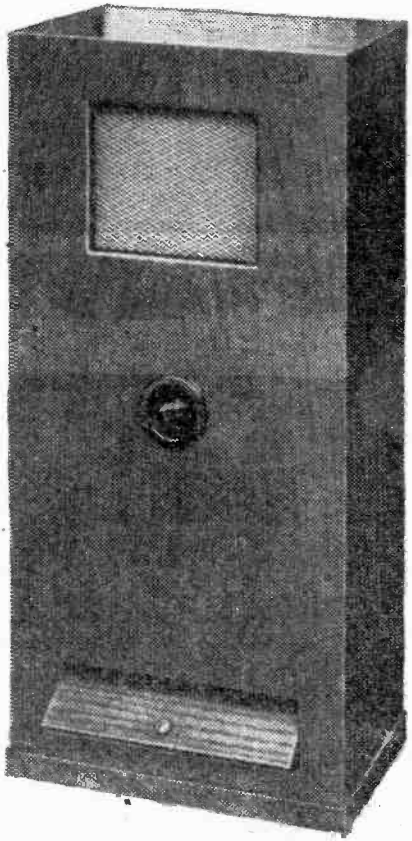


The R.M. "Radio Feeder," a three-waveband three-valve unit for addition to a standard power supply and amplifier.

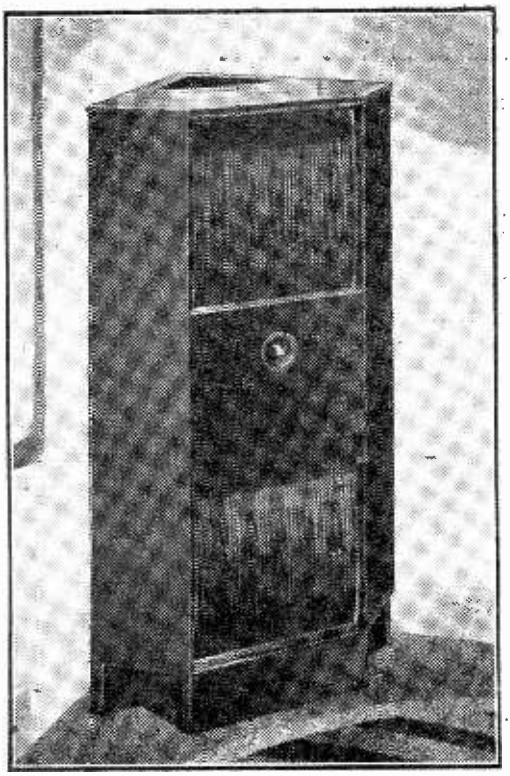
The R.G.D. have a 10-valve all-wave model with 12in. duplex cone and a response claimed from 40 to 10,000 c.p.s. The Dynatron Ether Conqueror has 12 valves, 4 wavebands, whistle filter and in one model a twin wide-range loudspeaker system all fitted in a hand-carved walnut cabinet. Another radiogram in this class is the McMichael in a rather elaborate cabinet designed to give space for record storage and books. This model is also fitted with twin speakers with cross-over filter network. A noticeable feature in quite a large number of the radiograms was the steps taken to avoid noise from the pick-up or facility in playing records without exposing the radio side. In some apparatus the entire lid was split centrally so that only the desired half need be raised, but in the Dynatron for instance, an internal separate lid is provided for the gramophone section.

Loudspeakers

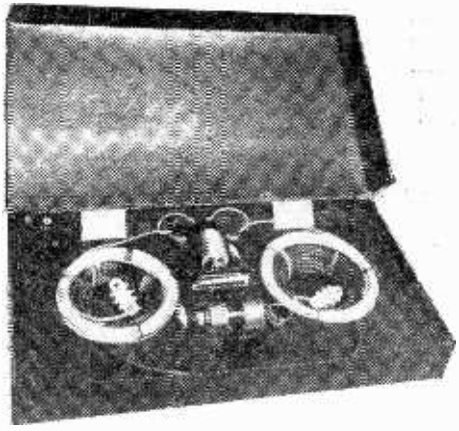
Quite a few firms are now manufacturing the acoustic cabinet type of speaker, and in addition to the special Vitavox dual speaker type of instrument there are the Wharfedale instruments, two of which are illustrated in this article. The "Varitone" is a more or less standard acoustic chamber, except that the phase inversion opening is provided with a flap or door which may be closed to increase the damping on the cone and so increase the brilliancy on speech. This cabinet is fitted with an 8in. speaker. The corner cabinet



The Wharfedale "Varitone" acoustic chamber speaker. At the moment supplies of the model are limited to schools.



This corner speaker by Wharfedale incorporates two loudspeakers with a special frequency filter network. The frequency range is from 40 to 18,000 c.p.s.



A complete anti-interference aerial kit in a carton, as supplied by B. I. Callenders, Ltd. This is of the all-wave type and has an 80ft. coaxial screened lead-in.

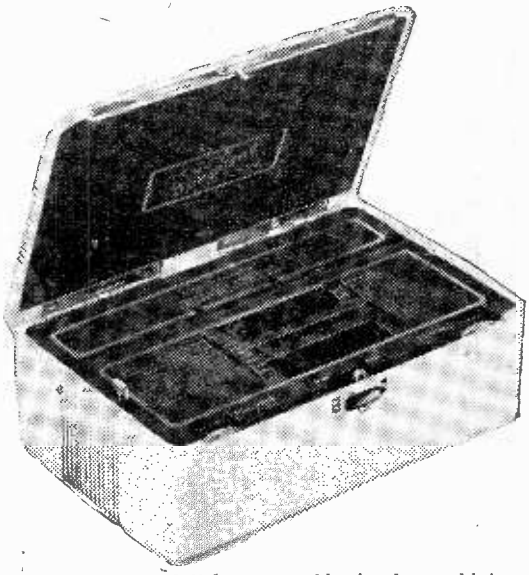
is on somewhat different lines and houses two speakers, a 10in. model for top and a 12in. model for bass, with a cross-over filter network for frequency separation. This model is claimed to have a response from 40 to 18,000 c.p.s.

In the Goodmans' range are some bass reflex cabinets, the smallest of which is fitted with an 8in. speaker with 3 watts handling capacity.

At the other end of the scale is the novel Truvox speaker in which the magnet has been considerably reduced in size. The special design results in an extremely small external field, which will be found of interest to television receiver designers.

Tuning Packs

A welcome item for the home constructor is the tuning pack. In pre-war days one had to build a receiver round a set of coils which might or might

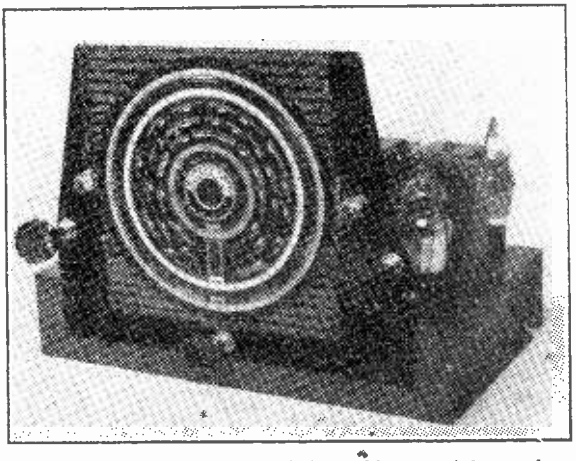


The smallest and lightest portable in the world is the claim of the makers of this "Playboy." It is entirely self-contained and covers medium and long waves, each with a separate tuning scale.

not be provided with an appropriate wave-change switch. One or two complete coil units were obtainable, but with the popularity of the superhet the difficulty of lining up a home-built receiver using one make of coil unit, another make of condenser, another make of I.F., etc., made many constructors hesitate to build a superhet. One or two packs were available before the war, but there are now quite a number of complete units from which to choose, or the type known in America previously as "Tuning Hearts." In some cases these are merely tuning condensers, coils and associated switches, whilst in some the valveholders are also included and wired. There are also some ready wired and tested units consisting of the early part of a modern receiver, intended for addition

to an amplifier which the user already possesses. The R.M., for instance, known as a radio feeder, covers three wavebands, has three valves and the glass tuning scale is edge illuminated and calibrated in metres and station names in three colours.

Complete chassis, ready for inclusion in a cabinet and attachment to a loudspeaker, are well typified in the Armstrong range. Model EXP.83, which is illustrated on right, is an 8-valve chassis incorporating wave-band expansion, special treble lift control and a push-pull output stage rated at 10 watts. It covers one short-wave range (16 to 50 metres) in addition to the medium and long bands.



For inclusion in an existing cabinet special complete all-wave chassis of this type may be obtained from the Armstrong Manufacturing Company. This is the model EXP.83 described on this page.

Incidental Items

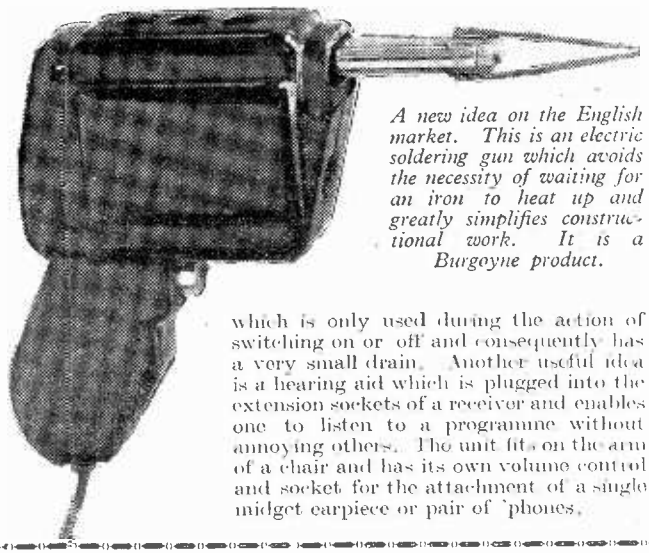
In addition to the complete equipment there are many items which may be termed incidental, and which are used not only by manufacturers and servicemen but also by keen constructors. The extensive range of meters, signal generators, oscillographs, etc., which have been presented to the public this season covers practically every need. It is noticeable that special television testing equipment is now being produced.

For high-voltage circuits, television and transmitting equipment, Dubilier can supply some reliable condensers. Those shown above are of the oil-filled variety and are available in a wide range.

Components, for set building or replacement, are now available in various makes, and range from simple dial-light holders or switches in the Bulgin range to multi-plugs and coaxial connectors in the Belling-Lee range. One item new to the English market is the electric soldering gun shown by the Burgoyne Company. This firm has also produced a miniature battery portable which is claimed to be the lightest, as well as the smallest and neatest, in the world.

It is entirely self-contained and weighs only 3¼ lbs., and one of the most important features is that the batteries may be replaced without having to move wiring or components. The lid incorporates a switch so that when opened the set is automatically brought into action.

An entirely new idea in loudspeaker models is the "Raimo" which is in the form of a wall plaque having a flower container, so that it adds a decorative effect in addition to performing its normal function. Most of the products of this firm are finished in "Texicolor," a new type of colour textile finish. They have also produced a remote-control unit for battery or mains apparatus which requires no additional wiring between set and extension speaker. It incorporates a 4.5 volt battery which is only used during the action of switching on or off and consequently has a very small drain. Another useful idea is a hearing aid which is plugged into the extension sockets of a receiver and enables one to listen to a programme without annoying others. The unit fits on the arm of a chair and has its own volume control and socket for the attachment of a single midget earpiece or pair of 'phones.



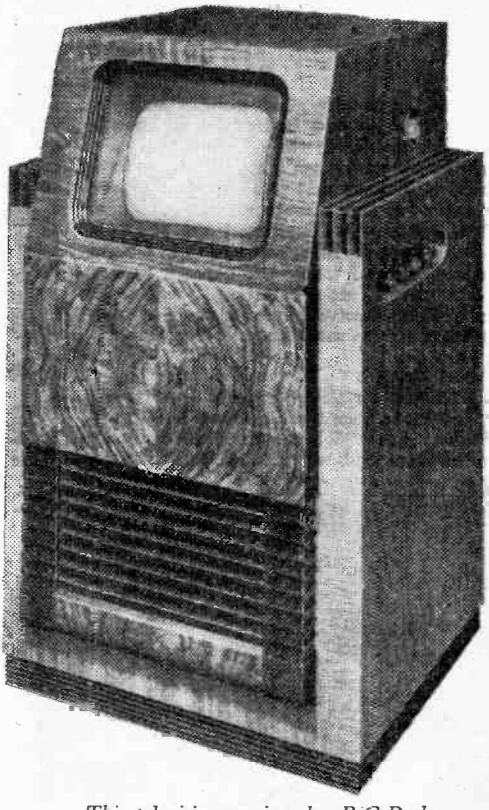
A new idea on the English market. This is an electric soldering gun which avoids the necessity of waiting for an iron to heat up and greatly simplifies constructional work. It is a Burgoyne product.

Television

One of the drawbacks which many find to the present television equipment is the limited view which is available to a large gathering—due to the curvature of the tube end. This is not very large, but does affect brilliancy when viewed from a wide angle. The G.E.C. have developed a new tube for use in their television receivers and this is of the 9in. type, but has a flat rather than a curved end. It is claimed that this gives greatly improves picture appearance as well as increasing the useful viewing angle. Some novelties are included in their television equipment, and these particular receivers, as well as those by Pye, include special interference eliminating circuits which do much to remove troubles from local electrical interference. There is in the case of the Pye, for instance, a special capacitor in the pre-V.F. diode which is conductive on signal peaks above mean white, and thus reduces "splashes" on the picture from peaky interference such as car-ignition radiations. Pye have also included special arrangements on the sound side to cut out the noises from similar interference.

Car Radio

The only stand at Olympia devoted entirely to car radio was No. 144 (Radiomobile), a product which is the combined effort of Smiths Motor Accessories and the Gramophone Company. With push-button tuning and a very small exposed panel, this set is built as a single unit and it is hoped eventually to be fitted as standard in all new cars. The new Standard "Vanguard," for instance, includes it in the panel layout. The set has built-in interference eliminators, and on most modern cars it is unnecessary to fit ignition suppressors. The aerial is also unusual, being a telescopic steel rod 18in. in length fitted immediately above the windscreen.



This television receiver by R.G.D. has a Thyratron time-base and employs magnetic scanning. It gives a 10in. by 8in. picture.

The Ether Conqueror, type K.129R, made by Dynatron, is fitted into a Regency cabinet, and as may be seen has a special lid for the record reproducing section, and a sloping panel on the radio side.

Gramophone Accessories

The Garrard Company had a new idea in gramophone motors, ideal for those building a radiogram. This was the Model S Drum Drive motor, having a below-baseboard depth of only just under 2¾in. It is supplied complete with magnetic pick-up. Their high-fidelity pick-up is fitted with a sapphire reproducer point and is of the magnetic type giving an output of 0.35 volts at 1,000 c.p.s. Their novel auto record changer playing mixed 10in. and 12in. records up to eight in number is now found more or less standard in the majority of commercial radiograms. It is very simple to fit and is available in different mains ratings and is complete with pick-up.

With the Amateurs

An Interesting Account of a British Amateur's Station

FROM time to time we see pictures of amateur stations in America and are struck by the elaborate equipment which they use. A large number of British amateurs, on the other hand, have home-constructed rigs with infinitesimal power, and although some of the lay-outs look very haphazard it is surprising what results are achieved. We are so used to seeing these pictures of small broadcasting stations that we are interested when we come across something out of the way at an English station, and no doubt the following details will prove of interest to those of our readers who are "on the air."

The station is situated well out in the country and about 400ft. above sea-level. The owner is fortunate in having unlimited space for antennæ at his disposal, and is remotely placed from roads or any interference. Unfortunately, this is more than offset by there being only a private electricity supply, although this will shortly be remedied.

American Equipment

The owner (who has been a "fan" since 1922) is "American minded" so far as radio is concerned, and since 1930 has favoured equipment from U.S.A., and the apparatus comprising the present station is 90 per cent. of American origin.

The power is supplied from a private generating plant from which seven other premises comprising the hamlet are served. This provides 100 volts D.C., and the radio equipment is supplied by conversion equipment comprising a motor-alternator and a standby rotary converter, both giving 115 volts 60 cycle A.C. at 1,500 and 750 watts respectively. These are remote controlled from the shack and situated in a separate building some distance away. Considerable difficulty has been experienced in getting a steady and interference-free supply. The power input is taken to three separate Variacs, whose variable secondaries take care of any fluctuating voltage, and each supplies a different section of the equipment.

Receivers and Recorders

The receiving equipment consists, amongst others, of a National HRO, an R.C.A. AR88, and a Howard 450A; the first two are used for S.W. and the last for B.C. work.

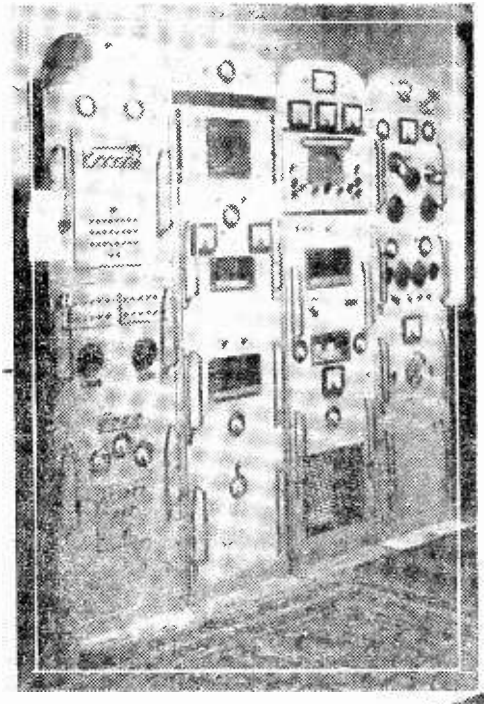
The recording apparatus comprises a McElroy tape recorder with its motorised puller, a Presto professional double speed 16in. disc recorder, with play-back, and an Armour wire recorder and play-back; each of these has its own matched microphone.

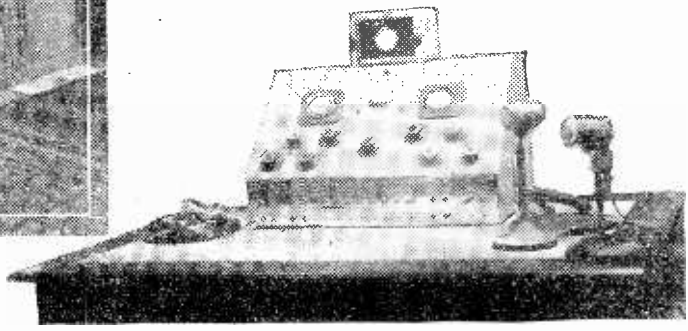
The Rack Equipment

This comprises four panels as follows, from left to right:

Panel 1. Input panel, with two Variac inputs and meters at top, patch panel under, covering 20 input and two monitoring circuits, and two through channels. Signal light indicators are fitted for patching. Under these are the two Variac controls with output meters, and at the bottom the main power input switches to the various sections, with more signal indicators.

Panel 2. Monitoring and H.T. panel with monitoring speaker at top; two H.T. supply units and associated meters under, supplying speech amplifier and modulator at 750 v., 300 mA. and 1,800 v., 300 mA. respectively, using six 866 valves with electronic delay switching.





Above is seen the complete rack assembly, and on the right is the control desk.

Panel 3. Receiver and amplifier panel, fitted with carrier percentage modulation meter at top, and three power-level indicators under. Below is the Howard communication receiver. Under this is the six-valve speech amplifier with three separate inputs, and using two L63s, two 6V6s, two 6L6s, and at the bottom is the modulator section using two TZ40 valves.

Panel 4. The R.F. panel. This has its own two separate H.T. supplies through a Variac input and delay switching, and gives 200 v., 80 mA. for the doubler circuit, and 3,000 v., 700 mA. for the final stage from 866 m/v rectifiers. These are at the bottom, over which is the C.O. with five-crystal switching and 6L6 first doubler, followed by 807 second doubler coupled to a pair of 100THs in the final. Coil switching is by turret-mounted coils throughout, and meters give full indication of conditions throughout the transmitter. Coloured signals show sections in operation throughout the rack. The coil set-up allows for 5, 10, 20, 40, 80 and 160 metre operation.

The Control Desk

Really the heart of the installation, this has a most elaborate switching system, and is fitted with six pre-amplifiers and individual and master controls for eight inputs simultaneously. Fitted at the desk are two turntables and a CRT modulation indicator. The console is permanently wired through the patch panel to the transmitter, and to the various receivers, recorders, turntables and microphones; also to the G.P.O. line through a special inductive coupling. This allows the inputs and outputs of the various instruments to be connected in any combination. There are two complete channels, a "red" and a "green," each with db indicators, so that whilst one channel is operating, the other may be set up and monitored for an instantaneous change-over in studio fashion. Again coloured signals give full visual indication of the set-up.

The Antennæ System

This is in course of erection, and comprises two 70ft. steel lattice masts (one ex 2NM at Caterham) and a 20ft. pole on the flat roof of the 50ft.-high house; these are placed in triangular formation. From these an almost endless variety of aerials can be slung. A 28 Mc/s rotary beam with Selsyn control and shack indicator is fitted to the top of one mast. On the flat roof is a 40ft. vertical rod aerial and a 5-metre dipole.

The owner will be only too happy to co-operate with any "Ham" by play-back over the G.P.O. line.

News from the Clubs

BIRMINGHAM AND DISTRICT SHORT WAVE SOCIETY

Hon. Sec.: N. Shirley, 14, Manor Road, Stechford, B'ham, 9.

AT the August meeting, held on August 11th, four of the members gave details of their logs for July, which included some very good DX. One of these members has just completed an EF50 receiver with which he received 108 stations in three hours. This Rx will be demonstrated at the next meeting. Another member gave a short talk about his home-constructed 2—v—2 receiver. Since he completed this about eight months ago, he has received 94 countries and 34 zones.

WEST BROMWICH AND DISTRICT RADIO SOCIETY

Hon. Sec.: R. G. Cousens (G3BCs), 38, Collins Road, Wednesbury, Staffs.

THIS society continues to meet alternate Mondays, 7.30 p.m., at the Gough Arms Hotel, Jowetts Lane, West Bromwich.

Every other Monday, practical work is done at the Udall Engineering Co., Ltd., Great Bridge, where the club transmitter, G3BWW, is now installed.

Active members include 8NC, 5KS, 2BJY, 2BXP, 3APZ, 3AGW, 3BYP and 3BCS.

New members are welcome and further particulars can be obtained from the secretary.

OSWESTRY AND DISTRICT RADIO SOCIETY

Hon. Sec.: A. D. Narraway, (G2APW), "Lamorna," Pant, Oswestry, Salop.

AT a recent annual general meeting the following officers were elected: Chairman, Mr. H. Woodhead (G2NX); vice-chairman, Mr. E. D. Power (G3ASC); hon. sec., as above; assistant hon. sec., Mr. G. H. Banner (G3AHX); hon. treasurer, Mr. P. J. Fay (G3AKG); committee, Mr. Smith, Mr. S. Brown (G4LU), M. O. H. Owen (G2AUZ) and Mr. R. MacQueen (G3APF). A full programme was announced by the hon. sec. Meetings are to be held at 7.30 p.m. in the Technical Institute, King Street, Oswestry, every fortnight. All short-wave listeners and constructors are invited and new members are welcome. It is hoped to organise a technical library, film shows and subsequent field days. Occasional sales of "ham" gear will take place. Last year, the initial year, was a great success, ending in visits to Service radar demonstrations.

LIVERPOOL AND DISTRICT SHORT WAVE CLUB

Hon. Sec.: B. G. Meaden (G3BHT), 10, Alfriston Road, West Derby, Liverpool, 12.

THIS club meets every Tuesday night at St. Barnabas Hall, Penny Lane, Liverpool, at 7.30 p.m. Included in the future programme of the club are: Oct 7th., Auction of spare gear and morse practice class; Oct. 14th, Talk; Oct. 21st., Talk and Oct. 28th, Annual General Meeting.

Morse practice is held every Monday night, 7-7.30 p.m. on 3,562 kc/s., call-sign, G3BHT. The club call G3AHD will shortly be heard on 3.5 mc/s.

Further details can be obtained from the hon. sec., or by attending a meeting. All are very welcome.

SLADE RADIO

Hon. Sec.: C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

THE fourth and last of the society's D.F. tests this year was recently held. The regular fortnightly meetings of the society will be held during October on the 17th and 31st in the Parochial Hall, Broomfield Road, Erdington, Birmingham, 23, commencing at 8 p.m., and visitors to any of the meetings or other events are gladly welcomed.

FLIXTON AND DISTRICT SHORT WAVE SOCIETY

IT is proposed to form a society in the Flixton district of Lancs, and all interested should contact Mr. D. Stott, at 23, Hampton Road, Urmston, Manchester, Lancs, either by post, or preferably in person.

ESSEX BRANCH, INTERNATIONAL SHORT WAVE LEAGUE

Hon. Sec.: K. Goodley, 34, Blenheim Avenue, Ilford.

THE inaugural meeting took place at "The King William IV," Chelmsford, on August 16th. An extensive programme has been arranged, including morse and basic radio instruction for beginners, talks and demonstrations by members, competitions and contests, and visits to places of radio interest. Meetings will be held in all Essex towns where there is sufficient support, and all radio amateurs, constructors and listeners should contact the Hon. Sec. for details of the next meeting in their area. The Chelmsford Radio Club (I.S.W.L.) has amalgamated with this official I.S.W.L. chapter.

Automatic Station Selection

Circuits for Use with Multi-switches and Push-button Mechanisms are Described Here by F. G. RAYER

TO be able to select three or four of the more popular stations immediately by some form of automatic tuning is an advantage. Operation is greatly simplified and correct tuning automatically obtained, reducing interference and distortion. Apart from this, the great ease with which the different programmes can be chosen alone makes some form of push-button or switched tuning worth while. As the simpler push-button switches are now easily obtainable the methods of connecting them are described here. Systems which turn the tuning condenser, either manually or by motors, are not dealt with because of the scarcity of the necessary components.

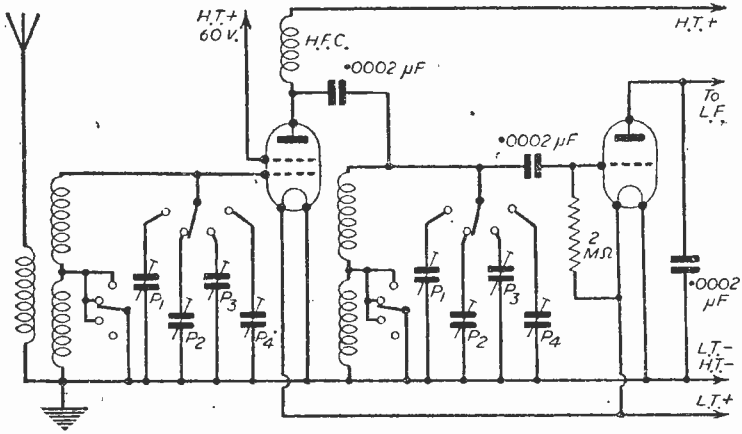


Fig. 1.—A simple two-valver with a rotary 4-position switch assembly to provide choice of four stations.

Rotary Switch Selection

In this, an ordinary multi-contact rotary switch is used, a particular station being received at each switch position. Fig. 1 shows a suitable circuit where four stations are provided for, three on medium waves and one on long.

A 4-pole, 4-way switch is used. Two switch sections select pre-set condensers in pairs. The other two sections short the long-wave sections of the coils in three positions for medium-wave reception. The fourth position gives long-wave reception.

In use, the two pre-sets P1 should be adjusted to one of the desired stations. Pre-sets P2 and P3 are also adjusted for two other stations in the same way. The stations obtained with P1, P2 and P3 will be on the medium-wave band. The pre-sets P4 are then adjusted for the long-wave band. In each case the switch is turned to the appropriate position, and the stations will be automatically selected afterwards by rotating the switch.

Adding Manual Tuning

If it is felt manual tuning is also needed for the reception of foreign stations, etc., it may be connected as in Fig. 2. Here, one pair of pre-sets is abandoned, a 2-gang, .0005 μF condenser being brought into circuit at that position of the switch. The receiver can thus be tuned in the ordinary way, with the automatic selection of three stations when required.

In this circuit separate wave-change switching is shown, so that manual tuning is possible on both wavebands without much switching. A double-pole switch only is needed here. If a 4-pole, 5-throw switch were used, it could be connected as follows: Position 1: Manual tuning on L.W. Position 2: Manual tuning on M.W. Positions 3, 4 and 5: Automatic selection of long- or medium-wave stations. (Wave-change switching would be obtained as in Fig. 1.)

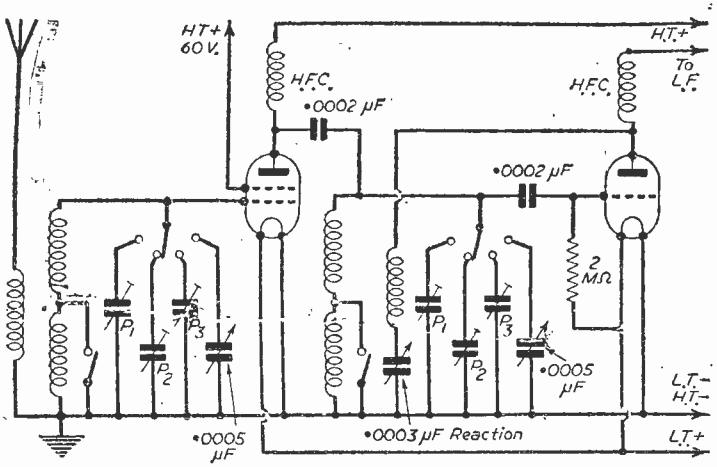


Fig. 2.—The same type of switch is used in this circuit, but manual tuning is provided and a reaction circuit is included.

Reaction

Reaction is added to Fig. 2, and may be with a normal variable condenser. Reaction could be used in the circuit shown in Fig. 1 if additional sensitivity were required, but a panel control should be avoided if possible, a pre-set being used. If automatic selection of weak stations is intended and a panel reaction condenser not wanted, a switch

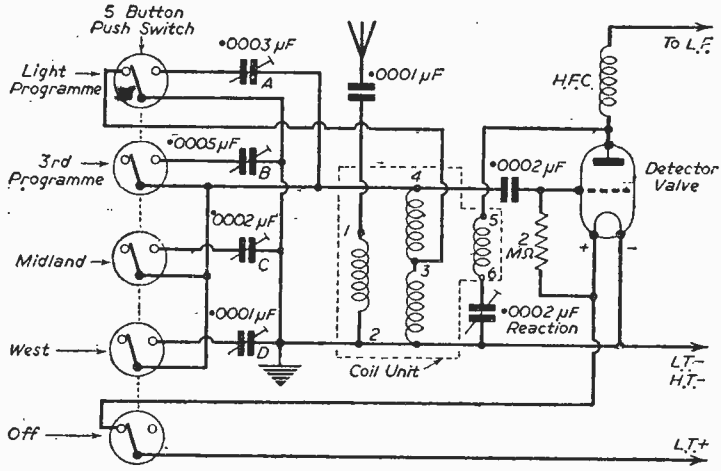


Fig. 3.—Push-button switching in its simplest form is indicated in this circuit diagram.

with an additional section may be used and an individual pre-set reaction condenser provided for each position of the selection switch.

Push-button Switching

The majority of push-button switches have a single-pole, double-throw action with each button. To enable such a switch to be used, one tuned circuit only can be adopted. If constructed as in Fig. 3, with a loosely coupled aerial circuit, this will be sufficiently selective for receiving the major B.B.C. programmes. By careful arrangement it is also possible to avoid additional wave-change and on-off switching.

In Fig. 3, all the switches spring to the left, except that which is depressed. If the lower switch is depressed, the receiver is off. This switch will spring into the "on" position when any of the other buttons are depressed.

If the top button is pressed, the receiver will switch on and operate on long waves. The .0003 μF condenser is then adjusted to the Light Programme.

Upon either of the central three buttons being depressed the top switch will spring out, changing to medium-wave reception. The pre-sets of these switches may be adjusted for M.W. stations, for example, Third Programme, Midland and West programmes.

When switching off depress the lower button. It will then remain in until any of the other buttons are depressed, according to the programme desired.

Some degree of reaction can be added by the .0002 μF pre-set connected to the reaction coil.

Pre-set Capacitances

These must be chosen with a maximum capacitance near that required. If too large condensers are used, it may be found that the minimum is too high for a station near the bottom of the band. (Plates may be removed to avoid this.) Normally, .0005 μF pre-sets will be suitable for most stations, but with most coils one of these would have a minimum capacitance too high to receive, say, the West programme on 216.8 metres. A .0001 or .0002 μF maximum component may therefore be necessary here.

Amplifiers and Volume Control

A simple and efficient battery-operated amplifier is shown in Fig. 4. This is suitable for any of the circuits shown, giving reasonable volume and quality.

In all cases, a volume control is desirable. This could be ordinary V.M. bias in Figs. 1 and 2. For Fig. 3 a low-frequency control could be added to the circuit. To do this the .25 megohm leak in Fig. 4 is replaced by a potentiometer of similar value, the grid of the L.F. valve being taken to the slider of the component. If five stations were to be selected with a 5-way switch, then the volume control could have an internal on-off switch, the lower push-button being used to switch in an additional pre-set condenser.

Push-button Selection with R.F. Stage

This is best arranged by obtaining a switch in which double-pole, double-throw switches are

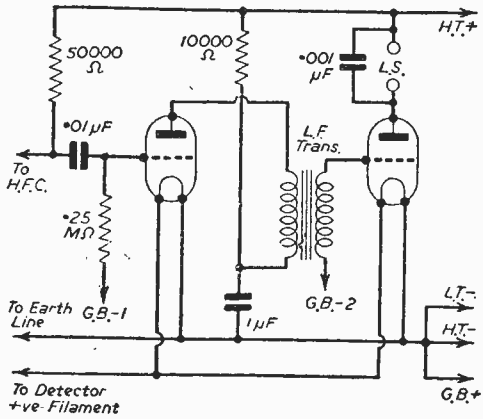


Fig. 4.—A simple L.F. amplifier in which the grid resistance of the first stage may be replaced by a variable component to provide volume control.

operated by each button. The simple switch may be wired as in Fig. 5, however, to give on-off, manual and two-station selection.

In Fig. 5 the on-off switching is obtained as in Fig. 3. The two pre-determined stations are obtained by the next two buttons, a double-pole, double-throw effect being obtained as one switch springs out when the other is depressed. These pre-sets are also obtained through the lower buttons being out.

When *both* the lower buttons are depressed, the pre-sets are disconnected and a 2-gang condenser brought into circuit for manual tuning. Both these buttons will stay in until the "off" button or either of the other buttons is operated.

As Addition to Normal Receiver

Fig. 6 shows how push-button selection may be added to a receiver without interfering with the manual tuning or circuits (which may be of superhet or all-wave design).

The filament circuit of the R.F. and detector stages of the receiver (or F.C., I.F. and second detector stages in a superhet) should be broken. It is then connected so that depressing one button on the push-switch makes the circuit complete. A second button is also connected so that the aerial is connected to the receiver when the switch is depressed. Pressing these two buttons will then enable the receiver to be tuned and operated as before.

The other three push-buttons select stations as in the circuit in Fig. 3. Upon any of them being depressed, the first two switches spring open, connecting the aerial to the push-button detector coil circuit, and switching on the filament of the push-button detector. The anode of this new detector is connected to the L.F. coupling of the receiver, so that the signal is amplified by the receiver in the required way.

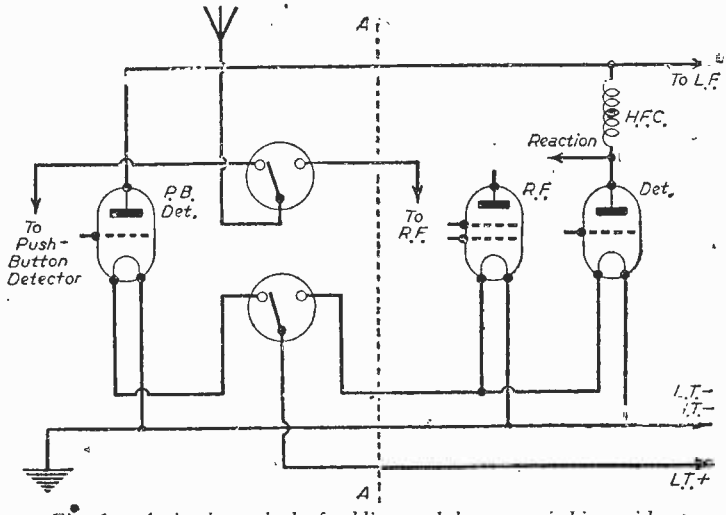


Fig. 6.—A simple method of adding push-button switching without interfering with normal circuit arrangements.

The necessary addition is shown to the left of the line AA in Fig. 6, the coil connection, etc., not being shown for clarity. These are as in Fig. 3.

Practical Layout

So that the method of connecting push-button switches is quite clear a wiring diagram is shown in Fig. 7. This unit forms an adapter which may be added to any battery-operated receiver, as outlined in the circuit shown in Fig. 6.

A double-pole, double-throw switch is used for transferring the aerial and filament connections. Lead X is taken to the aerial terminal of the receiver, and lead Y to the filaments of the R.F. and detector valves. (See Fig. 6.) The remainder of the circuit is as in Fig. 3, and the coil connections are numbered to agree with that circuit so that any coil may be used. A screened one is most suitable.

The diagram shows how switching is accomplished, one of the buttons always being in the "in" position

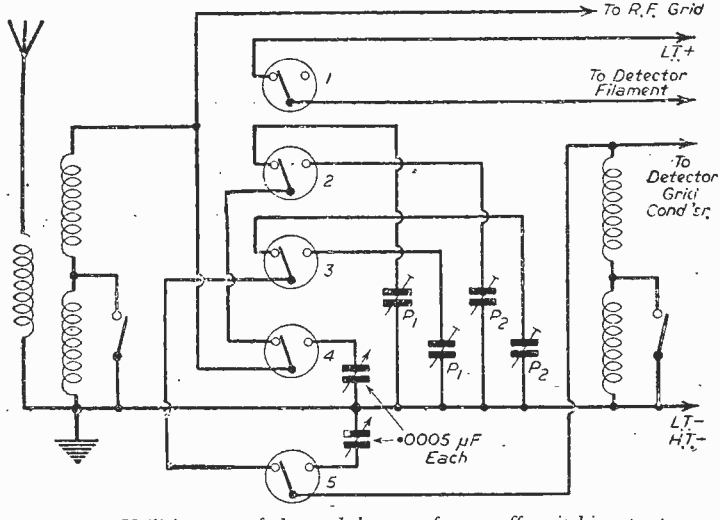


Fig. 5.—Utilising one of the push-buttons for on-off switching purposes.

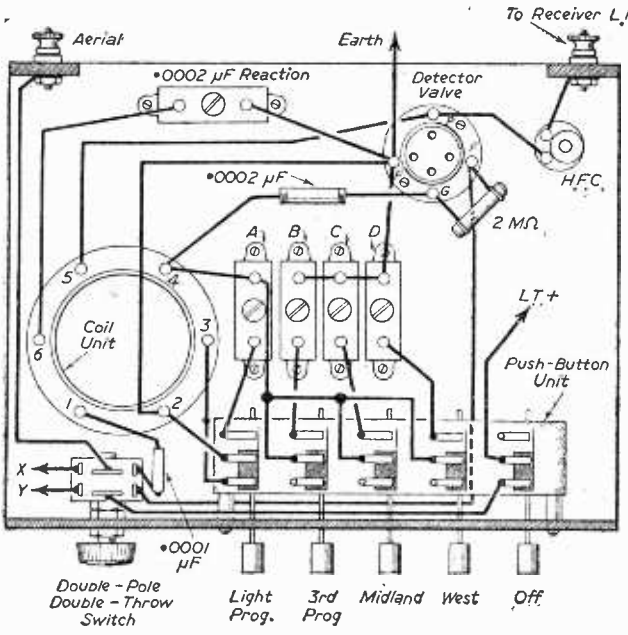


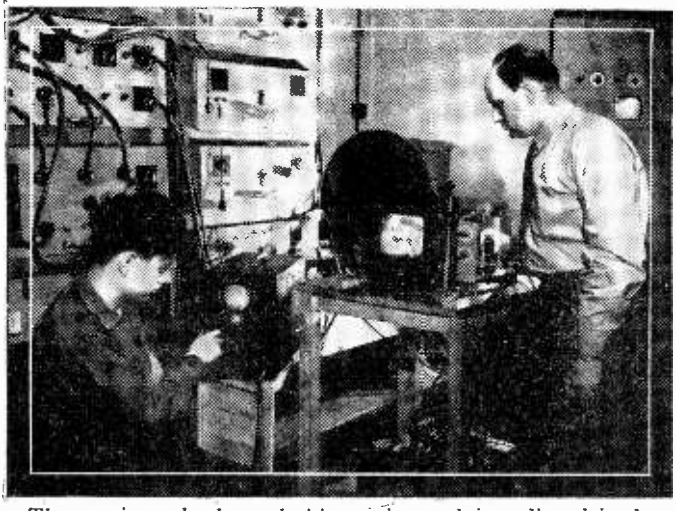
Fig. 7.—Practical layout for a push-button operated single valver.

once the switch has been fitted to the panel. The double-pole switch should be marked "Normal Operation" in one position and "Push-button Operation" in the other. The latter position will then provide automatic selection of four transmissions by means of the buttons, one being on long waves.

For Light Programme, Third Programme, Midland and West programmes pre-sets A, B, C and D should be set to approximately .00025 mfd.. .00045 mfd., .0002 mfd. and .00005 mfd. (or .0003 mfd. for the higher wavelength station). Pre-sets which have a capacity range accommodating these values should therefore be used. Other stations may, of course, be chosen.

Colour Television

RECENT reports of experiments and successful transmissions of television in colour in the U.S.A. have rather overshadowed the work which is being carried on in this country on similar lines. There are several methods by which pictures may be transmitted in colour, but they all depend upon the image being split up into primary colours and re-assembled at the receiving end, which introduces problems of synchronism as well as the normal problems of television transmission and reception. In one U.S.A. scheme three separate transmissions are made on three separate wavelengths, and thus in effect three receivers have to be used to pick up the radiations and they are then viewed through a rotating series of coloured screens.



The experimental colour television equipment being adjusted in the London laboratories of the Baird company.

Another idea uses a single C.R. tube with a rotating drum carrying the necessary colour screens, and it is interesting to note that in this country Baird carried out successful laboratory transmissions in colour as far back as 1928. His work is being carried on by his former assistant, Mr. E. G. O. Anderson, chief engineer of the Baird Company, and in the accompanying picture may be seen an experimental hook-up in which a colour disc with six segments of red-green and blue rotates in front of a standard C.R. tube. The picture is transmitted through a similar set-up and the black-and-white image on the tube end is viewed through the synchronised rotating disc and appears in its original colours. It will be noted that the still picture they are using for test purposes is of the well-known screen character Popeye.

Foreign Valve Data

Valuable Details of Some German Valves. By G. W. DAVEY (D2AH)

IN the May/June issue of PRACTICAL WIRELESS, a reader was asking for details of a valve designated RV12P2000. As the writer has recently returned from Germany where, as an amateur transmitter, he had the opportunity of using many foreign valves, it is thought some particulars of them may be of use and interest to readers.

The RV12P2000 is made by Telefunken, and is one of the most popular valves available in Germany at the moment, probably because it is the most plentiful and very versatile. It is a miniature pentode valve, made for the German forces, and present stocks are now being used commercially. It requires 12.6 volts on the heater (the valve is indirectly heated) and takes 0.08 amp. heater current. Maximum H.T. voltage is around 200, with up to half that on the screening grid. It can be used in all positions, as H.F. or I.F. amplifier, detector, L.F. amplifier or output valve. As an L.F. amplifier it requires about 3 volts grid-bias and takes only a few milliamps. A similar valve with variable-mu characteristics is the RV12P2001. Using two of these valves and a small metal rectifier a compact and efficient A.C./D.C. two-valver is easily built.

A miniature full-wave rectifier is the RG12D60, which also requires 12 volts on the heater, but at 0.2 amp. It takes 300 volts on each anode and delivers 60 milliamps. Miniature valves in a similar size (which is approximately 2ins. overall length by 1in. across) are also made in a directly-heated series for a two-volt accumulator. Those likely to be encountered are the RV2.4P700, an H.F. pentode, RV2.4T3, a special low H.T. tetrode, and the RL2.4T1, a triode. They all three require 2.4 volts on the filament, and the first two take 0.06 amp., but the RL2.4T1 consumes 0.16 amp. Maximum H.T. voltages for the RV2.4P700 and RL2.4T1 are approximately 120, whilst the RV2.4T3 requires only 20 volts H.T. with 15 volts on the screen.

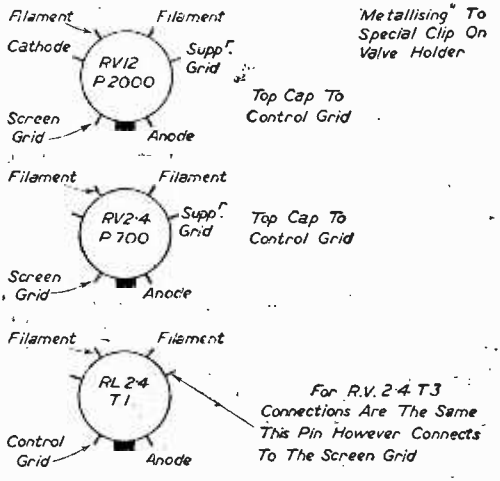
Another valve readers may have met is the RV12P4000, which has similar characteristics to the RV12P2000, but is not a miniature valve. It is about the size of a normal valve, but tubular in form, and completely screened with a thin perforated aluminium cover, similar to the metal "Catkin" valves which older readers may remember. This RV12P4000 was also built for the German forces, and was especially used in short-wave receivers.

The miniature valves are used in a special valveholder into which they fit upside down. When in the valveholder the valve is completely protected and can only be removed by means of a special "key" which screws into the threaded nut in the base of the valve. The RV12P4000 also has a special form of valveholder, but in this case the key is permanently moulded in the valve base.

Readers who have German "People's Receivers" may like to know what valves are in them. Those with which the writer came into contact had an REN904 and an RE134, both made by Telefunken. The first in an indirectly heated triode (5-pin) similar to the Mazda AC/HL, and the RE134 is a "small power" triode (4-pin) comparable to the Mazda LF410A. Valves of similar characteristics would make adequate replacements, although care may have to be taken to adjust, if necessary, the biasing resistance of the output valve.

Transmitting Valves

Two popular small transmitting valves are the RL12T15 and the RL12P35. The first is a 15-watt triode which requires 12 volts on the filament and up to 500 on the anode. The 20-watt German army 10-metre transmitter employed this type of valve throughout—one as modulator, another as oscillator, with a further valve as doubler into two in push-pull in the PA stage.



Details of valve pin arrangements and connections for certain Continental valves.

The RL12P35 is a transmitting pentode dissipating 35 watts, with 12 volts on the heater and 800 on the anode. In the 50-watt class there are two pentodes frequently encountered; the RL12P50 and the LS50. Both these take 12 volts on the heaters and 800 on the anodes, although the LS50 would stand 1,000 volts quite happily. This latter valve is notable for its small size and high efficiency—it is much the same size as an ordinary two-volt pentode. In all these valves it may be noted how the designations give a résumé of the valve characteristics—12, the filament voltage, T or P indicating triode or pentode (the German words are the same), and the last figures 15, 35, etc., indicating the wattage dissipation. This is a good general guide with most German service-type valves.

This is by no means an exhaustive nor even comprehensive list of valves likely to be encountered in German receivers; there are very many more, notably the "E" series (Philips), "AZ" series, and "V" series. Those readers who have dealings with many foreign valves cannot do better than consult the Brans' Valve Vade Mecum. The present writer makes the usual disclaimer regarding any connection with the writer or publication of this book, but would say that he has found it extremely useful in assisting with the many strange valve types he has encountered.

Finally, he would be pleased to render any help possible to readers of this journal in identifying any unknown valve they may have if they would write to him care of the Editor.

Reducing Phase Shift in Output Transformers

A Useful Aid for Quality Enthusiasts. By L. S. GEDDES

IT will sometimes be found that when feed-back is applied to a high-fidelity amplifier parasitic oscillation occurs, due to a phase shift of 180 deg. taking place at a frequency where the loop gain of the amplifier and feed-back network is greater than unity.

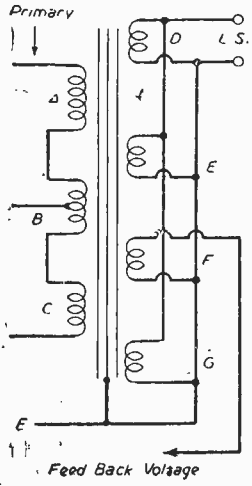


Fig. 1.—How sectionalised windings may be arranged on a multi-ratio output transformer.

Provided that inter-valve couplings are calculated for minimum phase shift at the lowest frequency to be handled, and the layout is above suspicion, then the trouble can generally be pinned down to a high leakage reactance in the output transformer.

A well-designed component should be of generous proportions, having two identical windings side by side, each consisting of alternate primary and secondary sections and using a high grade of silicon alloy core material.

Many readers may have an output transformer of the push-pull multi-ratio type which falls short of this specification and which accordingly will not perform satisfactorily when feed-back is applied across it.

If the transformer available has separate secondary windings alternating with the primary sections intended to be connected in series or parallel to obtain correct matching, then one of the windings not in use may be employed to obtain the feed-back voltage. The winding chosen should, for preference, be one sandwiched between two sections of the primary, or that half nearest the core (see Fig. 1).

The purpose of this arrangement is to provide feed-back from a winding with tight coupling and light loading so reducing undesirable phase shift.

If, in order to obtain correct matching, all windings are in use in a series combination, it may be possible, space permitting, to wind an additional secondary section on the outside to maintain correct turns ratio, leaving an inside winding available for feed-back.

If previously feed-back was taken from a series combination of the secondary sections, less voltage will be available from the one section; therefore, R2 (Fig. 2) will have to be decreased to give the desired ratio of feed-back and R1 increased to maintain correct bias on V1.

By making R2 variable and connecting a low reading A.C. voltmeter across the speech coil, it is possible to decide on a value of R2 which will give the optimum amount of feed-back obtainable and also the greatest loudspeaker damping factor before the threshold of instability is reached, oscillation appearing as a reading on the voltmeter.

It is important that the amplifier output has a very low hum content, otherwise this will also give a reading.

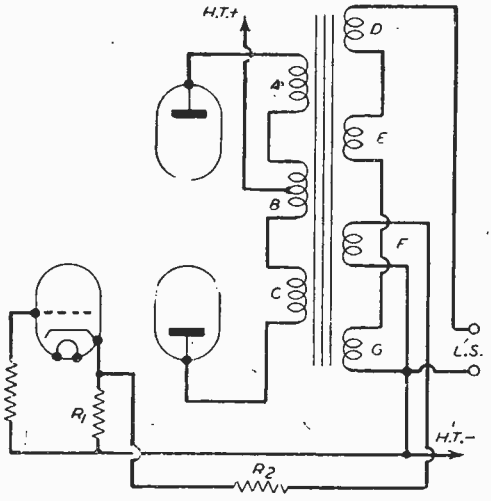


Fig. 2.—This method of providing feed-back should reduce phase shift.

Underneath the Dipole

Television Pick-ups and Reflections. By "THE SCANNER"

CRISIS! Crisis! Crisis!!! In these times of National stress and strain, many might think that our discussions and ruminations underneath the dipole might be a little inappropriate. "Why talk of television," they say, "when there's scarcely enough current to cook the Sunday dinner—what there is of it!" Our hothead politicians storm and thunder with results which are completely negative. Thermion's apt description of the "Shinwell," the new "no-volt" unit of electricity, has caused considerable amusement in many a radio workshop, and even the ranks of the left can scarce forbear to grin.

British Enterprise

It is an appropriate moment for us to remind ourselves that we are a nation which has the most advanced specialised radio industry in the world. Not only have we a thoroughly established and smoothly running television service, but our electronic devices in many fields are far ahead of those of other countries, even the U.S. These radio products are already contributing to the expanding flow of exports, in spite of the difficulties the manufacturers are experiencing in obtaining materials and suitable labour. It is ironic to consider that it may be beneath the guttering gleams of candle-light that our radio factories are turning out electronic detecting devices for locating oil deposits, and other highly advanced echo-recording equipment. The approach of another "Shinwell winter," with its implications of cuts, hold-ups and sheddings, have caused businesses and industries feverishly to search for alternative forms of power. Everything from windmills to water-motors, diesel engines to gravity motors, will be utilised. Incidentally, it is worth while remembering that, for all their size, windmills develop only a very small horse-power indeed, less than 1 h.p., and that to obtain equivalent horse-power from water, a very considerable head of water is required. I recall the enterprise of a stationmaster on the old Furness Railway, many years ago, who illuminated his little wayside station electrically from a wind-driven dynamo-set and accumulators. This, however, was before that interesting little Lakeland railway was absorbed by the L.M.S., in days when private enterprise and initiative were considered to be virtues!

Britain *Can* Make It

One of the finest and most efficient devices for the radio-location of oil deposits at great depths under the ground has just been perfected by a British company which hitherto has specialised in the manufacture of film recording equipment. The head of the firm related to me an amusing sidelight in the tangle of restrictive agreements which restrain British progress in sound recording apparatus. The contract for the production of a Government-sponsored film called "Britain Can Make It" actually contained a clause which required the film producer to make use of a specified American recording system! Evidently, the Central Office of Information, modern edition of the wartime Ministry of Information, haven't any faith in the title of their film. Britain *can* make it, given a fair opportunity, and in spite of cuts, controls, restrictions, directions, no houses and little hope! I echo Thermion's moan: "What a lovely peace!"

A.C. or D.C.

This winter, many factories and possibly a few dwellings will be deriving their electrical supplies from abnormal sources, as mentioned above, and in some cases the type of supply will change. For instance, the usual 230 volts 50 cycles A.C. might be temporarily replaced by D.C. at 240 volts, or even lower. The hundreds of 22½ kW. searchlight generators on trailers are likely to be employed, to keep the wheels of industry turning, and these diesel-driven generators give an output of 100 or 110 volts D.C. Extensive changes have had to be made with lighting bulbs and electric motors, though I have heard of a firm which has achieved success by running two of these generators in series, giving 220 volts D.C. The trials and tribulations of the radio firm trying to carry out its work with a D.C. supply can be appreciated. Using small converters to produce small amounts of A.C., the frequency of the supply varies a great deal. The effect on television pictures is remarkable, interference patterns and distortions of an extraordinary type being reproduced.

In gramophone recording, the steadiness of the electrical supply is a primary requirement. In this case, it may be possible for some studios to revert back to the old weight-driven motors, the steady drive of which has never been improved upon. So we progress forwards—looking backwards!

Television in the Cinemas

The 75 per cent. *ad valorem* duty on American films will leave a large vacuum in the programmes of hundreds of cinemas. Already, experiments have been made with variety and ballet performances as an alternative to films, since the British studios cannot hope to produce sufficient pictures to fill the gap. This is television's Big Opportunity, and a point where the B.B.C. and the important Rank group film interests may be expected to get together. The B.B.C. have the sole right to transmit, and possess the transmitting apparatus; the film people have variety and theatrical talent under contract, and the equipment to reproduce television on a big screen. Perhaps you and I, with our small home sets, will be able, literally, to watch the proceedings.

Programme Pointers

More Notes on the Proms and Some Autumn Visitors. By MAURICE REEVE

THE fifty-third season of Promenade Concerts was bigger and more successful than ever. Nine weeks long, with two orchestras alternating half weeks at a time under three conductors plus an associate, one wonders just how far the process of development and expansion can go on. Whilst the question of its repercussions on the future good, or ill, of music—nay, of the very soul of music itself—is a theme for a book rather than an article. And the then organisers of the Proms, in dear old Queen's Hall, fought shy of broadcasting and B.B.C. patronage lest the effect might be to turn the dwindling number of promenaders into erstwhile fireside stallholders!

One of the best of music critics, Neville Cardus, was also one of the shrewdest writers on cricket. *Manchester Guardian* readers, before the war, used to be delighted at the way the one subject intruded on the other when it was long out of season and almost out of mind. The similarities found between a Woolley off-drive and a brilliant scale passage played by an equally famous pianist, were as diverting as they were original. I mention Neville Cardus's happy choice of "mixed metaphors," as I am tempted to make a comparison myself between the capitalisation of music and cricket.

Cricket or Music

Much of the glamour and renown of county, 'varsity, and other forms of first-class cricket have been dimmed in the quite mistaken policy of the aggrandisement of international Test matches. These, in consequence, have become contests of such mammoth proportions that not only have they diverted most of the cricket-going public's attention without in any way improving or increasing their own standards and values, but they have drawn their patronage, too. With the vicious result that, earning most of the revenue derived from the spectators at cricket matches, teams now have largely to subsist on Test match profits dispensed to them by the central authority of the game, whilst their own performances attract less support than hitherto.

Should the present tendencies in the concert world continue to develop and enlarge, the consequences for music would be much more dire than they have been for cricket. Not only would standards drop even more rapidly, but music has no central authority to see that its mainsprings do not dry up and perish by the wayside. Neither can the commercially inspired concert, be it promenade or otherwise, compare with an Anglo-Australian Test match as an inspirer of loyalties and emotions, base as well as sporting. But, I suppose, the changing of standards and values, the setting up of new ideals for old, and the constant re-adapting of our minds and hearts to ever-changing conditions, is the hardest of all our jobs in all walks of life.

Gone are the days when Jarnefeld's "Preludeum," Mendelssohn's "Spring Song" and "Bee's Wedding," and Glazounov's orchestration of Chopin's A Major Polonaise, used to be enthusiastically applauded and their repetition demanded and complied with. Gone also are the days when the soloist of the evening had the platform to himself for his "group" in the second half, when he would play Chopin and Liszt ad. lib. to those who had come solely to hear him, for as long as they cared to bring him back. Sir Henry's final wind up, Carmen or something similar, was invariably played to a nine-tenths empty house.

Nowadays, six to seven thousand listen in rapt attention to Mahler's seventh symphony, and like material.

Autumn Visitors

Some great artists are making their first appearances here this autumn since before the war. Perhaps the most notable are Heifetz, violinist, and Arthur Rubinstein, pianist. The latter is a magnificent artist, at his very best in Spanish music, in which no one can approach him. Strange, this musical affinity between two such entirely contrasting nations, poles apart in every quality and ingredient that gives to the making of a national culture and tradition. But, Russian composers have almost all used the Spanish national dance rhythms and folk tunes with the greatest realism and brilliance; the Spaniards themselves consider Baliakirew's orchestral arrangement of the tunes comprising the incomparable "Jota Aragonesa" to be the finest of their kind, though Liszt's dazzling "Rhapsodie Espagnole," with Busoni's orchestral accompaniment, must run it pretty close. And, Russian pianists are invariably excellent in the colourful and fascinating works of Albeniz, Granados and De Falla.

Heifetz's debut, as a young man of 17 or 18, was the sensation of the post 1914-18 years. Such technical wizardry had seldom, if ever, been heard from a violinist before. A certain coldness and the lack of "that certain something" which always made Kreisler so supreme has now disappeared, and he is the perfectly-equipped violin maestro.

Effect of the Films

Talking of film-fans, it was very striking, at the recent London Music Festival at the Harringay Stadium, how those artists, notably Iturbi, who have made for themselves a big film reputation, drew easily the largest audience. This new development has also been in evidence at the Albert Hall and elsewhere. It is not a surprising development with those artists, such as Lily Pons or the much-lamented Grace Moore, who were also film-stars in their own right. But, apparently, one need only play snatches of the Tschaikowsky and Rachmaninow concertos and some Chopin, off, and thousands of admiring fans follow you to Harringay, or Harrogate, though your very appearance and personality remain totally unknown. Heaven knows what will happen when Stokowsky brings his Philadelphians over here!

Impressions on the Wax

Review of the Latest Gramophone Records

THERE is nothing quite like the best of J. S. Bach's preludes and fugues for showing off the possibilities of an instrument or, for that matter, of the organist himself. Bach's reputation in his own day was great as an executant, though his contemporaries probably failed to grasp his real eminence as a composer. As the finest organist of his day, Bach travelled Northern Germany, trying out the instruments in the various churches in many towns, and his extemporisations on these occasions must have formed the nuclei of the preludes and fugues we now possess. Incidently the manuscript of "Prelude and Fugue in B Minor," which has been recorded by Fernando Germani on *H.M.V. C*3604-5, is, to judge from a photographic reproduction, one of the most beautiful to look at of all the composer's surviving MSS. Fernando Germani possesses technical qualifications of an outstanding order. Critics both in Britain and abroad have paid tribute to his mature musicianship and one of the many points specially admired in his technique is his dazzling speed in pedal work.

There are few more satisfying composers of light music than Offenbach. He was a fine craftsman in his chosen line, knowing how to orchestrate his fluent, easy melodies so that they should present the most persuasive appeal to the ear. His "La Belle Helene" Overture, has been recorded by the Boston Promenade Orchestra, conducted by Arthur Fiedler on *H.M.V. C*3597, and I have no hesitation in recommending this record to you.

Piano Duettists

Some might think that the tenuousness of Debussy's piano writing is unsuitable for reproduction upon two keyboards, until the skill of the arrangement made by Rawicz and Landauer shows that the thing can be done most attractively. Falla's "Ritual Fire-dance," too, has been adapted to the medium with unerring taste and performed with the usual adroitness. The record is *Columbia DB*2324.

Selections of well-known film tunes are appearing more and more frequently in the record lists—certain indication of their growing popularity. One of the names most frequently associated with these selections is that of Peter Yorke, whose masterly arrangements and first class orchestra give them an added freshness. Peter Yorke has during the past year given us the hits from the films *Blue Skies, Make Mine Music, Till the Clouds Roll By, Centennial Summer* and *Night and Day*, and now augments that list with *Carnival in Costa Rica* on *Columbia DB*2329. This is music of a sunny, lively nature, mostly in rumba rhythm.

A set of records that I thought was rather outstanding was Vaughan Williams's "The Lark Ascending" (Romance for violin and orchestra), recorded by the Liverpool Philharmonic Orchestra, conducted by Sir Malcolm Sargent on *Columbia DX*1386-7. It is interesting to note that "The Lark Ascending" has pleasant associations with Sir Malcolm Sargent and the Liverpool Philharmonic Orchestra. Our soloist in this recording, David Wise, was for a number of years leader of that orchestra, and Sir Malcolm Sargent paid him the compliment of declaring that his interpretation of the solo part in this work was by far the best of all the artists he had heard play it. The familiarity with this work which the orchestra possesses has ensured a completely authoritative performance. These records may be recommended without reserve.

Variety

This month I am giving more space to variety recordings as there seems to be a very interesting selection. In his search for fine melodies to satisfy his admirers, Frank Sinatra has often delved into dance-music's past and unearthed half-forgotten songs such as "Souvenirs" and "I Don't Know Why," and many more. His latest two releases come well within the category of old favourites. "All of Me," having been popular around 1930, while "I'm Sorry I Made You Cry," dates from an earlier era—*Columbia DB*2330.

Other popular vocalists who appear in recent releases are Dinah Shore singing "They Didn't Believe Me," and "I May Be Wrong, But I Think You're Wonderful" on *Columbia DB*2331, Turner Layton singing "Roses in the Rain" and "Gotta Get Me Somebody to Love" on *Columbia FB*3334, and Leslie A. Hutchinson ("Hutch") singing "Heartaches" and "Danger Ahead" on *H.M.V. BD*1173.

Being a band leader of considerable versatility, Geraldo has established a firm following among light music lovers with his many broadcasts and personal appearances with his concert orchestra. This consists of his usual dance band, plus the addition of a large string section, woodwind, harp and timpani. For some years now a countrywide audience has tuned in approvingly to the programmes that have now become a regular feature of home entertainment, these, of course, being "Dancing Through" and "Tip Top Tunes," among others. Now with the redevelopment of television, the London section of this audience can both hear and see the band, which, as a point of interest, was the first to be "screened" after the war. The latest recording by Geraldo and his Orchestra is "Doin' What Comes Naturally" and "Managua Nicaragua" on *Parlophone F*2239.

Popular Musical Shows

Continuing his series of selections from popular musical shows, Sidney Torch and his Orchestra goes back to the first world war for the music of his latest recording, "Maid of the Mountains." *Parlophone R*3053 contains all the popular tunes from this famous musical.

Oklahoma Vocal Gems, recorded by the original artists appearing in the show at Drury Lane Theatre on *H.M.V. C*3595-6, are among the most tuneful and happily-arranged "vocal gems" that have been issued for a long time. *Oklahoma* is so full of unusually good tunes—four of them have become nationally popular already—that it requires good singers to interpret them. "People Will Say We're in Love," with its extraordinary high note at the end, is no ordinary musical comedy number.

Open to Discussion

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Electronic Musical Instruments

SIR,—I was interested in some of the recent articles on electronic musical instruments. Most of the difficulties mentioned in connection with the reed pick-up system described in your August issue can be overcome by proper screening and remote action.

The Everett Orgatron is no longer made but the Wurlitzer company purchased the patents and have completely re-engineered the instrument. Their method is to mount the reeds vertically and use an electromagnetic pallet valve on the much smaller orifice at the ends of the reed cells. It was found that the full size pallets opening and closing induced microphony in other reeds by virtue of the shock to the air in the main wind chest. For this same reason the suggestion that the reeds should vibrate continuously will not work because of modulation of the air stream and consequent reaction on adjacent reeds.

With careful layout, however, the method can be used for a few reeds if they are not in chromatic order and this arrangement is now being introduced in the Wurlitzer series 20 for the lower 16ft. notes. RC circuits having delay characteristics are necessary to reduce polarising transients.

The complete screening called for is achieved in the U.S.A. in several instruments by hot metal spraying of the interior woodwork and the use of wire gauze on all air channels in the Wurlitzer instruments.

Extensive experiments with frequency modulation have shown that it is very susceptible to mains-borne interference, but work is proceeding with the methods outlined in British Patents 495271, 512943 and U.S. patent 2001708.

Regarding the oscillator shown on page 278 of the July issue, this is used to provide the vibrato frequency in the Baldwin organ. W. E. Kock showed in 1934 that the neon dividing circuit shown on the same page tended to be unstable; however, by using argon-filled thyratrons, a very stable divider chain results.

I would like to point out that these and very many hitherto undisclosed details are described in my forthcoming book on the theory and design of electronic musical instruments, now in the course of production, and would also like to express my appreciation of your foresight in publishing articles of this nature which must help in stimulating design in this much neglected branch of electronics. —ALAN DOUGLAS (Sheffield University).

Pirated Call-sign

SIR,—I have held a transmitting licence in England since 1935 under the call-sign of G5RA, but have not actually worked a transmitter in England since early 1936, returning to Ceylon.

After this period I was advised by several amateurs, who knew I was here and working under VS7RA, that a pirate was working my call-sign. I was home in 1946, but did not start working again, although I renewed my licence which is still in force.

The other day I received some QSL cards from England via, I think, R.S.G.B., amongst them some "G" cards who I was supposed to have worked, so this means that the same pirate is again using my call-sign.

I have written the R.S.G.B. on the subject and asked them to put a notice in the bulletin that, whenever I do come to England and work I will publish the fact.

As matters now stand the pirate station using my call-sign will no doubt not send a QSL card, and consequently I shall have a bad name amongst amateurs who do not know the facts.—R. P. WALKER-ALEXANDER (Ceylon), G5RA and VS7RA (Off the air at present).

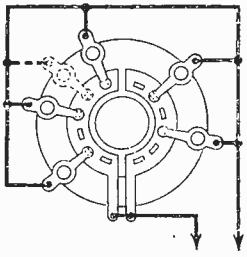
Two-valve Portable

SIR.—I constructed the two-valve portable described in your October, 1946 number, and am pleased to give the following report.

I dispensed with the frame aerial and made a plug-in coil of 65 turns of No. 24, and 40 reaction. With this I can receive the Home and Light programmes and Welsh Regional from Burnley, Lancashire (working loudspeaker on Home Service), and numerous European stations (AF1V Holland, France, etc.) after dark. I wish to point out that in the circuit diagram given no anode loading resistance was included for the detector. I used 10,000Ω with best results.—NORMAN REDHEAD (Grantown-on-Spey).

Remote Control System

SIR.—With reference to my "Remote Control System" article published in the September issue of PRACTICAL WIRELESS, I regret to inform you that a reader in Stoke-on-Trent has pointed out a mistake of mine. It concerns the mains portion of the switch bank, and unfortunately is referred to both in the text and in a diagram.



How to arrange the additional contact (shown by the broken lines above).

When making the system, I adjusted the wafer by ripping out the contacts I did not want and lashing up the remainder. In writing up the circuit, I tried to make it as simple as possible, and overlooked the fact that when the switch, as published, is turned clockwise through five positions, the switch turns off again. However, this is soon put right by inserting another contact point in the position

A" in the accompanying illustration. I [illegible] most readers would see this way out of difficulty.—H. W. J. GUMBRELL (Kent).

Ex-R.A.F. Equipment

SIR,—I have had so many replies to my offer in the September issue that I wonder if you could find a few lines for the following:

I would like to inform all who applied for circuits and information that I am dealing with these in strict rotation, but there have been so many requests up to writing, and I expect there will be more, that it will take me some time to deal with them.—A. JAMES (Bolton).

SIR,—With reference to your correspondent A. W. J. Marsh, of Newport, Isle of Wight, I would suggest that he gets in touch with The Supervisor, Air Publications and Forms Store, Royal Air Force, Kidbrooke, London, S.E.3.

I might add that they supplied me with the complete instruction book for the R1147 Receiver (Acorn valves), and that I have always found them most helpful in supplying circuits, etc.—E. ROUSE (N.W.6).

Peculiar Faults

SIR,—I have experienced a similar phenomenon with an output valve other than the 6V6, the valve being the Mullard Pen. 4VA. The traces of a bluish-green colour appeared near the top of the valve and changed shape as the volume was increased, and were of maximum intensity at maximum volume. When I first noticed the phenomenon I took a reading of the anode voltage and it was above the maximum 250 volts. On decreasing this the glow practically disappeared, and now with the anode voltage at about 210 the glow is only visible in the dark. It was my belief that it was due to stray electrons directed into a stream by two plates at the bottom of the valve. But on examination it was found that these were connected to the anode and consequently at positive potential, and therefore only capable of repelling positive particles, so my theory was rather unfounded. I am still not clear as to the real cause.

Glass always contains sufficient impurity, e.g., lead, to cause it to fluoresce where electrons are directed on to it.—M. CLIFT (Skegness).

SIR,—Recently a T.R.F. receiver was brought to me which had developed a queer fault. This took the form of a peculiar reaction overlap.

When searching for distant stations, the reaction control would be advanced and, short of oscillation, the station tuned in. Then, a minute or two later, the set would burst into oscillation, necessitating the turning of the reaction condenser back a little way. Upon doing so the station would disappear and the setting would have to be advanced to its original position.

At first, ordinary reaction overlap was suspected. This is caused by using a valve of too low an impedance in the detector circuit, too high H.T. voltage to the detector, or a valve with occluded gas in its envelope. Tests soon showed that this was not the case, there being no perceptible overlap at any setting of the tuning control. Yet the set continued to burst into oscillation a minute or so after a station had been tuned in.

Routine tests showed nothing wrong with the components associated with the detector circuit. Finally, in desperation, the detector by-pass condenser of .0003 μF was disconnected and another one of the same value substituted in its place. This cured the trouble immediately. The by-pass condenser, connected between anode and earth, had evidently an intermittent disconnection internally, and when it was "dis" there was naturally more H.F. energy to be fed through the reaction coil—hence the set bursting into oscillation. Though why it waited until a minute or so after a station had been tuned in to "dis" itself is quite beyond me.—WM. NIMMONS (Belfast).

Correspondent Wanted

SIR,—I would like to correspond with any amateur of my age, which is 16, preferably someone from abroad.—D. BARGENY (Station Road, Wincanton, Somerset).

Results on R1116

SIR,—Re correspondence on the performance of ex-Services communication receivers. I have one of the 1116 Rxs, and can quite honestly say it has surpassed my expectations, and am certain no other model has been offered at such a bargain price. When working perfectly, signal-to-noise ratio is very good. I have listed some of the DX "logged and reported."

VE8NW, EL5B., VU2CJ, VU2CD, VU2BQ, VR2AT, ZL2BE, GX, ZL4SO, VR6AA, VE7AJN, VS2BV, KH6CT, OX7B. VS1AN, J2AAZ, XZ2AB, OQ5BW, ZC6DD, YN1HT, ZD4AC, YS3PL, (Naval Air Station, Marianas). VK1 to 6. America 1 to 7 (W6 working portable), besides numerous others, which is a creditable performance. Aerial in use, 40ft. single wire. I have found that patience is the vital factor when logging DX signals, but it is worth it.

This report is solely connected with ex-Service receivers and not in any way to bias anybody's views on the home-built 0-v-2, of which I have one.—S. A. RICKETTS (Yeovil).

Ex-Service Equipment

THE co-operation of readers is sought in helping others out of difficulties regarding items of surplus gear as follows:

P. Silver, of 269, Lady Margaret Road, Southall, Middlesex, requires the base connections of a 2¾in. ex-Army C.R.T., reference ACR10.

S. J. Dallman, of 2, Oak Avenue, Hornsey, London, N.8, wishes to know where he can obtain an ECL11.

J. S. Marshall, of 28, Fairmead Avenue, Westcliff-on-Sea, Essex, requires details of the power supply, base connections, etc., of an A.M. Indicator Unit, type 184A, Ref. 10B/6181, with two C.R.T.s, VCR139A and 517B. The two tubes are Cossor, but the makers are unable to supply the details.

L. S. Irwin, of 31, Arthur Street, Ryecroft, Rotherham, Yorks, wishes to build a 'scope using the VT97 tube. Can anyone supply data of this, and a suitable ex-Service unit to go with it?

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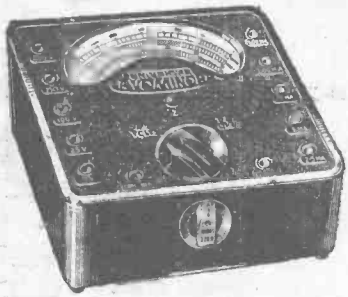

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0—500 "	

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