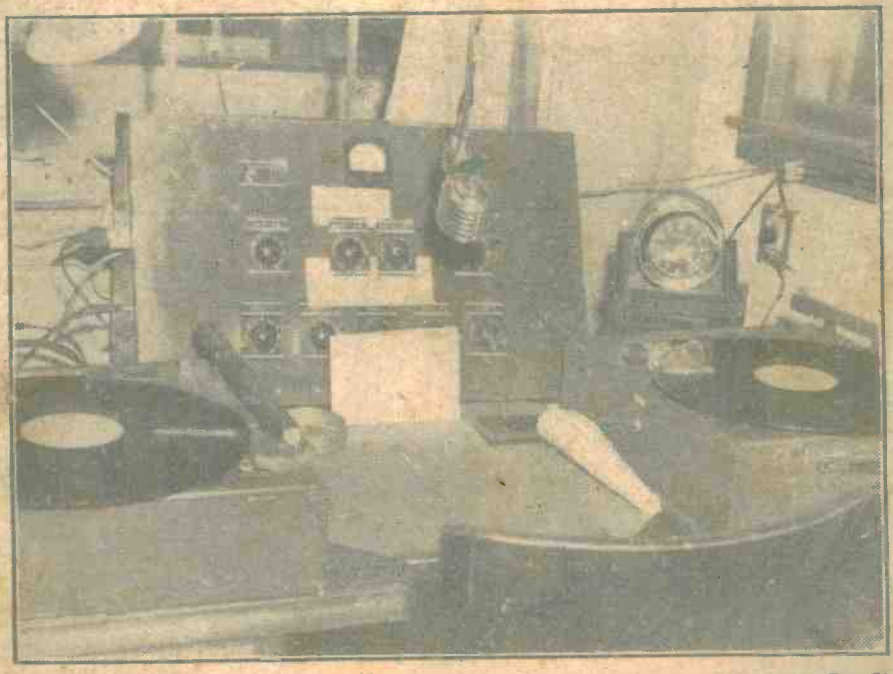
PUSH-PULL PHASE SPLITTING

Practical Wireless

Vol. 24 - No. 499. || Editor: F. J. CAMM || FEBRUARY, 1948



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PRINCIPAL CONTENTS

Post your DENCO orders to

VALLANCE'S

[illegible] ensure prompt supply [illegible] following Denco lines. All [illegible] available ex stock.

CHOKES
[illegible] 1.60 mc[illegible], 3 1. [illegible] up, 1 8.

COIL FORMERS
Horizontal 6 pin P[illegible] 3 4.
Horizontal 4 pin Polystrene 2 3.
Vertical 4 pin Polystrene, 2 3. [illegible]

COIL HOLDERS
Horizontal 6 pin Pol[illegible] 1 9.

COILS
The following colour code identifies the coil
Blue—R.F. Grid Coil, with Aerial Coupling.
Yellow—Detector or Mixer Grid Coil [illegible] anode coupling.
Green—Detector with [illegible] windings.
Red—Superhet Oscillator [illegible] I.F.

Range 1.	17 .6 mc/s.	Range [illegible]	[illegible]
2.	[illegible]	6.	30-60
3.	1.6 5.7	7.	50 90
4.	4.4-15.0	8.	72 1[illegible]

Ranges 1 5 tuned 300pf. variable.
Ranges 6 8 tuned [illegible]0pf. variable.
[illegible] in chassis or plug in types.
Plug in types [illegible] range 5, **4/2** each except green, **5/-** each.
range 6 to 8 **3 10** each except green, **4 8** each
Chassis type to range 5, **3 10** each except green, **4 8** each
range 6 to 8, **3 7** each, except green **4 5** [illegible]

DENFIX VARNISH
1oz. **1 1.** 2oz., **2 -.**

[illegible]LATORS, POLYSTRENE
[illegible] 1, [illegible] **1 4'.**
FT1 2, feed through type, **1 3.**

STAND-OFF TYPES
SO1 2, **11d.**, 2in.
SO1 3, **1 0½d.**, 3in.
SO1 1, **1 3**, 1in.

LOW LOSS VARIABLE CONDENSERS.
Type V.C.R. Polystrene Insulation
V.C.R.15, **6 11**, 15 pf.
V.C.R.25, **7 4**, 25 pf.
V.C.R.50, **7 11**, 50 pf.
V.C.R.100, **8 6**, 100 pf.

COIL TURRET, TYPE C.T.1
[illegible] wavebands, I.F., 1.6 mc/s. 5.0-11.75 mc/s.
.15-.17 mc/s. 11.5-27.0 mc/s.
.55-1.5 mc/s.
Position 5 on Coil Turret grounds Mixer Signal Grid when receiver is used for gramophone reproduction.
A twin gang 300pf variable is mounted on the turret; the whole makes a very efficient R.F. Tuner Unit. Price, **60 6.**
Blueprints of circuit are available. Price, **1 6** each.

COIL TURRET, TYPE C.T.2
This turret is identical in appearance and dimension [illegible] C.T.1, but has an I.F. of [illegible] kc/s.
Actual bands covered :—
1. 150-350 kc/s.
2. 520-1,700 kc/s.
3. 5-12.5 mc/s.
4. 12.5-30 mc/s. Price, **60 -.** Circuit, **1 6.**

COIL TURRET C.T.3
6 band R.F. Unit, with a 3-gang mounted on the Turret [illegible] pf. each section. Gang is rocked to provide band spread.
Bands covered are :—
1. .15-.7 mc/s, 2,000-429 metres.
2. .55-1.5 mc/s, 545-200 metres
3. 1.75-5.1 mc/s, 171-58 metres.
4. 5.1-11.5 mc/s, 58-26 metres.
5. 11.5-24.5 mc/s, 26-12 metres.
6. 24-42 mc/s, 12.7 metres.

Complete with calibrated dial. Band switch colour coded to correspond with dial markings. Knobs, drive assembly, etc. Price, **£6 10 0.**

OTHER LINES AVAILABLE FROM STOCK

SILVER MICA CONDENSERS —1 per cent
5-10 15pf., **11d.** 110-200-250pf., **1 3.**
20-25-30pf., **1 -.** 300-316-340pf., **1 5.**
[illegible]0-100pf. **1 2.**

SILVER MICA CONDENSERS 5 per cent.
5-10-15 30-50-100pf **1 10.**

MOVING COIL METERS
0-50 microamps. Round, flush mounting, 3½in. dia. Resistance 1 200 ohms., **60 -.**
0 1ma., 3½in. dia., flush mounting, **45 -.**
0-30ma., 2in. dia., flush mounting, **26 3.**
0-50 volt., 2in., flush mounting, **18 9.**
0-10 amp., 2½in. square, black scale with white [illegible] calibration. [illegible] **14 -.**
0 20 amp., 2in. dia., [illegible] with external shunt, **18 9.**

SPECIAL OFFER.—Everett-Edgcumbe moving coil meter 6in. scale, calibrated 0-150 [illegible], full scale deflection 0-1ma., in black bakelite case, size 7in. x 7in. x 2½in. This meter has a magnificent movement and is worth double the price. Provides an ideal [illegible] for a multi range meter 1000 ohms per volt. **PRICE £6.**

Welwyn Cracked Carbon Pr[illegible] type resistors.
1% Resistor 1 watt, **1 5** each.
900, 4.000, [illegible]1.000, 10,000, 90 000, 100,000, 240 000, 499,000.

We despatch goods wherever possible the day we receive your order. These are securely packed against damage, and can be sent C.W.O. or C.O.D., whichever suits you better. When sending C.W.O. please include sufficient for packing and postage.

VALLANCE & DAVISON, LTD.
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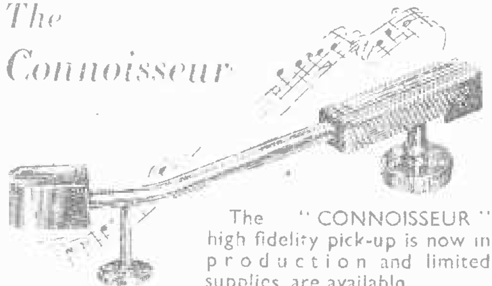
Staff Call Signs :—G2HHV—G8SX—G3ABD—G3AHV—G8BDD

The Connoisseur



The "CONNOISSEUR" high fidelity pick-up is now in production and limited supplies are available.

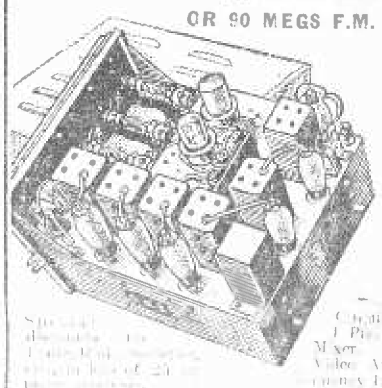
Faithful reproduction of all recordings from 12,000 C.P.S. to 30 C.P.S.

- New type damping material working in gap direct on to armature does not affect bass resonance point.
- The required downward pressure is 1½ ozs. which has been achieved without counter-balancing or springs.
- Being a constant velocity device, Bass compensation is required in the amplifier and alternation of high frequencies to suit individual recordings.
- Output direct from pick-up ... .1 volt
  With transformer coupled ... .5 volt

Apply to :—Albion Electric Stores, 125, Albion Street, Leeds, 1, or to Lawton Brothers (Sales), Ltd., Henry Square, Ashton-under-Lyne.

Made by :
A. R. SUGDEN & CO. (ENGINEERS) LTD.
BRIGHOUSE, YORKS.

Ex M.O.S. Radio BARGAIN
IDEAL FOR CONVERSION INTO A
TELEVISION RECEIVER
OR 90 MEGS F.M. RECEIVER



7 GNS
[C]arriage Paid
Cash with Order
10 VALVE
1½ METRE
SUPERHET
complete with schematic circuit diagram

[illegible]

External [illegible] L.T. and H.T. supply is required [illegible] Complete with 10 Mazda valves.

WIRELESS INSTRUMENTS [illegible]
54-56, The Headrow, Leeds, [illegible]

Practical Wireless and PRACTICAL TELEVISION
16th YEAR OF ISSUE
EVERY MONTH
VOL. XXIV. No. 499. FEBRUARY, 1948
Editor F. J. CAMM

COMMENTS OF THE MONTH — BY THE EDITOR

A Recording Development

IN a paper on the Development of Sound Recording and Production Sir Ernest Fisk dealt with transient pulses for the attainment of the highest standard of fidelity. He explained how the frequency distribution of these irregular non-repeating wave-forms determines the tonal character of a particular sound.

These transient pulses are known to extend well up to the top limit of human hearing and even into the supersonic range. He stated that for the first time in the history of sound science frequencies of up to 20,000 cycles per second were now being recorded on gramophone records. This development will have an important bearing on the future of television recording.

This important development in the science of sound recording and reproduction means that every note and every tonal characteristic detectable by the human ear in an original performance can now be heard with equal fidelity off a gramophone record.

The upper frequency response limit of the human ear is a factor which varies enormously with the individual and according to age. Few people can detect frequencies above 15,000 cycles per second.

He made an important statement concerning the accusations sometimes made that the gramophone industry is holding back development of sound recording methods on film and tape, etc., in order to protect their investment in the disc manufacturing business. He revealed that the biggest companies here and in America are spending large sums in research and development in connection with these new systems, and although he thought that for certain purposes they would become universally employed he did not think they would ever take the place of the disc record, having regard to the ease with which the latter could be mass-produced. On this point we disagree with him.

A gramophone using a photo-electric cell and a strip of celluloid containing a sound track was shown at one of the exhibitions some years ago. It was very successful scientifically speaking, and a few of them were sold to the public. The company was, however, bought out, and the invention "killed."

There were no needles or winding of motors. Several hours performance could be recorded on a coil of celluloid occupying no more space than a 12in. record. Excellent though the disc method is and although we agree that it will not entirely vanish, we feel that it is going too far to say that nothing will ever replace it.

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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.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Poor Inspection

A COLLEAGUE of ours who owns a commercial portable receiver recently found it necessary to replace the mains transformer, which had burnt out. He sent to the manufacturers for a replacement, correctly quoting the type number. With commendable celerity the new transformer arrived. Although it was marked "passed and checked" it had been wrongly connected, and had our friend not possessed technical knowledge its installation in the receiver would have caused considerable damage.

Many factories adopt what is known as "batch inspection"—that is to say, only one component out of a hundred is submitted for test. This may be good enough in the case of certain components, such as mechanical parts, but certainly is not good enough for valves, transformers or condensers. The standard of inspection in the radio industry could usefully be raised. There are many complaints.

Broadcasting in Schools

IN a letter sent to local Education Authorities in England by the School Broadcasting Council for the United Kingdom it is stated that the biggest weakness in the school broadcasting service is the quality of the reception in the schools.

The object of the letter is to improve the quality of the reception, for the use of school broadcasting can be fully justified only when its reception is natural and undistorted and can be heard by the whole class without strain. Good reception in schools depends on awareness of the special problems of school reception, the choice of suitable apparatus, the method of installing the apparatus and efficient maintenance.

The method of installing apparatus is as important as its selection. The Council have, therefore, arranged to give demonstrations.—F.J.C.

ROUND THE WORLD OF WIRELESS

Blood Donors

AN appeal for blood donors after the Southern Railway accident at South Croydon recently met with an immediate response from the Mullard Radio Valve Co., Ltd., of Mitcham, Surrey. It occasioned a letter of thanks from Dr. Murphy himself, the director of the National Blood Transfusion Service.

In it he said: "I should be very grateful if you would convey to each donor who came forward on Saturday my thanks for their donation of blood and, in the case of some, for bringing new potential donors along with them."

Radio Telephones Move

THE radio telephone services, which used to be operated from the International Exchange at Faraday Building, were recently transferred to the Wood Street Building, E.C.1.

Since the end of the war the traffic from this country to the Continent of Europe has increased to such an extent that it has become necessary to transfer out of Faraday Building, Queen Victoria Street, the radio telephone service to the Empire, the United States of America and South America.

Radio for Fishermen

ANGLERS fishing off Long Island, New York, report their catches to each other across the bays and inlets.

If there are any *hungry* fish in the place their location is reported on the new two-way communication units and everybody catches more. All this takes place on the 2,100 to 2,738 k/c band.

Radio Taxi Service

LONDON'S first radio-taxi system, providing two-way communication between driver and a booking office recently came into operation. It is estimated that by being able to call and re-direct a cab 50 per cent. "dead mileage" petrol will be saved. There are 12 cabs belong to Cosycars, of Streatham, and preliminary reports show that the scheme works very well up to a range of 15 miles.

Radiced Royal Wedding Pictures

THE largest volume of traffic in the 21 years' history of phototelegraphy was stimulated by world interest in the Royal Wedding on November 20th. During the 32 hours between 4 p.m. on November 19th and midnight, November 20th–21st, Cable & Wireless, Ltd., who trebled the staff of their facsimile room at Electra House for the occasion, received 271 photographs from overseas press correspondents in London. Fifteen of these were cancelled after transmission—49 before transmission—to make way for better pictures filed later. In all, Cable & Wireless transmitted 222 pictures to 15 countries: 77 went to New York, 73 to Australasia, 33 to Capetown, 12 to Stockholm, eight to Buenos Aires, and smaller numbers to Bombay, Bermuda (the latter inaugurating the new London-Bermuda service), Cairo, Colombo, Malta, Montreal, Rome and Vienna. Wedding pictures received via Colombo were the first phototelegrams ever received in Wellington, New Zealand.

Lecture on "Industrial Radiology"

RECENTLY, Mr. R. H. Cooke, M.S.R., of the Industrial X-Ray Dept., Philips Electrical, Ltd., gave a lecture to members of the Institute of Electronics on "Industrial Radiology." The lecture, held in the rooms of the Royal Society of Arts, was illustrated by slides and surveyed the uses of X-rays in industry and their various applications.

Mr. Cooke began his address by discussing the historical aspect of the discovery of X-rays. He then proceeded to trace the origin and propagation of these rays and the consequent development of the X-ray tube. Next, he dealt with the various types of industrial X-ray apparatus in use at the moment, at the same time giving a full description of the many factors involved in industrial radiology, such as the processing of the X-ray film.

In conclusion, Mr. Cooke gave some interesting examples of how X-rays are being utilised by an ever-increasing number of industries.

Col. Sir Stanley Angwin, K.B.E., making the opening speech at the Amateur Radio Exhibition. Also in the picture are S. K. Lewer, President of the R.S.G.B., John Claricoats, and H. Freeman, Exhibition Organiser.

The Radio Industries Club

FOLLOWING the success of the Radio Industries Ball, held at the Royal Albert Hall on October 3rd, the committee of the Radio Industries Club at their last meeting decided that a Radio Industries Ball should be made an annual event to be held under the auspices of the club, the date and place to be varied according to circumstances.

At the radio-taxi booking office, in Streatham, London. Cars can be called and re-routed without returning to their H.Q.

20 Years on Radio

DONALD PEERS, well known to radio listeners and theatre audiences in London and the provinces as the cavalier of songs, celebrated 20 years of broadcasting when he sang in Music Hall on December 20th. His rich baritone voice was first heard by cat's whisker fiddlers in 1927, when he broadcast from 2LO on December 17th of that year. Since then his signature tune, "By a shady nook, by a babbling brook," has become a national ballad.

For the future, Donald Peers, whose name sold over half a million gramophone records in 12 months, has made it his policy to sing "particularly pleasing" songs. By that he means songs to suit family audiences and numbers easily understood. It is for this type of singing that he has already earned a well-deserved reputation.

Broadcast Receiving Licences

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

Region	*Number*
London Postal	2,062,000
Home Counties	1,443,000
Midland	1,563,000
North Eastern	1,696,000
North Western	1,444,000
South Western	948,000
Welsh and Border	624,000
Total England and Wales ..	9,780,000
Scotland	1,048,000
Northern Ireland	170,000
Grand Total	10,998,000

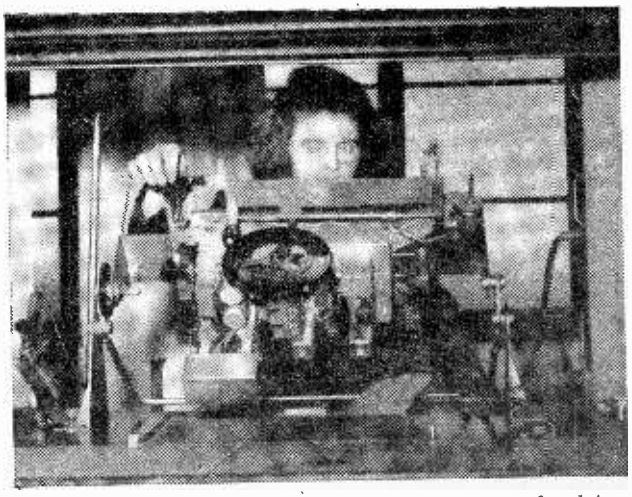
The above total includes 27,850 television licences—an increase of 2,800 over the previous month.

In spite of the steady increase in the number of licences, the Post Office is constantly detecting unlicensed sets, and during October, 1947, there were 626 prosecutions.

The requirement that each separate family or household using wireless apparatus in a house, part of a house or flat should have a licence applies not only to those who have bought their own sets, but also to those using sets which are rented or hired.

Australian Amateur F.M.

AMATEURS in Australia have been granted permission to employ frequency modulation for transmissions between 27.185 and 27.455 Mc/s, on 50 Mc/s and above. Pulse transmission is permitted on, and above, 166 Mc/s.



"Kongress" Radio receivers are now being mass produced in Czechoslovakia. Note the chassis cradle for easy handling.

Novel Battery Circuits—1

How Economies May be Effected Without Sacrificing Efficiency. By C. SUMMERFORD

THE experimenter who, because of location or for other reasons, has to derive the power supply for his receivers from batteries is at a great disadvantage as compared with the more fortunate mains user, and because of this is always ready to consider using circuits which could be called battery savers, provided this latter is not achieved at the expense of efficiency.

An unfortunate use of the word "freak" in describing circuits which are somewhat out of the ordinary tends to give the impression that such circuits are tricky, unstable or generally inefficient, and, although there may have been some justification for this belief with the older types of circuit, nowadays, with modern valves and components, these uncommon circuits can be made to give excellent results. In this article, therefore, it is hoped to show just how efficient these "freak" circuits can be with proper design and, although the four circuits shown are "paper" designs only and are intended as a basis for further experiments, there is little likelihood of trouble being experienced by constructors who build receivers around any of these circuits.

The increasing popularity of all-dry receivers has led valve manufacturers to devote considerable time and energy to the design of efficient and economic 1.4-volt valves. One such valve, the American 1D8GT, is a good example of what has so far been accomplished. This particular valve is one of the three-in-one type having the functions of diode, triode and output pentode and takes a filament current of 100 milliamps, with a total H.T. consumption of about 6.5 milliamps at 90 volts.

One-valve Reflex

By disregarding the diode section and using the triode and pentode sections only we can design a most efficient one-valve reflex receiver, as shown in Fig. 1. Apart from the use of a single valve instead of the more usual two, the circuit follows normal reflex practice. However, for the sake of those who are not conversant with this type of circuit we will briefly trace the signal through the whole receiver.

R.F. signals are applied to the grid of the pentode section (which acts as an R.F. amplifier of slightly lower efficiency than would be the case were a normal R.F. valve used) and after amplification are taken from the pentode anode circuit and transferred by choke-capacity coupling to the grid circuit of the triode section, which is used as a grid-leak detector.

So far the circuit has followed normal practice, but now comes the more unusual part. Instead of using a further valve for amplifying the rectified signals appearing at the detector anode, use is made of the pentode section again for carrying out

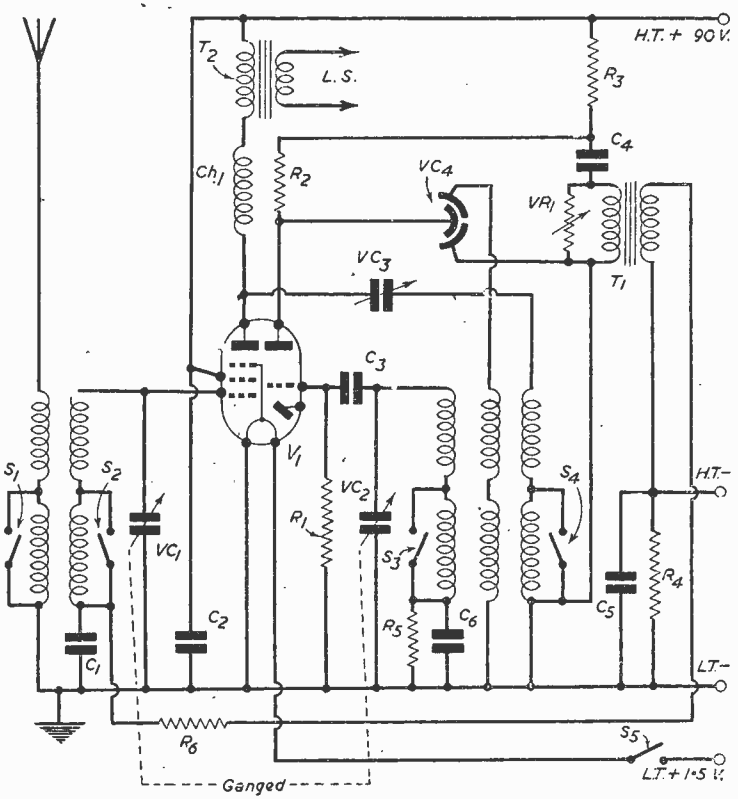


Fig. 1.—An efficient one-valve reflex receiver.

SUGGESTED COMPONENTS Fig. 1.

V1—American 1D8GT.	R1—1 meg., ½ watt.
C1, C6—.003 μF.	R2—20,000 ohms, ½ watt.
C2,C4—.1 μF.	R3, R6—50,000 ohms, ½ watt.
C3—.0002 μF.	R4—850 ohms, ½ watt.
C5—10 μF. elec.	R5—5,000 ohms, ½ watt.
VC1, VC2—.0005 two-gang.	VR1—50,000 ohms. potentiometer.
VC3—.0005 preset.	T1—1 : 4 parafeed transformer.
VC4—.0003 diff.	T2—To suit speaker.

this function. Thus we have the pentode section of the valve being used as R.F. amplifier *and* output valve, with the triode section as detector. Coupling between detector and output stage is by parafeed transformer, the normal grid connection of the transformer being taken to the junction of the aerial tuning coil and isolating condenser. As this condenser is virtually in shunt with the secondary of T1 it should not be larger than about .003 μF. or reproduction will be rather lacking in top response.

However, the actual capacity is rather dependent on personal taste—and on the type of loudspeaker used—and if different values are tried until the desired response is obtained no filter will be needed across the primary of the output transformer. Actually, the figure given above is about the right capacity in most cases. C6, which is used in conjunction with R5, is inserted to maintain reasonably accurate ganging and should be of the same capacity as C1.

Working under maximum conditions, i.e., with 90 volts H.T. on anode and screen, the pentode A.F. amplifier gives an output of approximately 200 milliwatts.

By inserting a resistor (R4) in the H.T. negative circuit automatic bias is provided for the pentode section. R4 should be shunted with an electrolytic of not less than 10 μF. in order to prevent negative feedback taking place at audio frequencies.

Additional L.F. Stage

A similar circuit is shown in the diagram of Fig. 2, but with the addition of a triode A.F. amplifier between detector and output.

Suitable valves for this extra stage are the American 1E4G or 1E4. As, however, neither of these valves is very easily acquired at the moment, it is suggested that a 1H5G is used instead. This valve is really a diode triode, the triode portion of which is of much higher impedance than the above-mentioned types. Notwithstanding this, no trouble should be experienced, provided the anode circuit is adequately decoupled.

The stage may discriminate somewhat in favour of the higher audio frequencies, due partly to the

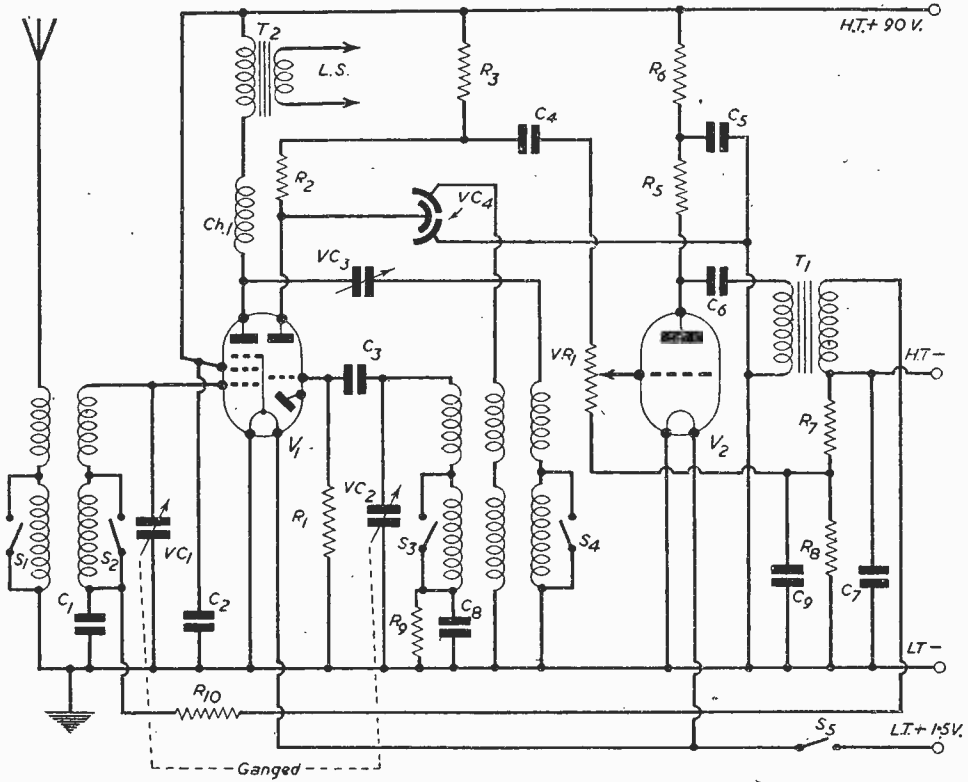


Fig. 2.—The arrangement of Fig. 1 with an additional stage and auto-bias.

ADDITIONAL COMPONENTS REQUIRED Fig. 2

VR1—.5 meg. potentiometer.

V2 1E4:
- R5—50,000 ohms, ½ watt.
- R6—20,000 ohms, ½ watt.
- R7—350 ohms, ½ watt.
- R8—400 ohms, ½ watt.

V2 1H5G:
- R5—100,000 ohms, ½ watt.
- R6—50,000 ohms, ½ watt.
- R7 plus R8—800 ohms, ½ watt.

C4—.01 μF.
C5—2 μF.
C—10 μF elec.

high valve impedance and partly to the high value anode load resistor used. Correct balance can, however, be restored by increasing the capacity of C1. It should be borne in mind that an increase in the capacity of C1 also entails a similar increase in the capacity of C8, otherwise accurate ganging will not be obtained. The remainder of the circuit is self explanatory.

Three-valve Superhet

Use is made yet again of the 1D8GT in the circuit shown in Fig. 3, but this time in a more normal manner, i.e., as detector, A.V.C. and output valve. The one other valve used in this circuit is a Cossor 1A7VG frequency changer.

In a recent article it was shown how the normal I.F. valve in a superhet receiver could be dispensed with by using a regenerative leaky grid detector in place of the more usual diode. As the saving both in initial expense and in H.T. and L.T. consumption is fairly considerable, use has again been made of this system here.

Taking the circuit in more detail: From the aerial to the anode of the frequency changer normal superhet practice is followed, but in place of the usual two winding I.F. transformer coupling the frequency changer to the following stage is a three winding type such as the Bulgin C51. By using the third winding as an ordinary reaction coil and controlling regeneration with a variable condenser of .0005 μF. an enormous increase in I.F. gain may be obtained—so much so that the absence of the normal I.F. amplifier is not noticed.

A condenser of .0003 μF. is connected between the detector anode and diode to provide an I.F. signal at the diode anode for A.V.C. purposes. A.V.C. is of the simple undelayed variety and is applied to the input grid of the frequency changer via the tuned circuit. The controlling of one valve only by A.V.C. is hardly adequate, however, but by returning the earthy end of the detector grid leak to the A.V.C. line we can obtain not only excellent A.V.C. but automatic selectivity also.

(To be continued.)

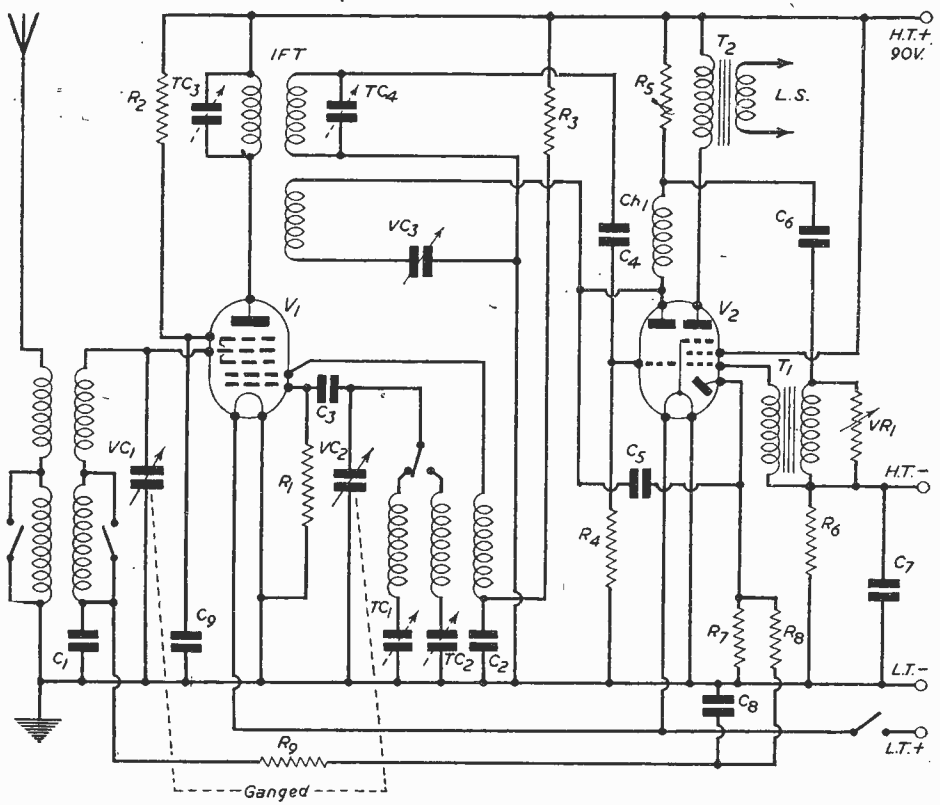


Fig. 3.—A superhet circuit with only two valves.

COMPONENTS REQUIRED

V1—Cossor 1A7VG.
V2—American 1D8GT.
VC1, VC2—.0005 two-gang.
VC3—.0005 mica diel. variabie.
TC1, TC2—M. and L.W. padders.
C1, C8—.05 μF.
C2, C3, C6—.1 μF.
C4, C5—.0002 μF.
C7—10 μF electrolytic.
IFT—Bulgin C51.
T1—1 : 4 parafeed transformer
T2—To suit speaker.
R1—100,000 ohms.
R2—40,000 ohms.
R3—5,000 ohms.
R4—½ meg.
R5—75,000 ohms.
R6—550 ohms.
R7—1 meg.
R8—½ meg.
R9—1 meg.
All resistors ½ watt type.

Practical Television Construction—2

Planning the Layout, and Designing the Power Pack are Dealt With This Month

By W. J. DELANEY (G2FMY)

LAST month we dealt with the main features of a modern television receiver, and we now come to the most important part, namely, the question of layout and construction. The modern broadcast receiver is generally built on a single chassis, but quite a number of manufacturers adopt a scheme much favoured by home constructors, namely, the separate construction of receiver and amplifier. In many cases, it is found that it is even worth while also to separate the mains unit, as not only does this facilitate modifications in design from time to time, but also enables one to carry out servicing tests much more easily. It has been shown that the television receiver is a complicated piece of apparatus, and therefore when we come to the question of design, we must bear in mind the facts already covered. There are two time bases to be lined up, a receiver to be adjusted for the satisfactory reception of the vision signal, and one for the sound, as well as the power supplies. There is thus every incentive for the complete receiver to be built as a series of separate units and, in fact, this is the principle which is adopted in many of the better class of commercial receivers. The only drawback from the amateur point of view is that the actual constructional work seems more tedious and there is some risk of trouble when it comes to connecting up the separate units.

Five Units

Experiment has shown that the most satisfactory scheme for the home constructor is a five unit combination, the two receivers being made up as one unit, the two time bases separated and the remaining two units consisting of the actual tube assembly and the power pack. It might be argued that if the two receivers are combined, why could not the two time bases be similarly combined. The answer to this is that to economise on valves, and also to simplify operation it is desirable to build the receiver so that the early valves operate both on sound and vision frequencies. Thus, to avoid long leads carrying H.F., it is desirable to have the sound receiver input close to the H.F. stage(s) which is carrying both frequencies, and the screening of two radio units is not a difficult matter. On the other hand, any leakage of energy in the time bases may result in difficulty in obtaining a steady picture, as nothing is worse than line frequencies leaking into the frame scanner. The synch. stage or stages can be combined in one of the time bases, or may follow on the vision radio chassis, and this is not difficult to arrange.

H.T. Supply

On the power pack side there are one or two points to receive attention. The E.H.T. winding *may* be carried on the main transformer, but this will necessitate the purchase of a specially wound component. On the other hand, a single E.H.T. transformer is not a very expensive item, and then standard mains transformers may be used for the rest of the unit. If hard valve time bases are employed some difficulty may be experienced in feeding the heaters, but simple chokes may be included in the heater circuit after tests if found desirable.

The amplifier associated with the time bases may include a large type of power valve requiring up to 450 volts H.T., and in view of the heavy H.T. current drain it may be found necessary to use two rectifying valves in parallel. It is the writer's opinion after tests that if one has to purchase two rectifiers it is better to make the H.T. unit in two sections, one delivering, say, 300 or 350 volts for the circuits calling for a working voltage of 250 volts (allowing for the voltage drop through decoupling circuits), and one delivering a higher voltage for the P.A.s. In this way the current called for may be split up amongst the two valves, and better voltage regulation is obtained and certain risks of interaction are avoided. If the separate mains transformers also carry low-voltage heater windings then the L.T. supplies may also be split up and this will be found an advantage in some circuits.

Final Layout

Having decided that the final receiver will consist of five units, the only question that arises is how they should be disposed in the final design. Certain panel controls must be provided, and the C.R. tube assembly must be arranged more or less as a centre piece. There are controls on the time bases and also on the radio receivers. But some of these may be treated as "pre-set" controls and may quite conveniently be tucked away as they will not be needed once the receiver has been set up. Opinion differs as to just what should be called a "panel control." If a good strong signal is received (and the receiver and aerial system may be so chosen and designed that a suitable signal is received), then there should be no need to want to touch any of the time base controls after the initial setting up. Picture width and height, and the "hold" controls should stay put if the design is good, and that leaves only radio controls to consider, plus the necessary tube control. To safeguard the tube, and to get the best picture result, the control of bias on the tube must be a panel control. This is generally labelled "Brilliance" and should be combined with the on/off switch so that when switching off the picture is blacked out first. Similarly, when switching on the control should be turned up only after a [illegible] has been allowed for all valves to attain the working temperature. Again, control [illegible] fitted for the vision and sound [illegible] it is usually found that once the

set up in a certain position there is very little variation in strength except on the edges of the reception area, and thus a vision or "volume control" is not a necessity. On the sound side it is desirable to turn down the volume on certain items and turn it up on others, so that a sound control is also desirable on the panel. One other control is found desirable on the panel and that is a focus control. Rising temperatures in the equipment do vary the focus and it is found that during a programme it may be necessary to adjust this, so that leaves three panel controls, or four on the fringes of the reception area.

Suitable Sockets

Each unit should be terminated in a multi-socket or with flexes fitted with a plug, and the unit which follows it should be so wired that the two may be joined easily, without the risk of connecting the wrong units together. The Belling-Lee multiple plugs are ideal for the purpose. The sizes of the units should be such that they fit round one another, and as the output from the V.F. amplifier to the tube must be short, the "end" of the vision receiver should obviously be near the C.R. tube base. This means that the input or aerial connector must be at the opposite end, and this calls for the unit (in view of its overall size) to run the depth of the complete receiver, lying by the side of the tube. The sound receiver can lie along the front of the C.R. tube chassis, tucked behind the tube front, and the time bases can then run along the other side of the complete assembly, with a multiple connector at the rear, joined to the tube holder.

Flying Relay Stations

INTERNATIONAL air liners have formed their own chain of flying radio relay stations across the North Atlantic for an experimental period of six months, under plans drafted by a technical working group of the International Air Transport Association (I.A.T.A.).

The relay system operates on a V.H.F. radio band during periods when normal H.F. transmission is interrupted by magnetic disturbances. It is expected to help increase regularity of service over one of the most important world air routes.

Plans for the V.H.F. relay were completed by the North Atlantic Communications Working Group of the I.A.T.A. Technical Committee, made up of airline experts, which has been studying improvement in the high standard of communications service on the North Atlantic in the light of the last year's experience.

Under normal conditions, the range of H.F. transmission is great enough to enable planes to transmit their regular hourly weather and position reports and other operational messages directly to ground stations on either side of the Atlantic. The range of V.H.F. transmission is much shorter, but the relay plan will enable aircraft to pass messages on from one to another until they come within range of a ground station.

Beginning at one minute after midnight on December 15th, crew members of scheduled air liners over the North Atlantic started to maintain a constant watch on V.H.F. bands to intercept messages and pass them on during periods of H.F. blackout, and to notify each other of any changes in frequency plan.

The world airline organisation ... normally enough I.A.T.A. air over the ocean at any ... complete relay chain. If ... ships stationed on the North ... fill in.

... International Civil Aviation ... provisions for serving the ... ss the North Atlantic, the I.A.T.A. group suggested the following alterations to arrangements drafted at the I.C.A.O. Dublin conference in April, 1946:

Rearrangement of frequencies so that ground stations need not handle more than eight communications channels at one time.

Transfer of weather reports to other than route frequencies in order to reduce the load on present circuits.

Broadcast of weather reports by major terminals to include reports of alternate airports as well, in order to keep to a minimum the number of stations on the air at any one time.

In order to relieve an overload on channels now used for the so-called "middle route" from North America to Europe via Shannon, Eire, the I.A.T.A. airlines have informally agreed among themselves to a distribution of the groups of frequencies each will use for normal operational messages.

Consol Beacons

I.C.A.O. was strongly urged to expedite the building of Consol radar beacons in Norway, Northern Ireland, Iceland, the Azores, Newfoundland and Bermuda, particularly because the existing North Eastern chain of Loran beacons, an alternative radio device, may have to close in 1949 when radio channels may no longer be available to them. Use of Consol was agreed upon by governments taking part in the Dublin meeting.

The I.A.T.A. group's arrangements will affect North Atlantic operations of the following I.A.T.A. member airlines: Aerlinte Eireann (Eire), Air France, American Overseas Airlines, British Overseas Airways, K.L.M. Royal Dutch Airlines, Pan-American World Airways, Sabena (Belgium), Scandinavian Airlines System, Swissair, Trans-Canada Air Lines, and Trans-World Airline (U.S.).

The working group is headed by W. A. Schrader, of A.O.A., while its secretary is Stanislav Krejcik, assistant secretary of the I.A.T.A. Technical Committee. Its meetings here were attended by several observers for I.C.A.O.

ON YOUR WAVELENGTH

By THERMION

F. J. C. at I.P.R.E. Annual Dinner

THE first annual dinner of the Institute of Practical Radio Engineers was held at the Connaught Rooms in October. But for pressure of space and early press days I would have recorded this notable event before, because I feel that this Institute is a live body of great value to the industry and a forum for those of kindred radio interests having the necessary qualifications to meet and to disseminate their knowledge and experience. It is a radio parliament and a pool of knowledge.

In his opening remarks, the then president-elect, Mr. J. F. Tomlin, stated that one of the primary aims of the Institute was to raise the standard and status of service engineers. Their efforts have met with considerable success.

Mr. F. J. Camm, in proposing the toast of the Institute, said that a body with 800 members and 900 students was already a force with which to reckon. He expressed the hope that the high standards already set would be maintained, and that membership of the Institute would continue to be recognised as a hall-mark of knowledge and integrity.

The question of apprenticeships was a matter to which the Institute might give consideration. The guests included: Dr. L. E. C. Hughes, A.C.G.I., D.I.C., B.Sc., Ph.D., A.M.I.E.E., and Mr. H. A. Curtis, F.C.I.S., Secretary of the R.T.R.A. Mr. Curtis said that the I.P.R.E. was fulfilling a function the importance and value of which was fully recognised by his Association.

Mrs. B. A. Smye-Rumsby, A.I.P.R.E., at present the only lady member of the Institute, made a plea for more women service engineers, quoting the wartime activities of women in the Services as justification.

The occasion was marked by the election of Mr. F. J. Camm to an honorary fellowship of the Institute in recognition of his long and valuable services to the industry.

I can certainly recommend all readers with the necessary qualifications to join this Institute which daily gains in prestige and membership.

A Note for the Malady Maker

THE *Musical Express* has for a long time been criticising another musical journal whose policy I facetiously labelled as Malady Making. In these days of paper shortage I should have thought the malady maker could have devoted some of its space to answering these well-directed criticisms. Instead, they devoted a leading article to yours truly, criticising and, of course, disagreeing with my criticisms of clap-trap drummers, jazz, and crooning generally. You will remember that I replied to this criticism, since when the malady-maker has remained as silent as it did over the *Musical Express*. The managing editor of this latter journal wrote to thank me for my comments.

A Ballad Singer

I was interested to see that Josef Locke, since his debut with Columbia in August, has become one of the most popular singers in the lists. There is something in the way he puts a song over that has caught the imagination of listeners: the secret is indefinable, but certainly two cardinal ingredients must be a really fine voice plus a lively microphone personality. Ballad is Locke's speciality, though he has had experience in other branches, notably opera. His public will find him this month among the Victorians. The combination "Weatherly-Adams" means fine examples of those songs, some sacred, which delighted the drawing-rooms of the end of the last century. F. E. Weatherly, Oxford tutor, Bristol lawyer, and highly popular author of many lyrics, and Stephen Adams, prolific composer of ballads, have produced two very charming songs for Josef Locke in "Star of Bethlehem" and "The Holy City."

The Tele-record

MANY "viewers" were interested when the B.B.C. gave a repeat programme of the morning's Remembrance Day ceremony at the Cenotaph; technicians at Alexandra Palace filmed the service from the television screen. The method is, of course, temporary and has its limitations. We do not agree with a morning newspaper which claimed that the method made television "history."

Guild of Radio Service Engineers

THE Guild of Radio Service Engineers (G.R.S.E.) in the current issue of their journal, which now enters its second year, deals with the methods adopted by some of its members during the power cut last winter. The arrangements made varies from the staggering of hours to the use of gas-heated soldering-irons, battery-operated rotary converters, and the use of battery-operated oscillators to give a signal when the B.B.C. was off the air.

B.B.C. WEATHER FORECASTS

["Weather will be fine in all parts of the British Isles, except where it is dull and cloudy, with patches of rain turning to drizzle or drizzle turning to rain. Rain in north spreading south, and rain in south spreading north. Visibility will be good except in areas of fog which are probable between Iceland, Shetlands and Biscay. Temperatures will be higher or lower than of late. A ridge of low pressure is stationary over mid-Atlantic and rapidly approaching our western seaboard, with ridges of high pressure following in its train."]

It's that, or something like it,
Four times every day,
And those oft-repeated forecasts
Steal our programme time away.
We prefer more entertainment,
It is that for which we pay.
Weather forecast's deadly boring
When broadcast four times each day.

"TORCH."

Cathode-ray Tube Data

General Notes on Service Cathode-ray Tubes which are Now on the Market, and Some Circuits in which They May be Used

IN response to our request in the December issue for data relative to Service cathode-ray tubes, we have received many interesting lists and details from our readers.

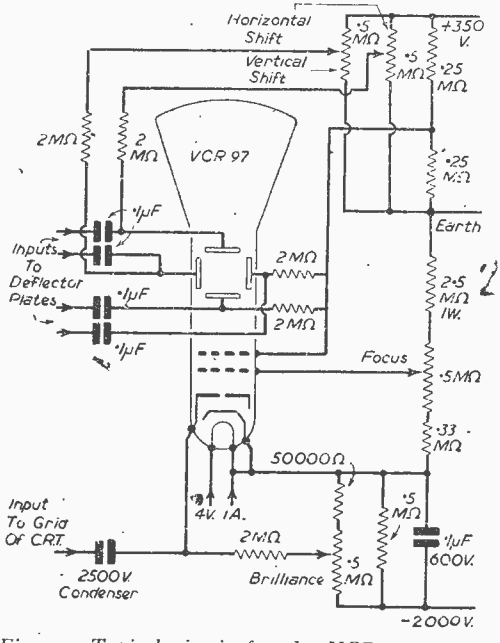


Fig. 1.—Typical circuit for the VCR97 and its equivalents.

These have been analysed and the important material collated so as to form a useful list for the experimenter, and this will be found on page 58. It should be pointed out, however, that some of the base connections are a difficult matter to trace out the leads if the tube is purchased already fitted in some piece of apparatus. In general, the 12-pin varied in different models and we therefore do not give the actual contacts for all of the types of base. It is, however, not

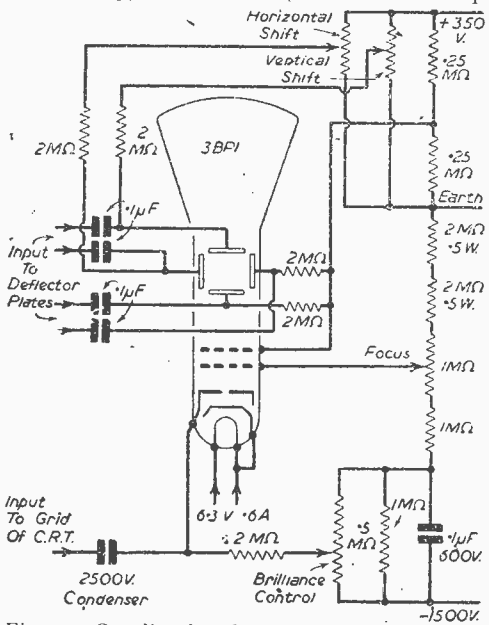
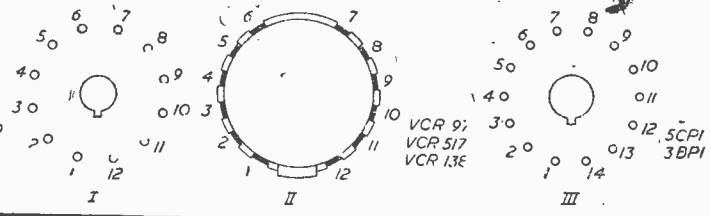


Fig. 2.—Supplies for the 3BP1 are shown here.



Tube Type	Voltage A1	A2	A3	Grid V. Normal	Cut off	Base Connections 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Side cap	Dia.
VCR97	2,000 max.	250-450	—	−30	−100	G	C	H	H	—	A2	—	Y2	X2	A1	X1	Y1	—	—	—	6in.
VCR517	2,000 max.	250-450	—	−30	−100	G	C	H	H	—	A2	—	Y2	X2	A1	X1	Y1	—	—	—	6in.
VCR138	1,500 max.	300 approx.	—	−20	−60	G	C	H	H	—	A2	—	Y2	X2	A1	X1	Y1	—	—	—	3½in.
VCR139 ACR10	800 normal	120-130	—	−6	−12	C	G	H	H	A2	—	Y2	X2	A1	X1	Y1	—	—	—	—	2¾in.
3BP1	1,500	430 approx.	—	−30	−45	H	C	G	—	A2	—	Y1	Y2	A1	X1	X2	—	—	H	A3	3in.
5CP1	1,500	430 approx.	3,000	−30	−45	H	C	G	—	A2	—	Y1	Y2	A1	X1	X2	—	—	H	A3	5in.

The first four tubes are of the 4v 1a heater type and the last two are rated at 6·3v ·6a.

side-contact base has the modulator taken to pin 1 and the heaters to pins 3 and 4. A1 is pin 5, A2 pin 6 and A3 pin 10. The coating is generally found on pin 7, whilst X and Y plates may be found at various points on the remainder of the connections or "top caps."

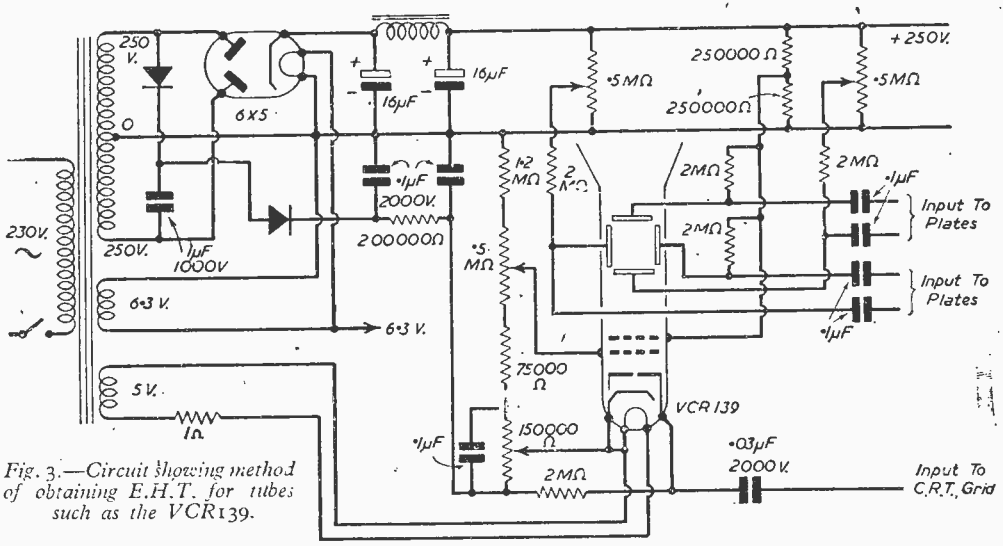


Fig. 3.—Circuit showing method of obtaining E.H.T. for tubes such as the VCR139.

It may be stated as a more or less general rule that all tubes except the VCR97 have short or medium afterglow, the 97 having a long afterglow.

Circuits

In the illustrations, circuits for the supplies to the electrodes of the VCR97, 139 and 3BP1 are given.

The 5CP1 can be used in a similar circuit to the 3BP1, except that it requires a voltage of 3,000 volts (+1,500 to earth) on its third anode, which is brought out to a clip on the side of the bulb. This +1,500 can easily be obtained by the use of a doubler circuit with the junction of the doubler condensers taken to earth.

A method of obtaining E.H.T. of about −900 volts, which is ample for such tubes as the VCR139, is shown in Fig. 3. Here a 250-0-250 transformer, with 6.3 volt and 5 volt low-tension heater windings, is used to supply all the voltages for the tube and oscilloscope. A voltage multiplying circuit using metal rectifiers is used for the − 900 volts and a 6X5 rectifier is used to supply the normal 250 volts H.T. The 6X5 has a high heater to cathode insulation (350 volt. max.) and is heated by the same supply as is used to heat the rest of the valves. The 5 volt winding is used to heat the cathode-ray tube heater, and is taken to it via a 1 ohm resistor, which will drop 1 volt and give 4 volts on the heater. The metal rectifiers in this circuit may be either of the special type for scope power supplies or else may be of the ordinary receiver type connected in series. They must each be able to withstand the peak inverse voltage across the 500 volt (250+250) winding of the transformer. Of course, the E.H.T. smoothing condensers must be of ample rating.

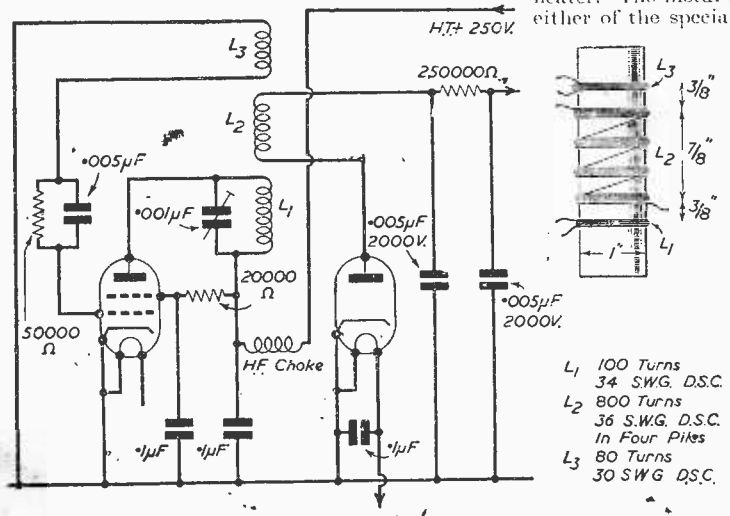


Fig. 4.—Another scheme for obtaining E.H.T. by means of an oscillator.

E.H.T. Supplies

A method of obtaining high-voltage, low current supplies is shown in Fig. 4. This method, very popular in America, utilises a high-frequency alternating current generated by the oscillator valve, a 6V6 or other power valve, to induce a high voltage across a secondary coil wound

(Concluded on page 76)

Ex-Service Cathode-ray Tube Data

NAVAL Type	Base	Size (m.m.) L	D	Cathode Vh (V.)	Ih (A.)	Focus and deflect	A3 max. Kv.	Sensitivity m.m./v./v. X	Y	Screen Colour	Diam. in.
NC1 (W.306)	Br. 9-pin	160	40	4.0	1.1	E.E.	0.5	60	80	Green	1.5
NC2 (W.307)	8 pin bayonet	414	136	0.6	1.2	GAS/E	1.5	450	450	Green	5
NC3 (W.308)	Br. 9-pin	205	71	4.0	1.1	E.E.	.8	120	150	Green	2.5
NC4 (W.1070)	As NC2 except for fluorescent screen.									Blue/Grn.	5
NC5 (W.1071)	6-clip base	495	136	4.0	1.1	E.E.	3	600	675	White	4.5
NC6 (W.1307)	12-pin spigot	354	79	4.0	1.1	E.E.	3.4	350	250	Green	3
NC7 (W.1308)	12-pin spigot	638	295	4.0	1.0	E.E.	6	1,425	1,270	White/Grn	12
NC8 (W.1920)	As NC2 except for fluorescent screen.									Red	5
NC9 (W.1921)	12-pin spigot	380	114	4.0	1.1	GAS/E.E.	2.0	350	390	Blue	4.5
NC10 (W.1851)	As NC5 to wider specification test limits.										
NC12 (W.3128)	12 contact	431	160	4.0	1.0	E.E.	5.0	625	1,175	Green	5
ARMY	**Voc. No.**										Diam. m.m.
ACR1	ZC.0123	495	136	4.0	0.9	E.E.	4.0	600	675	White	110
ACR2	ZC.0697	495	136	4.0	0.9	E.E.	4.0	600	675	White	110
ACR8	ZC.3081	—	—	4.0	1.2	E.E.	3.0	870	500	White/Grn	110
ACR10	ZC.3141 (Equivalent R.A.F. VCR139A.)	205	70	4.0	1.1	E.E.	1.0	170	170	Green	.55
ACR12	ZC.1955	620	295	4.0	1.0	E.E.	5.0	650	650	Green	220
ACR13	ZC.3596	431	160	4.0	1.0	E.E.	5.0	620	1,160	Green	120
3BP1	—	—	—	6.3	0.6						3in.
5CP1	—	—	—	6.3	0.6		3				5in.
R.A.F.											Diam. in.
V.C.R.84 (10E/10)	12-pin spigot	677	295	4.0	1.1	E.E./M	4	800	500	—	12
V.C.R.85 (10E/11)	12-pin spigot	660	295	4.9	1.0	E.E./M	6	1,345	1,250	—	12
V.C.R.86 (10E/12)	As V.C.R.84	520	160	4.0	1.0	E.E.	5	900	700	—	6
V.C.R.87 (10E/13)	12-pin contact base	512	160	4.0	1.1	E.E./M	3.5	900	750	—	6
V.C.R.97 (10E/222)	12-pin contact	431	160	4.0	1.0	E.E.	2.5	600	1,140	Green	6
V.C.R.112 (10E/171)	7-clip base	495	135	4.0	1.0	E.E.	3	870	500	Grn/White	5
V.C.R.131	As V.C.R.87	585	300	4.0	1.1	E.E.	4	950	950	Green	12
V.C.R.138 (10E/407)	As V.C.R.97	340	90	4.0	1.1	E.E.	2	360	780	Green	3½
V.C.R.139A (10E/466)	10-pin spigot	205	70	4.0	1.1	E.E.	1	170	170	Green	2¾
V.C.R.140 (10E/420)	—	587	306	4.0	1.2	M.M.	5	—	—	—	12
V.C.R.511 (10E/586)	As V.C.R.87	585	300	4.0	1.1	E.E.	6	1,000	1,000	—	12
V.C.R.514 (10E/658)	12-pin contact	370	90	4.0	1.1	E.E.	2	380	580	Green	3½
V.C.R.515 (10E/13026)	EMI 8-pin	384	90	4.0	1.05	E.E.	1.2	480	400	Green or Blue	3½

Anti-static Aerials

Some New Ideas in Interference Elimination.

By G. R. WILDING

FREQUENTLY the view is expressed that the present high technical development of radio design affords little scope for serious experiment and research by the amateur radio technician unequipped with elaborate apparatus. This view is, I maintain, quite wrong, for investigation into methods of combating radio interference at least, requires no special apparatus or laboratory standard equipment.

If any projected anti-static device will in any way materially reduce radio interference without sensibly affecting signal strength, the simplest of tests will prove it. Furthermore, in no field of radio experiment will any degree of success be more valuable, so it is the aim of this short article to indicate fresh fields of experiment for the amateur radio enthusiast.

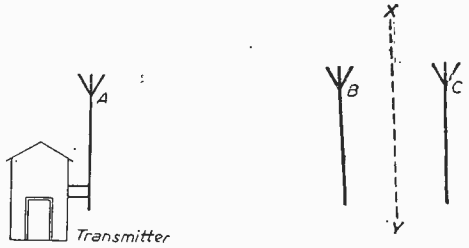


Fig. 1.—Diagram to explain the reception of a signal on two aerials.

Principles

First, a word about contemporary anti-static aerials. These almost universally comprise a mast or aerial proper, mounted as high as possible, and in as interference-free an area as possible, connected to the receiver by a screened down-lead to prevent static being picked-up from adjacent electric wiring, etc.

But in the types of aerial to be described, an entirely different principle is employed, and to make their functioning quite clear I must revert to basic radio theory.

Consider a transmitting aerial A, and a receiving aerial B, as in Fig. 1. Now, according to the electrical height of the aerial A, and the field strength of the transmitter, a voltage will be induced in it, which we will assume to be 50 mV.

Assume now that an identical receiving aerial C is erected by the side of aerial B at an equal distance from the transmitter. Obviously this aerial C will have a voltage induced in it, equal to, and in phase with, that of aerial B. But consider what happens when this second aerial is placed behind the first aerial.

As it would be slightly farther away from the transmitter, it will have a correspondingly smaller E.M.F. induced in it, but this would be unmeasurable and in any case doesn't concern us. What does concern us, however, is the phase difference between the voltage induced in aerial B and the voltage induced in aerial C now that they are at different distances from the transmitter, *provided that this distance is not a wavelength or multiple of the wavelength radiated by the transmitting aerial.*

Instead of their individual E.M.F.s rising and falling together, the voltages induced in aerial C would lag behind the voltages induced in aerial B. However, if a second transmitter D is now placed equidistant between the two receiving aerials on a line XY, the E.M.F.s induced in them by this transmitter will be equal and in phase.

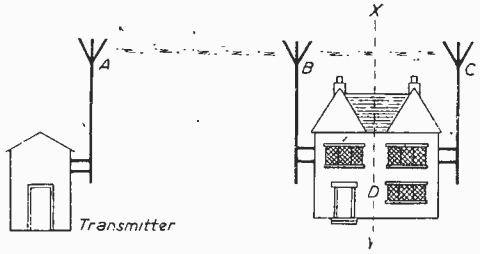


Fig. 2.—This diagram shows the two aerials on one building.

Phase Differences

Therein lies the germ of the idea, for if we feed the two receiving aerials to a centre-tapped coil as in Fig. 2 the equal voltages induced by transmitter D will cancel out and leave only the voltage *difference* between the E.M.F. induced in the two receiving aerials by the transmitter A.

This means that our aerial system will receive signals from A or any other transmitter not equidistant from it, but will not receive D or any other transmitter situate on the line XY.

If we now draw Fig. 1 in practical fashion, transmitter A becomes any broadcasting station, aerials B and C comprise the listener's anti-static

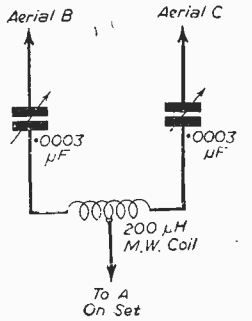


Fig. 3.—Coupling arrangement for the two aerials.

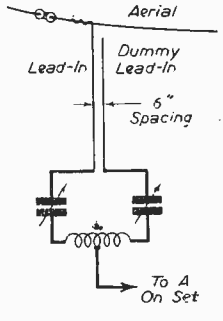


Fig. 4.—Another anti-static aerial idea.

aerial array, and *transmitter D becomes the strong zone of static emanating from the household mains wiring and local electrical machinery.*

It will be obvious that this aerial system functions as, and is in every way identical to, a giant one-turn loop or frame aerial, with the advantage that its extreme dimensions enable it to be immune from man-made static radiated from the entire domestic electric wiring.

In order that complete electrical balance can be obtained between the two aerials, it is essential to use some form of variable coupling between each half of the aerial coil or alternatively arrange that the central tapping point can be adjusted.

Ideally, a fixed tapping point with an adjustable powdered iron core would enable optimum results to be obtained most easily, but here experiment alone would be the best guide.

The aerial leads *should* be screened, but in many cases it will be found that this is not absolutely necessary, but an electrostatic screen between the two halves of the coil will be found an advantage. This screen should, of course, be earthed, and it might be advisable in some cases to enclose the coil completely in an earthed can.

The disposition of the two aerials is the most important feature of the idea, and gives great scope for experiment. The simplest way of testing the effectiveness of the aerial system when erected, and when the coil tapping or coupling has been adjusted for minimum static, is to disconnect either of the two aerials and note if this produces an increase in static.

If it does, of course the aerial system is functioning correctly.

A coil unit I have found very effective, and which has the advantage of being easily constructed, is shown in Fig. 3, where the coil utilised can be an old two-pin plug-in coil fitted with centre-tap.

Another aerial designed for minimum static pick-up is shown in Fig. 4, where a dual down lead is employed, fed to a coil unit similar to the type required for the first mentioned aerial. With this scheme the static picked up by each down lead is cancelled out by the coil leaving only the E.M.F.s induced in the aerial itself.

A Bandspread Receiver

A Simple Set with an Efficient Tuning Device.

By R. M. S. HALL

MANY of the new broadcast receivers use bandspread tuning on several short-wave bands. The normal electrical bandspread uses a small variable condenser or condensers in parallel with the main tuning condenser(s), thus enabling any part of the band to be spread. It is not proposed to discuss this further as many articles have been written on this particular type of bandspread. In my case I was faced with the problem of providing easy short-wave tuning on a BC receiver just being constructed.

There were several methods open:

1. To have a high ratio SM drive.
2. To spread the whole band.
3. To employ several spread bands.

It was decided to use a combination of the first and third, thus avoiding calibration troubles.

Final Arrangement

This is the scheme adopted: To use a small (75pF) variable condenser ganged to the main (500pF) tuning condenser. With a normal (16-50 m., 200-550m.) S.W. and M.W. coil this scheme works quite well.

The size of the band-determining trimmers (TC1/2/3) varies with the band to be spread, but the approximate size can be easily found from the fact that the ratio of the wavelengths is equal to the ratio of the square roots of the tuning capacitances, remembering that a normal coil tunes to 51-2 m. with 500 pF (.0005μF) in circuit.

Example: 16-metre band, 47pF, so use a 50pF trimmer.

The selectivity of the set was found to be quite good, using high-mu coils and a regenerative detector. The line-up was:

RF buffer-stage, EF50, Mullard.

Regenerative det., EF50, Mullard.

Output pentode (3W), EL32, Mullard.

In the diagram, S1, S2 and S3 are ganged.

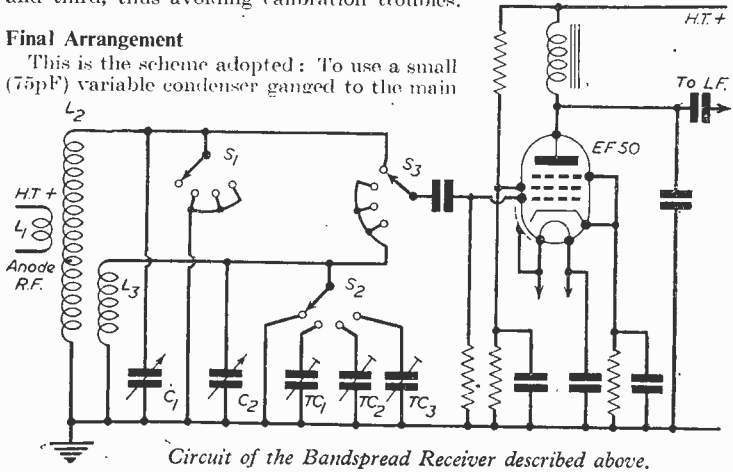
In position 1 of these switches, M.W. coil is used, tuning by C1. S.W. coil shorted.

In position 2, S.W. coil is used, tuning by C2, M.W. coil shorted.

In position 3, S.W. coil is used, tuning by C2, M.W. coil shorted.

In position 4, S.W. coil is used, tuning by C2, M.W. coil shorted.

Thus any number of bands may be spread to cover the frequencies of most interest to you.



Circuit of the Bandspread Receiver described above.

The Quantum Box

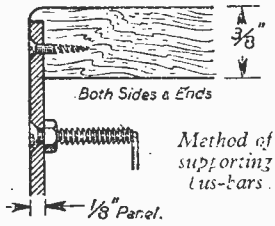
A Useful Addition to the Service Workshop or Experimenter's Workbench

By JAMES LAIRD

IN these days of supply difficulties, here is a most useful piece of apparatus, which I have named the Quantum Box. It contains, always to hand, 36 different condensers and resistances. As is well known, routine testing reveals a large number of condenser and resistance faults. When these are suspected, the Quantum Box almost invariably picks out the faulty one. It is invaluable as a substitution in condenser or resistance open circuits and, by moving one prod only, correct values can be ascertained. With a unit such as this speedy service is assured, and in the majority of cases better performance is obtained. Of course, the more accurate the components, the better the unit. Condensers and resistances with a tolerance of one or even the half of one per cent. cost money, and the serious experimenter would doubtless require them, but for ordinary use my choice is quite adequate.

Construction

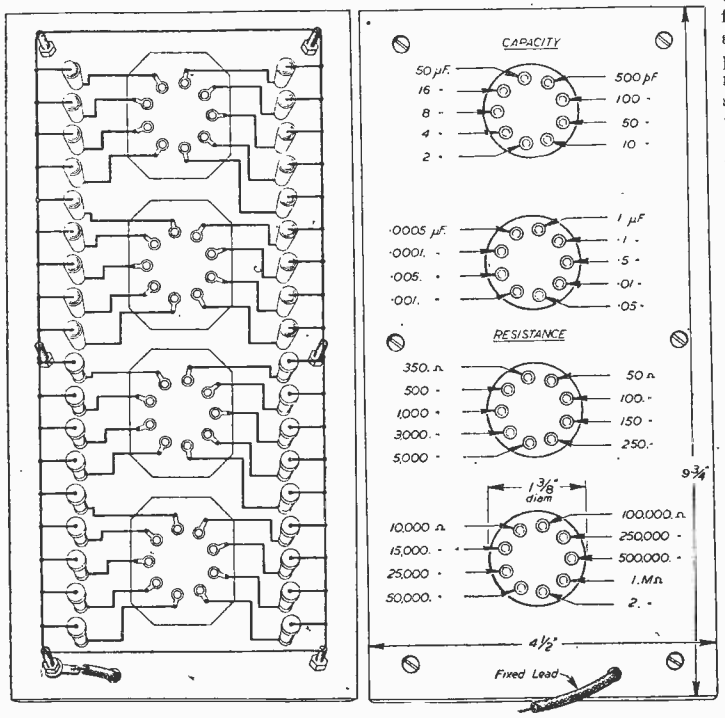
The construction is quite simple and straightforward, and should not present any great difficulties even to a beginner. Heavy wire should be used (18 s.w.g.), and all joints well and truly soldered. A heavy wire is run round, near the edges of the underside of the panel, and all negatives and one prod are soldered to it. It is supported on six screws bolted to the panel, and soldered to the screw ends. To go into details of construction is quite unnecessary as the diagrams explain everything. A unit of this description, or one of even greater accuracy, will become a necessity to the workshop and to the serious electronic worker in the near future, as the modern trend seems to be for greater accuracy and precision. The beauty of this instrument lies in its absence of complicated switching, and also in having only one prod to change.



Method of supporting bus-bars.

Using the Box

In use, especially when searching for the cause of hum in a set, always short the prods of the Quantum Box before and after each test in order to discharge internal condensers. Failure to do this will result in fireworks or even a nasty shock. If it is decided to fix a crocodile clip on the negative prod, which is very handy, and clip it to the chassis of set, then shorting the other prod to the chassis will suffice. The 50, 16, 8 and 4 μF condensers in the box are electrolytics, therefore their proper polarity must always be observed. The nine-pin valve-holders used have a ring on the underside of each socket; which holds the tips of the sockets together, and thereby ensures good contact, even with the thinnest of prod plugs.



LIST OF PARTS

1 Panel, 9¾in. x 4½in. x ⅛in.
4 Valve holders, 9 pin (British).

Condensers			Resistances	
50	µF	50 v.w.	50	ohms.
16	,,	500 ,,	100	,,
8	,,	,, ,,	250	,,
4	,,	,, ,,	500	,,
2	,,	,, ,,	1,000	,,
1	,,	,, ,,	5,000	,,
.1	,,	,, ,,	10,000	,,
.5	,,	,, ,,	25,000	,,
.01	,,	,, ,,	50,000	,,
.05	,,	,, ,,	100,000	,,
.001	,,	,, ,,	500,000	,,
.005	,,	,, ,,	1 megohm.	
.0001	,,	,, ,,	2 megohms.	
.0005	,,		150	ohms.
10	pF.		350	,,
50	pF.		3,000	,,
100	pF.		15,000	,,
500	pF.		250,000	,,

The diagram shows the layout and method of wiring the Quantum Box, whilst a list of the parts required is given above.

Radio Amateurs' Examinations

The 1947 Test Paper and a Report on the Results which were Obtained

IN order that prospective transmitting amateurs may gain some idea of the standard required by the G.P.O. examinations, we again give the full Test Paper which was set last year. The City and Guilds of London Institute have reported on this examination and their report follows the Paper.

1947 Radio Amateurs' Examination:

Candidates should attempt as many questions as possible. Use should be made of diagrams where applicable. The maximum possible marks obtainable is affixed to each question.

1. An alternating voltage of 10 volts at a frequency of $\frac{100}{2\pi}$ Mc/s is applied to a circuit consisting of the following elements connected in series:

(i) an inductance of 10 micro-Henrys,
(ii) a capacitance of 10 pico-farads,
(iii) a resistance of 10 ohms.

(*a*) What current flows through the circuit? (5 *marks.*)

(*b*) What voltage appears across the inductance? (5 *marks.*)

2. What is meant by the "selectivity" of a tuned circuit? On what circuit constants does it depend?

Why is this quality necessary in a receiver? (10 *marks.*)

3. What is understood by the term "C.W." and what special method is needed to detect C.W. signals? Describe a circuit arrangement which could be used for this purpose, illustrating your answer by a diagram. (10 *marks.*)

4. What is meant by modulation? Describe a method of modulating a typical low-power R.F. amplifier. (10 *marks.*)

5. What are the relative advantages and disadvantages of a variable-frequency master oscillator over a crystal-controlled oscillator for use in an amateur transmitter? Describe a variable-frequency oscillator of good frequency-stability. (15 *marks.*)

6. Describe, with the aid of a diagram, the circuit arrangement of a low-power crystal-controlled transmitter for the 58.5 to 60 Mc/s frequency band. (15 *marks.*)

7. Describe FOUR types of aerial commonly used for amateur transmission and how they may be coupled to the transmitter. What are their relative advantages and disadvantages? (10 *marks.*)

8. Condition 8 of the Postmaster-General's licence to establish an amateur wireless station stipulates:

> "Where the sending apparatus is not crystal-controlled there should be kept at the station . . . a reliable frequency meter of the piezo-electric crystal type or other type approved by the Postmaster-General, for measuring the frequency to an accuracy of not less than ± 0.1 per cent."

Describe an apparatus to meet the foregoing requirement. Illustrate your answer by a diagram and explain how the apparatus is used. (20 *marks.*)

Report on the Papers

The following general report is given on the papers as a whole and is not necessarily applicable to the work from individual schools.

Year	No. of Cands.	No. of Passes	No. of Failures	Percentage of Failures
1947	326	120	206	63
1946 (Nov.)	216	150	66	30.5
1946 (May)	182	115	37	22.2

The report on the last examination commented on the falling-off in the percentage of entrants obtaining a pass and suggested that a number of persons had sat for the examination without adequate preparation. The tendency then noted has become accentuated in the 1947 examination, the percentage of passes having fallen to 37, and the majority of the entries were of an extremely low standard. From the phraseology and vocabulary used, and the general way in which the answers were given, it is apparent that a large number of entrants, unused to sitting for examinations, had received little or no coaching for the Radio Amateurs' Examination. The use of abbreviated and corrupt English, such as is commonly used by amateur radio operators, is to be deprecated for examination purposes. Some of the answers were of a flippant nature, and on the whole there appeared to be a tendency to treat the examination as a not very serious matter. Confidential notes to the Examiner, regretting ignorance, do not give a good impression. A report on the questions follows:

Question 1 (*calculation*): Comparatively few candidates attempted this question; of those who did, less than half did so correctly.

Question 2 (*selectivity*)
Question 3 ("C.W.") } Fairly well done by the better candidates.
Question 4 (*modulation*)

Question 5 (*master oscillators*): The essential points in the design of a variable frequency oscillator of good frequency-stability were not at all well understood.

Question 6 (*the transmitter*): Many incorrect answers were given concerning the required frequency of the crystal and the methods of multiplication suggested to obtain the required final frequency showed little regard to efficient operation.

Question 7 (*aerials*): Not well done, in particular the methods of coupling to the transmitter were dismissed very briefly.

Question 8 (*frequency meter*): Very poorly done by the comparatively few entrants who attempted the question. They seemed to have a hazy idea of what a frequency meter of the piezo-electric type really is, and of how to use it.

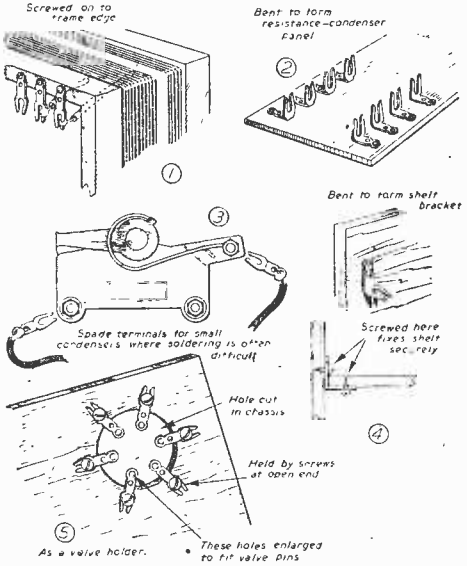
Practical Hints

Handy Connector

HAVING made several midget portable sets, I have found that the handiest little gadget to use in these confined spaces is the metal contact fitted to American octal holders.

I always remove any spare tags from my holders and have, at various times, used them as follows:

1. For anchoring ends of frame aerial.
2. For making small resistance-condenser panels.
3. For spade terminals for small variable condensers—where soldering is sometimes very difficult.



Useful aids made from valveholder tags.

4. For an angle bracket for shelves—or anything else that requires holding.
5. For a valveholder.

Other readers who make their own sets may be able to think out still further uses for these handy little pieces of metal.—J. BROWN (Heaton, Bradford).

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.

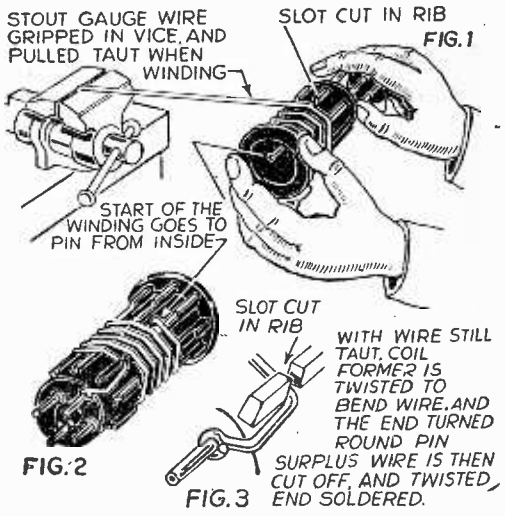
Short-wave Coil-making Hint

WHEN it is desired to wind 4- or 6-pin short-wave coils with fairly heavy gauge wire for, say, the grid windings, certain snags arise. It is all right fixing the start of the winding through a hole to one of the pins. When the end of the winding is arrived at, however, it is next to impossible to pass this end through a similar hole, without all the turns loosening.

The author has made many coils with quite thick gauge tinned wire, in the following manner:

A light gauge wire is first wound round to get the approximate length required. The stouter gauge wire is then cut to this length plus about 12in. extra.

A hole is then drilled in the coil former for the top end of the winding, and a slot cut in one of the ribs at the approximate end of the winding. This distance is calculated from wire gauge tables, giving spacing for various numbers of turns at spacing of one diameter of wire. The slot is cut right down to the bottom of the rib. The stout wire is then passed through the top hole and out through the usual bottom hole of the former, and is soldered to the appropriate pin. Then the other end is fixed in a vice and the wire pulled taut. The coil former is then rotated in the two hands, the person moving slowly towards the vice as the winding proceeds. When the turns are completed, and this should bring the wire to the slot, the wire is allowed to enter this slot, and keeping the wire taut all the time the coil former is twisted to bend the wire. This takes the wire parallel with the rib, but at the bottom. Still keeping a tension on the wire, this is turned once round the appropriate pin for the end of this winding. Only then is the tension on the wire relaxed, and after soldering to the pin the surplus wire is cut off carefully, using a small metal saw.



Effective coil-winding hint.

This procedure gives a very rigid coil on plain ribbed formers. Where a reaction or other winding carrying H.T. is wound on the remaining length of ribbing, at this end, a strip of mica should be inserted just over the thicker wire where it runs parallel with the rib. If the slot is to be full depth of the rib, however, there should be ample clearance without it.—R. L. G. (Chelmsford, Essex).

Push-pull Ph

A Further Explanation of

By R. V

MANY alternative circuits can be utilised to provide the opposite voltage phases necessary for push-pull output stages. Most of them are adaptable for battery or mains valves. The circuits included in Figs. 1 to 8 are a basis to the majority of modern push-pull amplifiers. Whatever his range of components, the experimenter or constructor should readily find one circuit suitable to his requirements and available "spares."

The push-pull transformer coupling shown in Fig. 1 is probably best known. The circuit uses battery valves, although mains types only require the addition of suitable bias resistors and condensers. The transformer has a centre-tapped secondary, its ratio being determined by the operating conditions of the output valves. The anode circuit of V1 is shown decoupled, the H.T. current of the valve passing through the transformer primary. When a midget transformer is used it should be parallel fed to prevent core saturation. The essential modification is given in Fig. 2.

Typical transformer ratios under different output conditions are: Class B, 1.5 : 1; Class A, 4 : 2; Q.P.P., 1 : 8; and about 1 : 4 for Class AB2. Parallel feed is usually preferable for "quality" amplifiers where the two output valves are operating under Class A conditions.

Using Standard Transformer

Fig. 3 provides an alternative to Fig. 1. A normal intervalve transformer replaces the centre-tapped push-pull component. The circuit offers a useful standby if a suitable centre-tapped push-pull transformer is not to hand. The only additions are the resistors R2 and R3. Each must be of similar value, not exceeding 500,000 ohms and preferably in the region of 250,000 ohms. Class A operation is usual with this arrangement. However, with a 1 : 5 transformer, there is no objection to a Q.P.P. output stage if the equipment is battery operated. Again, parallel feed may be employed for the transformer primary, provided the valve

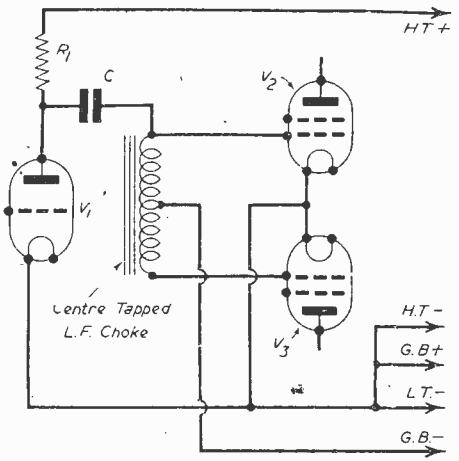


Fig. 4.—Basic circuit for inclusion of a centre-tapped L.F. choke.

V1 is not overloaded due to the volts drop across the inserted anode load resistor.

The centre-tapped choke shown in Fig. 4 is of practical value, although less adaptable than the transformer when connected as an intervalve unit. It is most suitable for Class A, but can be used for

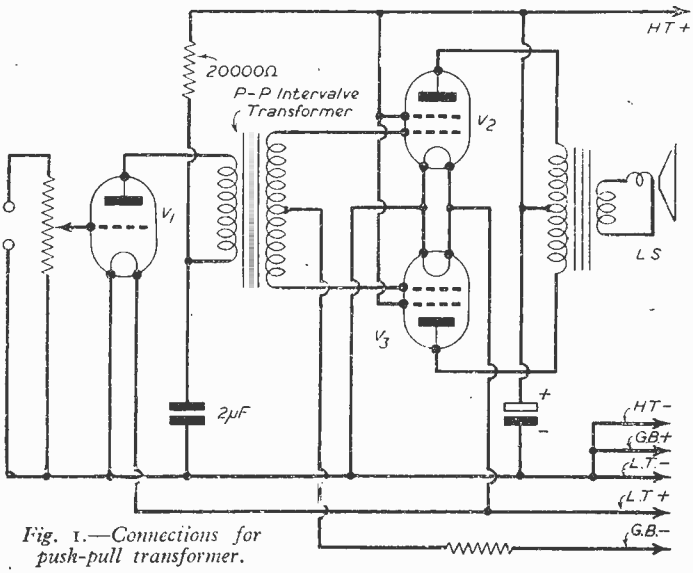


Fig. 1.—Connections for push-pull transformer.

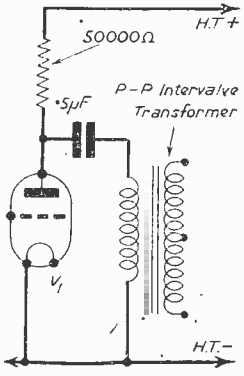


Fig. 2.—Connections for valve and transformer, using parallel feed.

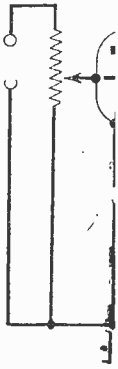


Fig. 3.—

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Q.P.P. if adequate L.F. drive is available without overloading V1. Unlike a transformer, a centre-tapped choke does not provide any voltage

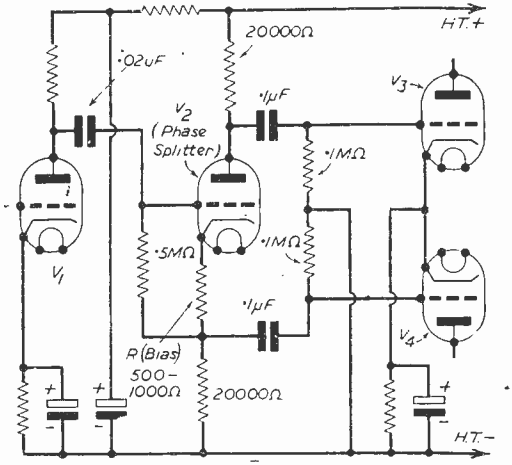


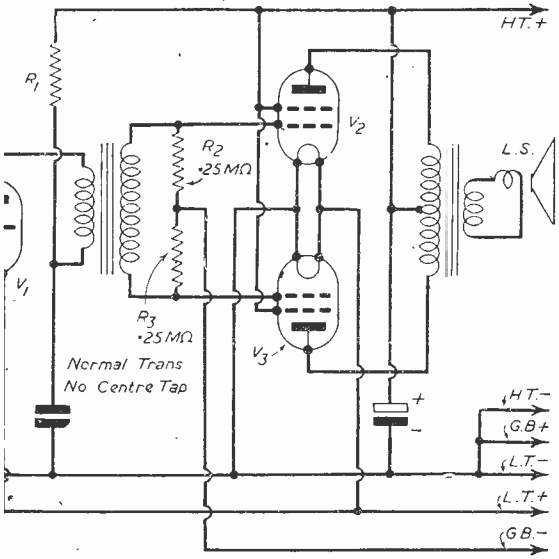
Fig. 5.—Phase-splitting valve with principal component values.

step-up to the individual output valves. The value of the resistor R1 is between two and three times the anode impedance of V1. Starting at, say, .5 μF, several alternatives might be tried for C. A smaller capacity will usually reduce the bass response of the circuit, while a critical value, depending on the inductance of the choke, will even produce a restricted bass boost. A high-inductance choke should be used for maximum stage gain, otherwise there will be a noticeable bass attenuation, especially if the value of R1 exceeds 50,000 ohms.

Phase-splitting Valve

The use of a valve for phase splitting, as in Fig. 5, is applicable to mains receivers or amplifiers utilising indirectly-heated valves. A triode is usual, although a pentode connected as a triode, with suppressor and screen grids strapped to anode, can be substituted. The valve performs its duty purely as a phase-splitter, there being no gain as in a normal amplifier stage. It must be able to handle a signal at L.F. sufficient to drive the grids of the output valves at full swing during maximum volume. Standard component values have been introduced in Fig. 5 for guidance. Push-pull Class A output is used. This, with the phase-splitter, provides an ideal combination for a mains "quality" amplifier.

The method illustrated in Fig. 6 can be used without variation on either mains or battery equipment. The circuit relies on the upper output valve V2 to provide the opposite phase necessary to drive V3. Component values are given. In most instances they will be the same for mains valves, with the addition of the necessary bias components. Reasonable volume and quality may be expected with mains valves, and a pair of triodes in the output stage. But for battery operation the circuit has its limitations. Economy of H.T. current necessitates Q.P.P. operation. Only under favourable conditions of H.T. can sufficient L.F. drive be obtained to load the output stage without



ternative circuit, using normal inter-valve transformer.

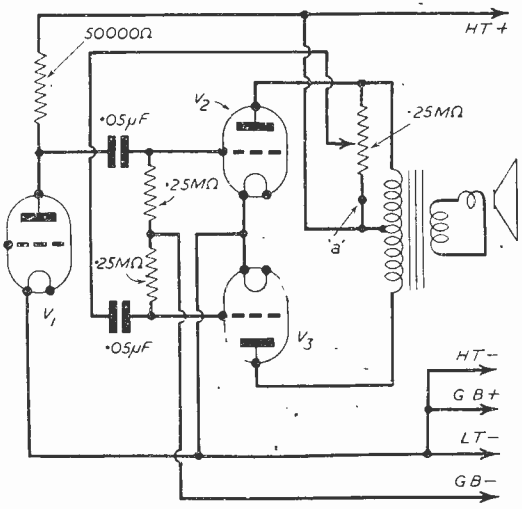


Fig. 6.—"Phase splitting" for push-pull, when the required input for V3 is taken from the output of V2.

overloading V1. Besides, although economical in components, the circuit suffers from the fact that distortion in the anode circuit of valve V2 is fed back to the grid circuit of V3, and so to the output and loudspeaker.

Paraphase Circuit

A more satisfactory version of the "paraphase" circuit is given in Fig. 7. A separate triode valve V2 is employed to feed the grid of the output valve V4. The potential divider also comprises the anode load of V1. Principal component values are indicated. It may be more convenient in practice to substitute V1 and V2 by a single double-triode valve. Provided the L.F. signal from V1 is sufficient, there is no reason why the circuit should not be used with battery valves and Q.P.P. output.

A word about the potential divider in Figs. 6 and 7. Once set, this should not need readjustment. A graded volume control is ideal for the purpose.

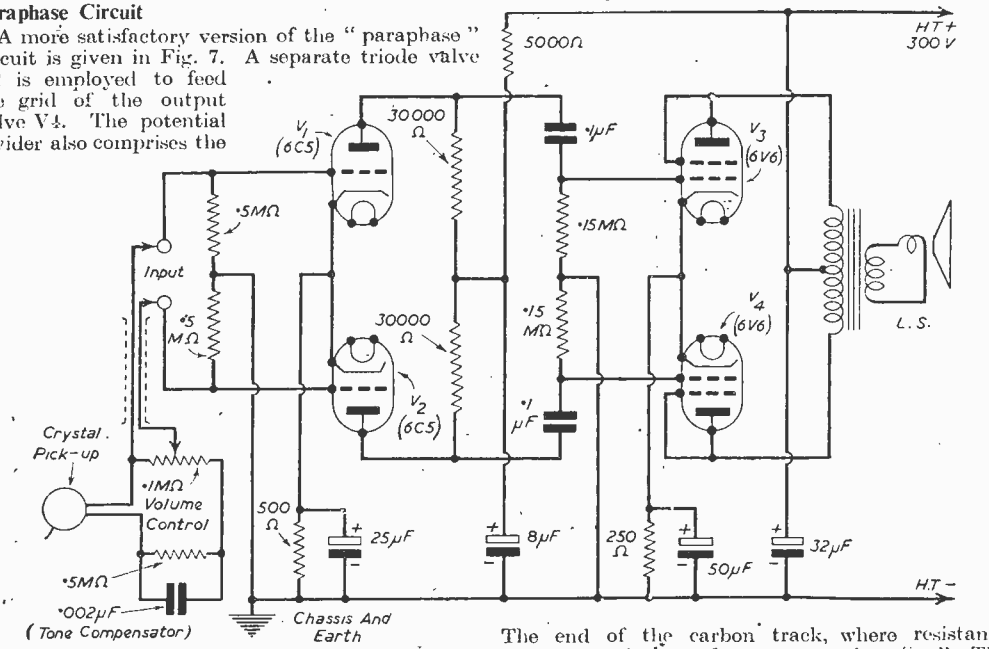


Fig. 8.—Twin-channel amplifier circuit, using "strapped" tetrodes as output triodes. Typical circuit for crystal pick-up is also shown.

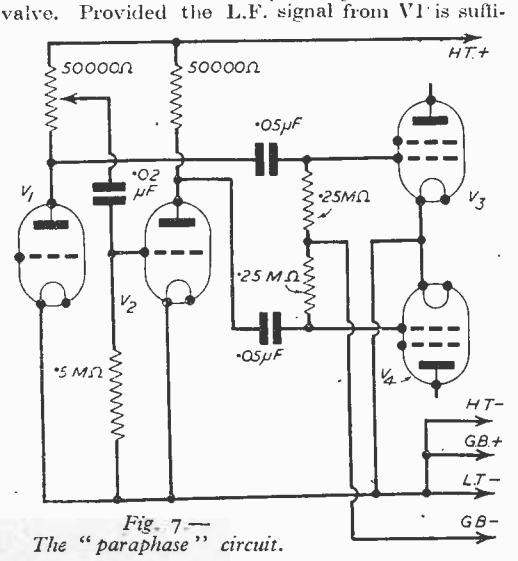


Fig. 7.—The "paraphase" circuit.

The end of the carbon track, where resistance variation is least, is best connected to "a." The position for the slider of the control will be found at a setting near the end corresponding to point "a." Correct setting will ensure that the grid of each output valve is being equally fed, the signal to each valve having the same peak L.F. volts.

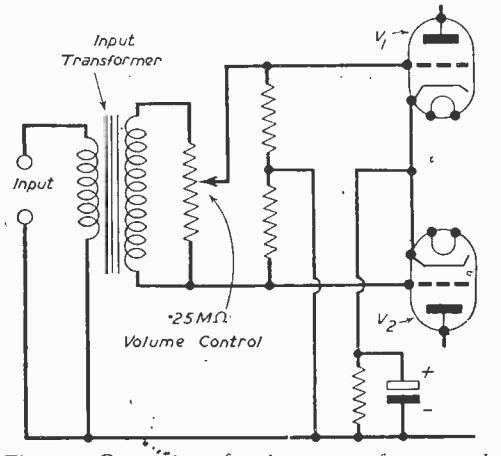


Fig. 9.—Connections for input transformer and volume control.

The circuit shown in Fig. 8 has two input channels with separate valves, or a double-triode, to feed the matched output pair V3 and V4.

Test Instrument Design–2

This Month Signal Generators and Beat Frequency Oscillators are Dealt With

By P. E. TOOKE

THE oscillator is the heart of a Signal Generator. On this depends whether it has any useful purpose or is just another "maybe." In an article such as this, to attempt to describe an instrument suitable for all tastes is impossible, so it is intended to run stage by stage through an average circuit.

Fig. 1 shows the completed circuit, excluding minor modifications which are explained in the text. The oscillator comes first. This was dealt with last month. Nevertheless a few points are worth noting. An E.C.O. circuit is shown with a modulated buffer stage. The triode circuit hardly needs any explanation. The range should be kept within 100 kc/s to 5 Mc/s, for an all-range job. This should be broken up into about five ranges. Coils on the L.F. side should, if possible, be Litz wound. To give a good "Q" further inductance can be given by means of iron dust cores, but these should be sealed when set. Notice the decoupling on the plate circuit. The buffer is loosely coupled through about .0001 μF capacity; the output from the buffer should be about 1 volt, so the coupling may have to be increased for the L.F. ranges.

Modulation is injected on the screen of the buffer. The modulation oscillator is a Colpitts circuit, using a small choke, and has a frequency of approximately 400 c/s., modulation is at a depth of 40 per cent. If no means of checking is incorporated, a variable gain control can be put on the screen to adjust modulation. It is very useful to bring out the modulation frequency to the front panel for checking L.F. stages of sets, etc., H.T. on the Colpitts valve should be switched to allow pure C.W. output when desired. The modulated output from the buffer can now go straight to the attenuator, or if it is to be measured, an R.F. meter stage will have to be put in.

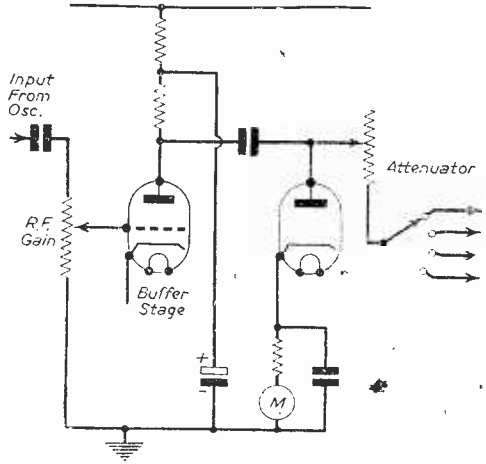


Fig. 2.—An R.F. meter and rectifier circuit showing modification of buffer stage for R.F. gain control.

R.F. Meter

Fig. 2 shows an R.F. meter, using a diode rectifier feeding a D.C. voltmeter. Of course, if one has a thermo-couple meter available, this is ideal. However, not everyone is lucky enough to possess one; and if they do, it is generally too versatile an instrument to "tie up" on a piece of gear. On most commercial instruments the diode circuit is used, however, and it serves very well. The diode rectifies the output from the buffer, and feeds the resultant D.C. voltage into the meter. The meter should be calibrated at 1 volt with the modulation off. This should be done with a reliable valve voltmeter, then the modulation checked at 40 per cent., and this noted on the scale. Then all that is necessary is to adjust to the R.F. level with the "mod." off; and then with the "mod." on, adjust the audio gain control, till the meter reads

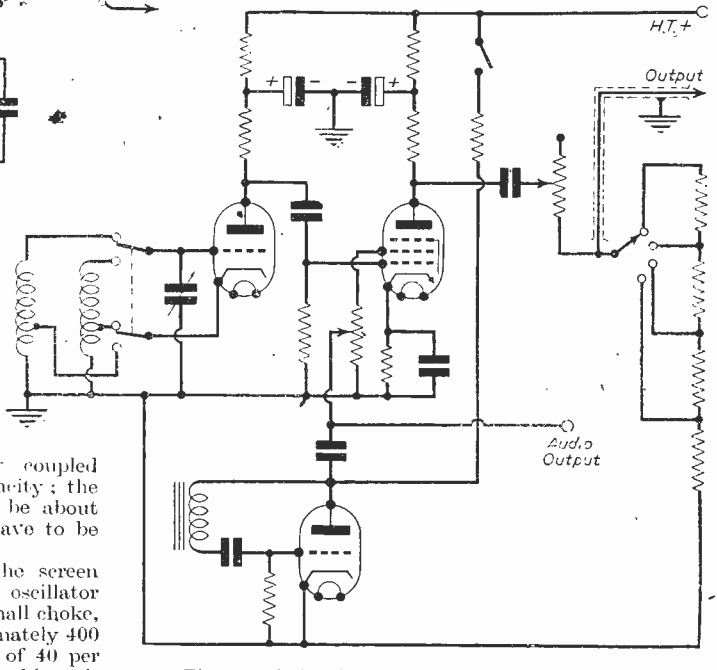


Fig. 1.—A signal generator using an E.C. oscillator.

to the modulation calibration. Most servicemen will put these calibrations in for a few shillings if a valve voltmeter is not available.

The attenuator is not very elaborate. A potmeter slider, feeding a fixed, switch-tapped "bleeder" network. The slide wire should be equal to one resistance of the bleeder; and each tap of the bleeder should be a one tenth of the last. The resistance used should be wire wound, non-inductive if possible, and the whole circuit screened to prevent any stray pick up. The output lead should be coaxial; and matched, if possible, to the attenuator impedence.

Construction

A few tips on construction. The buffer and oscillator stages should be screened, preferably completely canned with coils, switching, etc. If one is anything of a mechanic a coil turret should be attempted. This is by far the best method of coil switching as the coils are right on the contacts with a minimum length of lead.

A good dial is an investment. This is really worth while, as the accuracy of the calibration staying constant relies only on the dial and oscillation. If the dial has back-lash, or it slips, all the good work put into the oscillator to ensure stability is of no avail.

Calibration of all gear is probably the amateur's number one bugbear. Failing the possession of a multi-vibrator or sub standard, a good reliable signal generator should be begged or borrowed. After setting mod. and R.F. gain controls (if you have incorporated these refinements), the standard generator should be used to beat against yours, using a radio for mixing and demodulation. The beat note should be zeroed, or as near as possible, and the dial marked. Checks should be made at about three or four positions on each range. Be very careful that you beat the fundamentals and not a harmonic. Otherwise, it will take a few hours to unscramble it.

After all trimmers are set they should be sealed and the instrument put in a case. If a wooden one is used, line it with foil and earth it to chassis.

Beat Frequency Oscillator

So much for the Signal Generators. Now for the next most used test instrument, the Beat Frequency Oscillator; or B.F.O. This very useful piece of apparatus is, as its name implies, two oscillators, one with a fixed frequency and the other slightly variable, the outputs of which are fed into a mixer stage and the resultant beat note demodulated. This is then fed as an audio note into the output.

This piece of apparatus is very useful for checking receiver audio stages and amplifiers. Super frequency checks in conjunction with a frequency sub standard can also be made. With it curves can be drawn for transformers, etc., and to anybody interested in audio work of any sort it is essential.

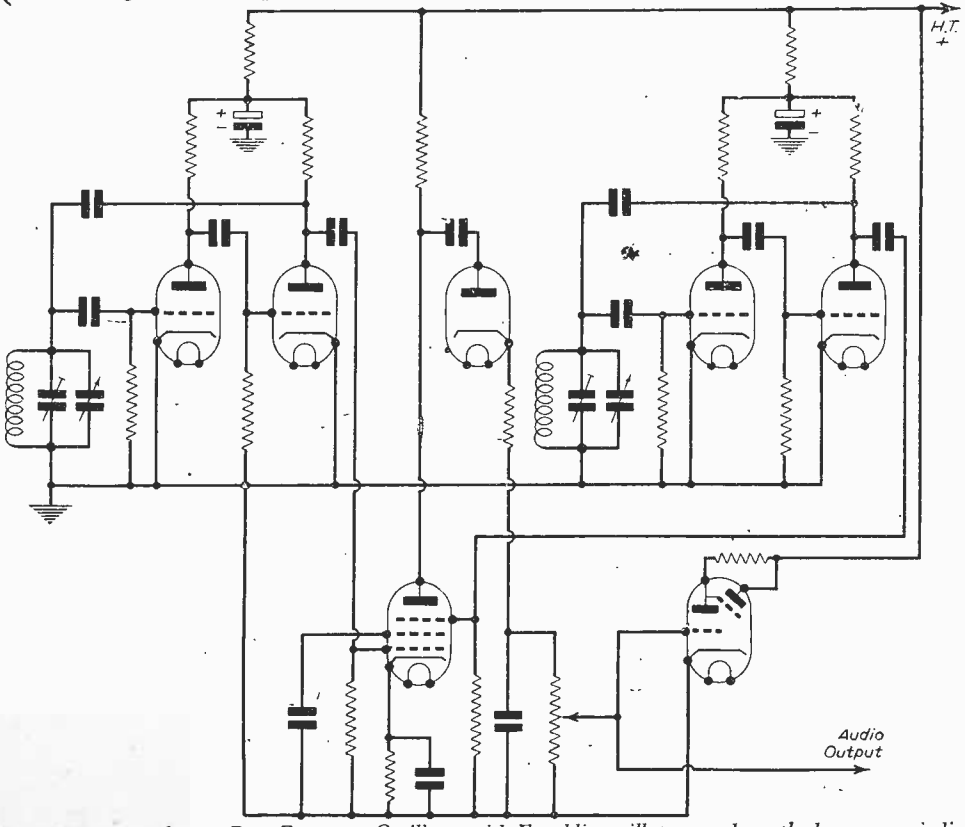


Fig. 3.—This circuit shows a Beat Frequency Oscillator with Franklin oscillators, and a cathode-ray zero indicator.

The one described here uses two Franklin oscillators. A mixer and diode demodulator, zero beat can be checked on a "Magic Eye" or meter. Fig. 3 shows the circuit with "Magic Eye" check.

The Franklin oscillators should be of about 100 Kc/s frequency. One should be swung with a .0005 μF condenser, the other has a fixed capacity, plus a small trimmer, used for "set zero check."

Screening

Both oscillators should be completely screened from each other and the fixed one set so that it gives zero beat when the trimmer capacity is half way in and the main condenser fully in or out. The outputs from these oscillators are fed into the mixer stage, a pentode, one on the grid, and the other on the suppressor. The resultant beat note is taken from the plate and demodulated by a diode, then with "Magic Eye" check and gain-control the instrument is finished.

Cathode-ray Indicator

The "Magic Eye," or, to give it its proper name, the Cathode Ray Indicator, is worked, as can be seen from Fig. 3, from the detected audio-frequency and shows zero beat by opening after the flutter gets slower and slower as the beat note decreases. An A.C. meter works the same way, but is rather expensive.

A double check can be made by leading out a mains, 50 c/s note from a winding of the transformer and beating this in with the output, so giving a beat check at 50 c/s. So much for the B.F.O. design.

Adjustment is simple: the adjustable oscillator condenser is fully opened. The trimmer check is set at half way. Then the capacities on the oscillators are set to give zero beat and then sealed. Calibration is very tricky and not advisable unless you have an oscilloscope. Then it is done by checking the number of wave forms against a set time base. Unless one has the advantage of a "scope" I would give the advice: Leave the calibrating to a serviceman who has.

(To be continued.)

A Regenerative Pre-selector

A Useful Accessory for the Battery Short-wave Superhet.

By T. HARPER

THE pre-selector described here will increase considerably the sensitivity and selectivity of a battery-operated short-wave superhet receiver, and can be recommended to DX enthusiasts for pulling in weak stations on 20 metres.

A 1N5GT/G valve is used in an electron-coupled circuit. A separate feed-back winding is used, as this is easier to adjust for proper operation than a tapping on the grid coil. The filament choke is home-made, consisting of about 60 turns of 26 or 28 s.w.g. enamelled wire on a $\frac{1}{2}$in. diameter paxolin former, the ends of the winding being anchored to soldering tags screwed to the former. The exact size is not critical, sufficient turns being used to obtain reaction while keeping the resistance low, so as not to reduce the filament voltage.

Tuning

Band-spread is used to make tuning easy, though it can be omitted if desired, but a good slow-motion drive should be fitted as tuning is fairly sharp. While the original model was built on a small chassis, 5in. x 3$\frac{1}{2}$in. x 1$\frac{1}{2}$in., an increase in size would be preferable to allow more room underneath the chassis to mount the band-set condenser. Power supply is obtained from the receiver, if it uses 1.4 volt valves, the leads from the pre-selector ending in a 4-pin UX plug to fit a valveholder mounted on the receiver chassis. A screened lead should be used for connection to the aerial terminal of the receiver.

Operation

In using the unit for the first time, tune in a moderate strength signal on the receiver, then transfer the aerial to the pre-selector and connect the output lead to the receiver aerial terminal. Tune the pre-selector to resonance, as shown by an increase in signal strength, and advance the regeneration control to about half way. Reduce the capacity of the aerial series condenser until oscillation is obtained, as shown, by a strong carrier which

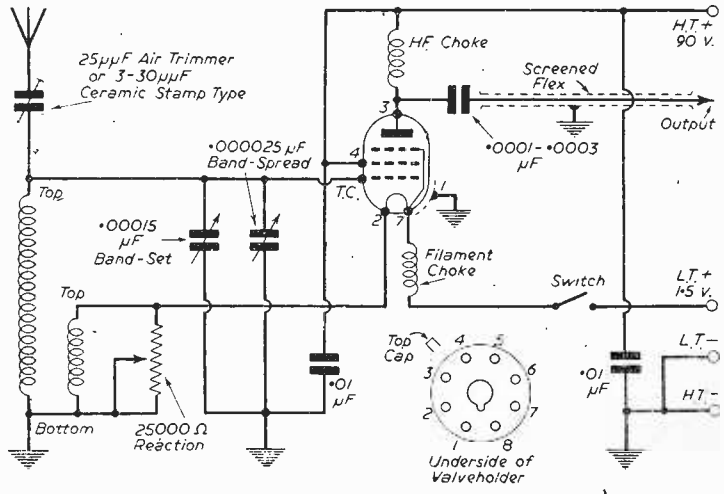


Fig. 1.—Theoretical circuit of the pre-selector.

tends to block the receiver, and check that oscillation is obtained over all the frequencies covered. Maximum gain is obtained just below the point of oscillation and tuning should be found to be sharp and sensitivity considerably increased. The reaction control should be quite smooth in operation, and it may be necessary to experiment with the reaction winding so that oscillation is shown by a decrease in signal strength due to the receiver blocking and not by a fierce howl. The oscillation is, of course, amplified by the receiver in the same way as an incoming signal. The reaction setting should hold pretty well over the width of an amateur band so that it is only necessary to keep the tuning in step.

While a 1.4 volt valve is shown, a low consumption 2-volt R.F. pentode could be substituted for use with a receiver using 2-volt valves.

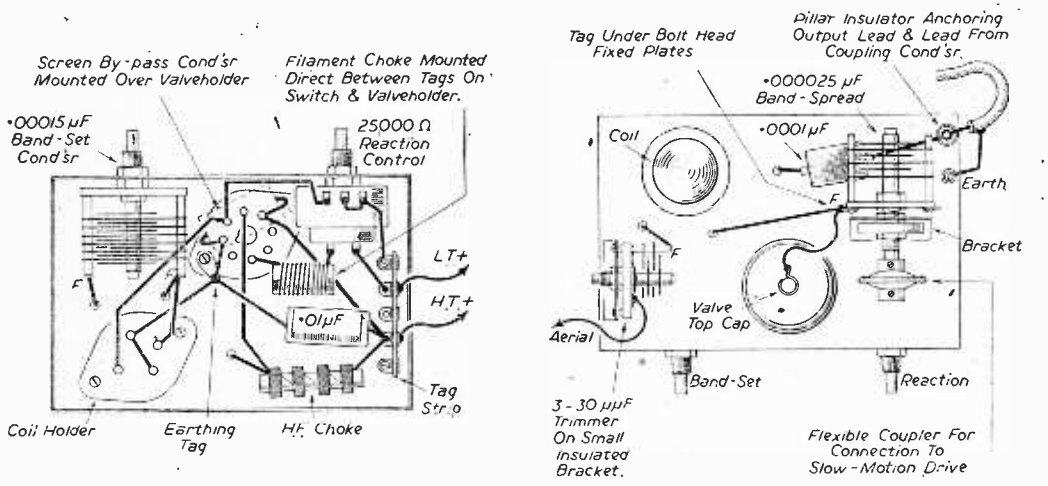


Fig. 2.—Top and below chassis wiring diagrams for the pre-selector.

B.F.O. for the R.1116

I HAVE operated one of these receivers for eight months on the amateur bands and have been very much impressed by its fine performance when properly handled. I am, however, a morse enthusiast and have felt myself handicapped to some extent by the fixed frequency B.F.O.

Recently I determined to remedy the situation by fitting a variable pitch control and, after considerable experiment, finally solved the problem to my complete satisfaction.

Components Required

The extra control needs only a 100 mmfd. variable condenser with a mounting bracket and extension spindle while the addition involves no alteration to the original wiring.

It is necessary to remove the right-hand aerial socket. This will leave a panel hole of the right size to accommodate the extension spindle bush. The variable condenser can then be mounted on the right-hand side of the metal cabinet so that it lines up with the bushed hole but is some 4ins. behind it. An Eddystone, or similar, extension spindle can be fitted and the job finished off with a small instrument knob and scale on the panel.

The only connection necessary for the condenser may be made with an 8in. length of single-core rubber-covered flex. One end is connected to the fixed vanes of the condenser and the other is taken through a small hole in the screening can of V8 to be pushed in alongside the anode pin of that valve in the appropriate socket. (The moving vanes of the condenser are automatically earthed via the mounting bracket and chassis.)

Avoid Short-circuits

Care should be taken, before switching on, to make sure that the new lead is not shorted to earth since it is connected to the high tension positive line! If it is found that the whole swing of the condenser does not give a satisfactory pitch variation, the existing B.F.O. trimmer—C55—may have to be readjusted. This is quite simply achieved, the correct trimmer being found beneath the "inspection cover" of L23 underneath the chassis.

The whole of the work involved in this modification may be achieved in a couple of hours without using a soldering iron or (except for the removal of the spare aerial socket and its connection to the left-hand socket) in any way disturbing the original wiring.—(W. T. J.)

Beginner's Guide to Radar—3

In This Concluding Article Transmitter-receiver Switching and P.P.I. Presentation are Dealt With

LAST month we saw how it was made possible to distinguish between enemy and friendly aircraft and proceeded to a discussion of some of the more usual types of aerial. One of the most popular was the stacked half wave with wire-mesh reflector, and this is illustrated below in Fig. 7. Amateurs who are familiar with the Sterba and 8 JK systems will be well acquainted

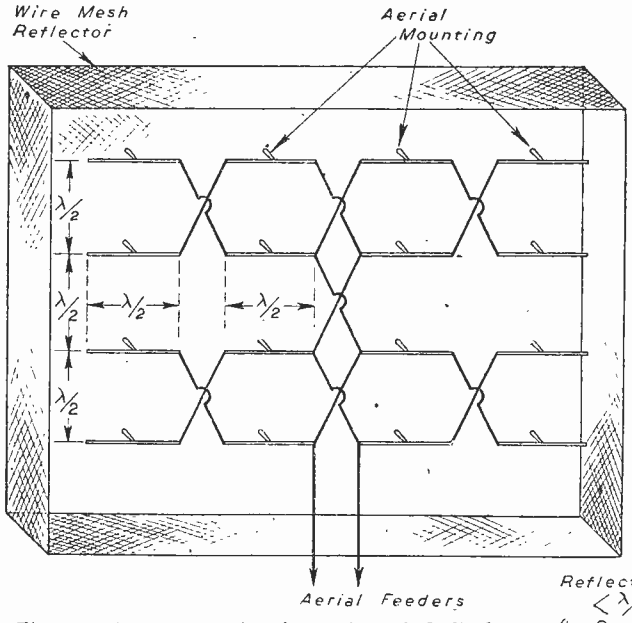


Fig. 7.—A representative form of stacked dipole aerial array, with wire mesh back reflector. The whole array is arranged to rotate for direction-finding.

with this particular form of assembly. The Yagi aerial is illustrated in Fig. 8 and is somewhat less efficient, but this is offset by the fact that it is more compact. The arrangement of Fig. 7 was used mainly for coast-watching stations (amongst other things) and the Yagi is used principally with the G.L. and S.L.C.

Transmitter-receiver Switching

It has been stated already that the same aerial array is often used for both transmission and reception. Obviously, it is essential that the receiver should be disconnected each time the transmitter pulses, for otherwise the receiver would be damaged. This requirement can be met more easily than may at first appear. The method is shown in simplified form at Fig. 9, where it will be seen that a spark gap is connected across the feed lines to the receiver at a point which is exactly one quarter-wave away from the transmitter feeders. When the pulse is applied to the aerial, arcing takes place and the gap is effectively closed. This means that there is a quarter-wave stub across the aerial feeders. And it is known that such a stub offers infinite impedance; it is, in fact, often known as a "metallic insulator."

While the gap is closed the receiver is completely isolated from the transmitter aerial feeders. Immediately the pulse is completed and there is no output from the transmitter, the gap automatically opens. At the same time, the impedance of the transmitter output circuit rises to a value which is very high in relation to the input impedance of the receiver: the aerial therefore feeds straight into the receiver.

Peak and Mean Power

The question of power output from a radar transmitter is an interesting one. Instead of being given in terms of power input to the aerial it may be stated in terms of either the peak power in the pulse or the mean power. The two are vastly different due to the fact that the time during which the transmitter is actually transmitting is only a very small fraction of the total time. For example, if two micro-second pulses are being generated at a p.r.f. (pulse recurrence frequency) of 500 per second, the quiescent period

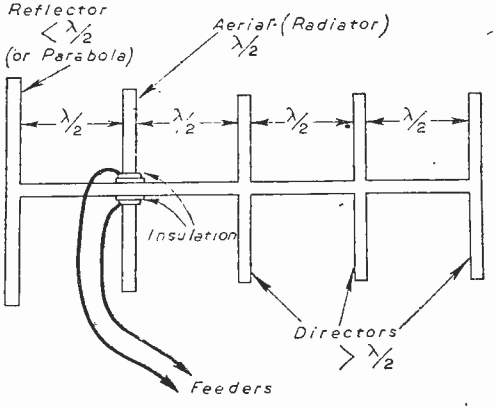


Fig. 8.—The Yagi type of directional aerial has a reflector, which is slightly longer than the aerial itself, or which consists of a parabola and any number of directors, which are slightly shorter than the aerial. The narrowness of the beam angle is governed by the number of directors. All elements are spaced by one-half wavelength.

between the pulses is 2,000 micro-seconds; the ratio between the "working" and "resting" times is therefore 1 : 1,000. This means that if the peak power were 200 kW.—by no means an unusual figure—the average power would be only 200 watts.

An advantage accruing from this is that relatively

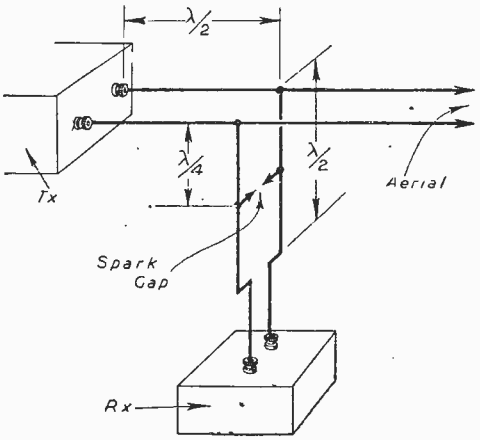


Fig. 9.—The method of connecting both transmitter and receiver to the same aerial is shown here. The spark gap (normally of the vapour-tube type) arcs over when the transmitter emits a pulse and so completes the quarter-wave "metallic insulator."

small valves can be used for the generation of very high peak powers, because of the long rest periods between pulses.

P.P.I. Presentation

It has been mentioned that a G.C.I. (ground control of interception) system may be used for plotting enemy aircraft after they have crossed the coast inland, and for vectoring our night fighters on to the hostile craft. The G.C.I. equipment introduces another form of C.R. tube presentation, although it should be mentioned that a corresponding system is employed with some coast-watching radars. This particular presentation is known as P.P.I.: or plan position indicating. The P.P.I. tube shows the aircraft on a grid scale corresponding to a map of the country for a radius of 100 miles or so of the G.C.I. station.

This is done by using a special form of C.R. tube using magnetic instead of electrostatic deflection; coils mounted outside the neck of the tube replace the deflection plates. Bias is applied in the "X" direction so that the range trace is in the form of a radius on the screen. In addition, the "Y" coils are mounted on bearings and arranged to rotate around the neck of the C.R. tube at the same speed as the aerial array; in this case the aerial rotates through a complete revolution. By this means the radial trace is caused to rotate, or pivot, about the centre of the tube. The output from the receiver is applied to the grid of the C.R. tube to produce brightness modulation. The tube is normally biased so that the radial trace is only just visible. But when the aerial picks up an echo the detected output from the receiver causes a bright spot to appear on the trace at a distance from the centre of the tube to correspond with the distance of the aircraft from the aerials. As the aerial array is constantly rotating, the bright spot would appear for only a very short time. To ensure that the spot remains visible for a sufficient length of time for plotting to take place, however, the tube has a fluorescent coating which produces an "afterglow" of about 25 seconds. As the aerial rotates once in 20 seconds, it will be seen that the bright spot, which actually resembles a small sausage,

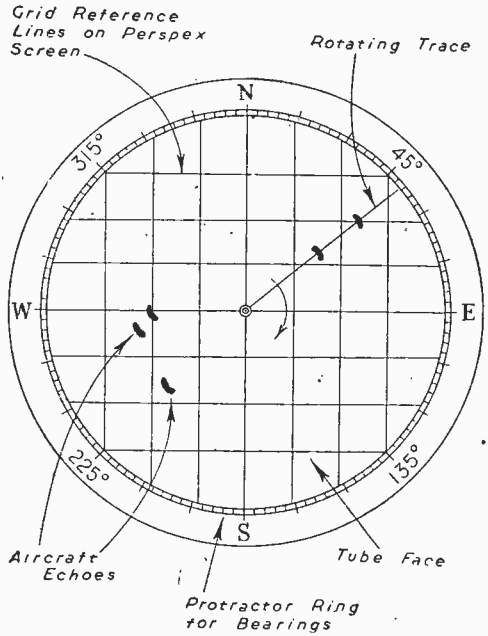


Fig. 10.—This illustration gives a good impression of the type of presentation obtained on a P.P.I. (plan position indicator) tube.

remains visible on the screen as long as the aircraft is within range.

The general appearance of the screen on a P.P.I. tube is shown in Fig. 10. The plan position indicator is used in conjunction with a normal range tube, similar to that already briefly described. In the case of a G.C.I. station two sets of stacked dipole aerials are used, one being mounted above the other. When receiving, however, the receiver can be switched from one aerial to the other at high speed, by using an electronic switch, so that two blips are obtained for each echo. This is done when height finding, as already explained. By comparing the size of the two blips an accurate estimation of height can be obtained from the calibration chart.

Underneath the Dipole

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

TELEVISION can no longer be said to be in its infancy. This oft-repeated bromide might have been true in 1937 or 1938, but it is now a cliché rarely uttered by regular viewers. Television has made much technical progress, of course, but I have come to the conclusion that the most rapid progress has actually been made not by the research engineers, but by the men behind the Emitron cameras—the producers, the editors, the technicians manipulating the equipment and also the performers who regularly disport themselves in front of the cameras. Every week *the* miracle of the entertainment world is performed by the boys at the Alexandra Palace, and it is time they had a hearty pat on the back.

Shopping For Entertainment

In spite of very strict limitations, both of budget and studio space, the B.B.C. manage to put on about 30 hours of varied entertainment, most of which has to be specially adapted for the requirements of television. Not all the entertainment is of universal appeal, of course, and to attempt to satisfy all tastes all the time would be quite impossible. In any case, nobody can afford the time to allocate more than about five or six hours a week to viewing, and this allows fairly reasonable selective "shopping" to be done. Choose the programmes you think you will like, after referring to *The Radio Times*, and deliberately refrain from looking at others. That's a safe piece of advice for new viewers. There is little risk of television becoming the drug that ordinary broadcasting now is in many homes, where the loudspeakers bray all day long and nobody listens to the braying. Music while-you-work is all very well as a superficial background to this mechanical age, but its message is of necessity hackneyed and trivial. Television will never drop to this level ; its strength and its weakness lie in the concentration upon which it insists.

New Art Forms

Talk of "new art" probably conjures up in the minds of my readers the kindergarten varieties of drawings and paintings associated with long hair, dirty finger-nails and corduroy trousers in the vicinity of Chelsea or Bloomsbury. But no one will deny that the cinema is a new art form, with its own special way of story telling, in which both picture and sound are now separately and distinctly used in punctuative effect. The "talkie" has travelled a long way since the early silent films and ever since *The Singing Fool* introduced the use of sound films. Sound is no longer a mere accompaniment of the words spoken ; music, effect noises and commentary each make their contribution to the final design.

The cinema had progressed a long way before the advent of sound, and many great silent pictures achieved a distinction which put them in a class entirely separate from the ordinary weekly "flick." Sound seemed to stop progress in this respect for a few years, and now, especially in English-made films, we observe a competent handling of this composite craft which again places it in the "art" category. Television has made similar strides, and though its form may derive from a combination of sound radio and the motion picture, the most successful producers are those who ignore the concepts of either medium.

Television Producers' Problems

The small screens of the home receivers, particularly those smaller than the 10in. by 8in. size, present the television producer with a special set of problems. Long shots cannot be seen in great detail, and, therefore, he must arrange his television cameras to make the greatest possible use of mid-shots and close-ups. Most of the devices of the cinema are available to him ; cuts or dissolves from shot to shot, travelling ("tracking") or panoraming ("panning") cameras, sound effect backgrounds and so forth. But it has become obvious that they must be handled in a very different manner. On television, quick cutting from shot to shot, rapid panoramic movements of camera or multiple dissolves are to be avoided. In short, the editing technique has to be modified to a much slower tempo, with emphasis on close-ups.

This rule applies not only to studio performances but also to outside television broadcasts, though in this case long shots are more tolerable. Consider the dignified presentation of the television broadcast of the Cenotaph ceremony, in which the many television camera angles were utilised with great discretion ; changes of viewpoint being made at precisely the correct moments, and not too often. The prime object of the producer manipulating the controls is to make the "cut" from shot to shot as unnoticeable as possible. He can best do this by closely relating these changes to the associated sound, speech or music. Thus, on the Cenotaph ceremony transmission, cuts were made at the ends of the verses of hymns, on precise music beats. Another notable fact about this excellent outside broadcast was the remarkable transmission of the atmosphere of crowd emotion and reaction, which had a most moving effect upon viewers. The same could not be said of the remarkable film record, photographed from the end of a cathode-ray tube and televised the same night, nor of the newsreels' version of the event.

Physical Limitations

Television plays and studio performances present the producer with a new set of problems. Limitations of studio space, lack of time for making wardrobe or make-up changes between scenes, apart from budget considerations, place restrictions upon the imaginations of the television script writers. On television, once a play is started, it has to play right through ; there is no second chance

and very rarely an interval. A film-shot lasting, perhaps, 20 seconds on the screen occupies possibly an hour in its making, and many "takes" frequently have to be made before the film director is satisfied. With television, everything is "Take One," and that take may last an hour! The film studio which succeeds in completing the shooting of more than ten minutes' screen time on a picture in a week is doing very well; the B.B.C. have to produce 30 hours of television entertainment! What a contrast, and what a triumph for the boys at the A.P.! Their professional handling of a complicated technique must be the envy of the television engineers and producers of other nations. It is the intuitive use of the television equivalent of the old-established Dramatic Control Panel, together with the most careful pre-planning, that gives the modern television play its smooth continuity and polish.

Independent Frame

Conscious of the acute rise in the costs of production, the film people have also become "pre-planning" conscious, and have evolved their own special system under the title "Independent Frame." By exploring the smallest detail of every proposed camera set-up when a production is in the script stage, they are able to figure out ways and means of using various technical tricks to reduce the size and number of the settings which have to be constructed. For instance, a scene in which a principal artiste is seen in a railway station giving up his ticket at the platform barrier may, in fact, merely comprise a small piece of barrier erected in front of a ground-glass screen upon which is projected (from behind) a view of the railway station with engines and huge crowds well in evidence. Back-projection of moving backgrounds, such as the passing scenery viewed from a train or a car, has been a device used most effectively in films for many years. Static backgrounds with moving figures are far more difficult, and the wholesale substitution of projected backgrounds for expensively-built settings has required the improvement of many pieces of equipment. Perhaps some of these devices will be available for the television producers in due course. In the meantime, they will carry on, no doubt, quite happily in their own independent frame!

Cathode-ray Tube Data

(*Concluded from page* 57)

on the same former as the oscillator coil. A half-wave valve rectifier is used. The smoothing condensers need be only of small capacity because of the high-frequency, but they must be able to withstand the voltage across them. A trimmer may be connected across the anode coil to adjust the output voltage and regulation of voltage. The output of the circuit shown should be about 1,500 volts, although by suitable modification much higher output voltage can be obtained. This circuit is much safer than the normal circuit because the condensers have a low capacity and any heavy loading of the circuit will cause the voltage to fall sharply. R.C.A. suggest this method for some of their cathode-ray tubes.

A.C./D.C. Television Set

It is rather interesting to note that this high-frequency oscillator method of obtaining the high voltage for the cathode-ray tube indicates that it would be possible to make an A.C./D.C. television set or oscilloscope.

Our Cover Subject

OUR cover illustration this month shows the control room of an Army radio station in Canada. Many ex-Servicemen will remember the various Army and Service radio stations which operated in all parts of the world, and that depicted is at station CFWH, situated at Whitehorse, Y.T., and is operated by Canadian Army personnel. All operations, including announcing, putting programmes on the air, etc., is carried out on a voluntary basis, and the station is on the air from 7 to 11 o'clock each night, especially for the benefit of the troops at Whitehorse.

Club Notes

THE BIRMINGHAM AND DISTRICT SHORT WAVE SOCIETY
Hon. Sec.: N. Shirley.

THE annual meeting of the above society was held on Monday, December 1st, when the following officers were elected: Chairman, Mr. T. Burton, G2BON; treasurer, Mr. L. Hawkesford, G2HKT; secretary, Mr. N. Shirley; librarian, Mr. R. Moreton; sale and exchange section, Mr. C. Wallis, G3CWV.

As from January 5th, 1948, meetings are held on alternate Mondays at 220, Moseley Road, Birmingham 12. Items planned for future meetings include a demonstration of an all-dry portable 0—v—1, a five metre TX built from ex-Government equipment, talks on the principles of oscilloscopes and tips for the newly licensed amateurs.

BURNHAM AND HIGHBRIDGE AMATEUR RADIO SOCIETY
Hon. Sec.: A. D. Taylor, G8PG, c/o P.O. Radio Station, Highbridge, Somerset.

THE above society is now in course of formation and it is hoped to hold a first meeting shortly. Interested amateurs in the Burnham area of Somerset are requested to communicate with the acting hon. secretary.

RADIO SOCIETY OF HARROW
Hon. Sec.: J. Lavender, G2KA, 29, Crofts Road, Harrow, Middlesex.

ON Tuesday, November 4th, an interesting lecture on magnetic recording was given by Mr. Amos, B.Sc., A.M.I.R.E. of the B.B.C. A practical demonstration of a wire recorder, kindly loaned for the occasion by Mr. Greasley, G8VQ, then followed. Future programmes include a series of "Around the Shacks" talks by licensed members, starting off with a description of his gear by the secretary, Mr. Lavender, G2KA. Club membership now exceeds 70 and meetings are very well attended. Refreshments are available. Meetings alternate Tuesdays.

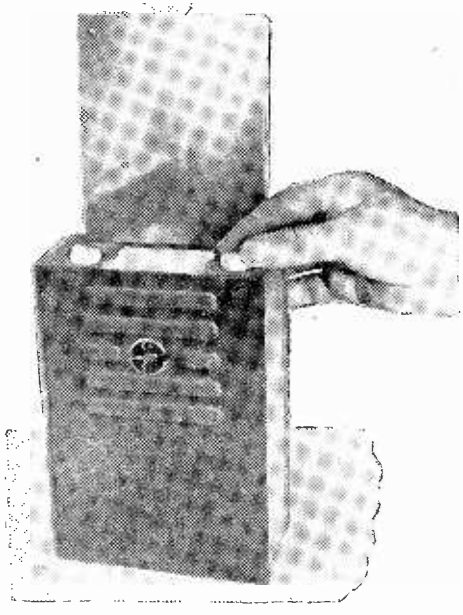
LONDON SHORT WAVE CLUB
Hon. Sec.; R. Lisney, 4, Ongar Road, Fulham, London, S.W.6.

THE past month has been spent mainly in the renovation and building of the club transmitter at H.Q. at the "Crown," Battersea Park Road. The transmitter is now in the final stages of testing and a club licence is being applied for in the near future. Features at the meetings include morse instruction and general discussion. Recently a discussion was held on centimetre oscillators with a number of members putting forward some interesting observations.

Trade Notes

Hermes Radio Tourist

A NEW type of "personal" receiver has been produced by Hermes, Brooke & Co., a British firm, and is made under the Enham Industries scheme by disabled ex-Servicemen. As may be seen from the accompanying illustration the receiver is finished off to resemble a book, and has a fabric finished metal case available in powder blue, cream, green, rose, black-and-gold, brown, etc. The aerial is enclosed in a slide at the rear and is withdrawn to the position shown in the illustration when it is desired to listen. There are two controls, tuning and combined volume and on/off switch. The

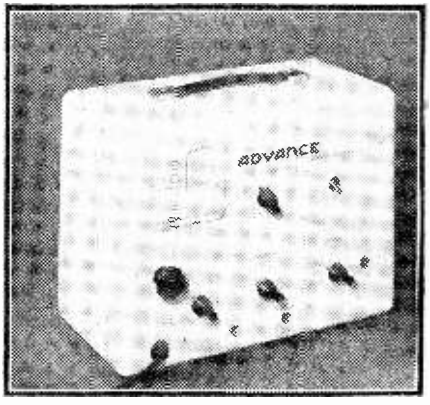


The Hermes "Radio Tourist."

central plate carries tuning points for various stations. In spite of its miniature overall dimensions (8¼in. high, 6in. wide and 2¾in. deep), it incorporates a 3½in. moving-coil loudspeaker and operates from two U2 cells and a 67½ volt H.T. battery. The circuit is of the superhet type, utilising four valves of the 1.4 volt type, and provision is made for the connection of an external aerial if this is called for. A sling carrying case may be obtained in waterproof leather and canvas. The quality of reproduction is quite pleasing, and the receiver is, of course, directional, due to the frame aerial. The price is £13 13s., plus P.T.

Advance Signal Generator

WITH the increasing use of television equipment, Servicemen find a need for a signal generator, which includes the television frequencies as a fundamental of the range. In the majority of signal generators the range does not include these frequencies and thus one has to make use of harmonics, and it is not always a simple matter to select the right ones. In addition, of course, the accuracy may suffer. In the Type "E" Generator,



The "Advance" Type E Signal Generator.

produced by Advance Components, Ltd., the actual fundamental range goes up to 60 Mc/s, whilst the harmonic range runs from 60 to 120 Mc/s. Described by the makers as a laboratory instrument at a popular price we have found the generator fully up to the maker's claims. There are six tuning ranges, 100-300 kc/s, 300-1,000 kc/s, 1-3 Mc/s, 3-10 Mc/s, 10-30 Mc/s and 30-6 Mc/s. These are selected by the top central control, and the three lower controls adjust the A.F. output—in steps from 0 to 5 volts, the voltage output from 0 to 10 and a multiplier of five steps from 1/t V to 100 mV. There are also three jacks providing the A.F. output, full R.F. and attenuated R.F. Supplied with the equipment is a shielded A.F. lead provided with crocodile clips, and an R.F. coaxial lead, with a dummy aerial padder, giving three separate outputs. The entire instrument, measuring 13in. by 10½in. by 7¾in., is finished in cream enamel and weighs 15lbs.

On test the instrument performed very well indeed, and was, in fact, used for lining up a home-built television receiver. The sound and vision frequencies are separately marked on the appropriate range and it was found that the shielding and general design was of a very high order so that settings were most accurately obtained. The only point to be observed at the U.H.F. is to keep the leads from the padding unit very short—not more than three inches, to avoid standing waves and similar troubles. At 19gns. this provides a really first-class servicing instrument which may be highly recommended.

Programme Pointers

The Music of To-morrow is Discussed by MAURICE REEVE

CONCERTS are arranged, artists booked and programmes drawn up with far greater prescience and foreknowledge than coal is laid up for the winter or the level of income tax decided. When we hear a symphony concert to-morrow it is the result of plans drawn up anything from six to twelve months ago. It is no exaggeration to say that the musical life of the country for 1949, rather than for 1948, has, for better or worse, been largely decided; that for the year just beginning was hatched long, long ago.

What are those plans? And what can one's summing up be on the year now past? Neither are rosy and both can be delivered in the same phrase, the mixture as before. Masses and masses of symphony concerts and solo recitals—mostly piano—with, for the most part, the same hackneyed programmes. Beethoven, Chopin and Tschaikowsky *ad nauseam*, with perhaps a little less Tschaik than in the immediate past. This welcome retrocession is doubtless due to the even more welcome resurrection of Wagner.

With the return of some of the famous pre-war virtuosi, the indiscriminate and unthinking filling of concert halls is largely a thing of the past. The quality of the performance is again beginning to take its rightful place in the concert-goer's mind. "They are doing Beethoven's Fifth," and off they rushed. Now, "Who is doing it?" is often asked before money and time are spent on totally inadequate performances. And, if only "So-and-So" is doing it, and not So-and-So, more and more are exercising discrimination.

Modern Music

More programme space is given, and will continue to be given, to modern music than was allotted to it after the 1914-18 war, which is very proper and necessary, though it does act as a great deterrent to the box office. The innate conservatism of the British people is no more prevalent and undying anywhere than in music, and the first part of a programme has to be of the very highest appeal if the "innovations" and "originalities" introduced into part two are not to act as a dead weight on the attractions of the concert as a paying concern. No recognised British master, living or dead, can "draw an audience" on his own, nor is he seldom asked to, for that matter, whilst the younger school, especially the continental flowerings, have to rely for their support on their own especial sympathisers and imitators, as with all freak growths everywhere.

Although this music must be performed (one recalls Malvolio's "I have a reasonable good ear for music, let us have the tongs and the bones"), one cannot help feeling that most of it will share the same fate that was meted out to the "masters of the future" in the days above referred to. These latter, to-day, are little more than museum pieces. But they had to be tried; they formed the trial XIs from which Debussy and Strauss, Sibelius and Elgar, to go no farther back, were picked for international honours.

More Wagner?

The coming year would seem as if it will be run on the same lines as was 1947, with, perhaps, more Wagner and more opera, though German opera is most unlikely for some time to come. That glorious form of musical self-expression, chamber music, will be prevalent, and the unforgettable Schnabel - Fournier - Szigeti - Primrose combination will be emulated by the collaboration of other famous soloists. We shall continue to look to the B.B.C. and it will not be in vain, as our chief provider, the Covent Garden of music, distributing the world's produce in all its manifold variety to all corners of the land. Through its magnificent series of symphony and other concerts, at which financial loss, if any, does not carry the same shattering and catastrophic results as in the adventures launched under private enterprise, we shall continue to hear the rightly beloved classics together with the best, and not so good, of the modern world. To continue in our horticultural metaphor, the pineapples and the peaches, together with the medlars and the gooseberries, will be served up to us, all ripe and unrationed. Raspberries we shall have to continue to grow ourselves.

Private Enterprise

For private enterprise, the position may well seem intolerable and the problem unsolvable. On the one hand it is told it must not give so many performances of the hackneyed masterpieces, which are the only concerts that really pay (and, in parenthesis, are the only concerts at which the great virtuosi can be heard because they simply will not appear in new and untried works); whilst on the other, it is bidden to perform more "originally designed" programmes, even if only for art's sake, but which do not pay to anything like the same extent, if at all. The B.B.C. seems the only complete answer.

A word about the totally needless repetition of programme items, artists' names and other data. Recently, I turned on a symphony concert *at half time*, and from then to the end I had to listen to the fact that the concert was coming from the Royal Opera House, Covent Garden, the works performed, the orchestra's name, together with its leader and conductor, chorus and chorus master, no fewer than six times! Heaven knows how many times in all it must have been repeated. The whole thing was, or is, perfectly ridiculous, and the more so when we remember that it is all in *The Radio Times*, which we are told sells three million copies per week, and is therefore obviously being referred to by the vast majority of listeners. In sporting commentaries the disease is much more virulent, and the repetition of runs scored at cricket, goals at football and, worst of all, that the inside left of such and such a team is "that tall, sturdy Scot," or that "Blankshire opening batsman who, you will remember, scored a century in his first Test," is not less than nauseating. The whole question urgently requires the most serious attention.

Impressions on the Wax

Review of the Latest Gramophone Records

IT has been perfectly obvious during Gigli's recent tour that the magnetism of his singing remains immensely strong; huge audiences have been drawn to his recitals and to Covent Garden. A giant in opera, Gigli is just at home in songs of the carol type, and in selecting the always appreciated "Adest Fideles" and the grand old Austrian hymn "Silent Night, Holy Night" for his latest recording on *H.M.V. DA*1874, he gives us a record which will be eagerly sought after by his admirers.

There are few interpreters of romantic music to beat Artur Rubinstein. This explains why his help was enlisted for the production of the film, "Song of Love," a picture above the average of its kind, dealing with the life and melancholy death of Robert Schumann. Important figures in contemporary German music are represented; among them Brahms, whose life-long devotion to Robert and, after his death, to his widow Clara is a matter of history. The music of the two great composers is very different: Schumann frankly romantic, Brahms restrainedly lyrical over a stout classical basis. I have mentioned "Song of Love" because the latest recording by Rubinstein are the melodies he plays in the film. They are "Traumerei" and "Liebeslied" recorded on *H.M.V. DB*6532.

Record Token Service

A number of readers have written in asking for details of the Record Token Service run by His Master's Voice. The Service was introduced in 1939, but owing to the shortage of record supplies was temporarily suspended in 1942. During its short existence many thousands of pounds worth of tokens were sold. It had been readily accepted as an ideal form of making gifts, and the reasons for its favour with music-lovers are not far to seek. Gramophone records, even more than books (that other class of gifts closely associated with tokens), are fragile things, difficult of transport. Moreover, it is a chancy proceeding to give records unless the taste of the recipient is intimately known. The tokens enable you to get round these obstacles in record-giving. The receipt of a record token enables a man to call at his music shop and order precisely what he most wants up to the face value of the token. Details of the service, and specimens of the attractively decorated tokens, can be had from your nearest "His Master's Voice" dealer.

A Novel Challenge

When Peter Dawson arrived in London in September, he remarked to reporters that the popularity of crooners among Australian "bobby-soxers" disgusted him. Very naturally, a howl of rage arose from the admirers of the American style, and Dawson has been challenged to a radio singing duel, he to sing two numbers and then two recordings in crooner style to be played. Listeners will judge. The duel will be on when the veteran ballad-singer returns to Australia after his English tour. During this recent tour Dawson has started to make records again, after an interval of some years. The great recording artist—he has made over 3,000 immensely popular records for "His Master's Voice"—is incontestably in as fine voice as he ever was, and this new addition to his long and steady output will be heartily welcomed. "Fret-foot" is a song of his own composition; he composes under the pen-name of "J. P. McCall," whilst on the reverse side of *H.M.V. B*9592 is "Walk Down the Road."

"Peter Grimes"

Benjamin Britten's opera "Peter Grimes" is derived from the poem "The Borough," by George Crabbe. Crabbe was born at Aldeburgh, on the Suffolk coast, and his poem deals with the life of a small fishing and shipbuilding town. Britten is also an East Anglian (he was born at Lowestoft, within sound of the sea). "My life as a child," he relates "was coloured by the fierce storms that sometimes drove ships on to our coast and ate away whole stretches of the neighbouring cliffs. In writing 'Peter Grimes' I wanted to express my awareness of the perpetual struggle of men and women whose livelihood depends on the sea." The orchestral interludes are fully understood only when heard in their context, but at the same time their inclusion in concert programmes does give a taste of the magnificent score Britten prepared for this opera. He has identified himself completely with Crabbe's poem, and the sound of the windy sea is always behind the drama of the little fishing town. The orchestration is superb; there are effects so telling and yet so simple technically that Britten's work must be considered one of the most important operas ever to come from a British composer. The opera has been recorded on *Columbia DX*1441-2 by the London Symphony Orchestra under the able baton of Sir Malcolm Sargent.

Dance Music

All the latest up-to-the-minute tunes have been recorded in the recent releases, including "I wish I Didn't Love You" and "Peg o' My Heart," played by Geraldo and his Orchestra on *Parlophone F*2255; "An Apple Blossom Wedding" and "Sleepy San Benito," played by Jimmy Leach and his New Organolians on *Columbia, FB*3358, and "South America Take it Away" and "That's My Desire," played by Joe Loss and his Orchestra on *H.M.V. BD*5990.

Following their interpretation of Tchaikovsky's "Nutcracker Suite" (*BD*1182-4), Spike and the City Slickers are back again this month with two recordings in the comedy vein.

The "Puppy Love Song," sung by tail-waggers, Dr. Horatio Q. Birdbath, George Rock and Sir Frederick Gas, is a saga of a romantic interlude between a Pekinese and another dog, appropriately—if somewhat boisterously—interrupted by Spike's three vocal confederates.

"Pop Corn Sack" is a delicious satire on those filmgoers who insist on crunching popcorns, and paper, during a dramatic movie scene. The record is *H.M.V. BD*1188.

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).

All-wave Three

SIR,—Having just returned from overseas I had, as you can guess, quite a pile of PRACTICAL WIRELESSES to sort through, and being very keen on S.W. listening I decided on building the All-wave Three of December, 1944, and on behalf of your magazine would like to thank the designer for marvellous results obtained. Herewith a few results:

20 metres, 'phone: HK3BF, HK3BJ, FA8BG, HK1DZ, XACP, FF8FP.

40 metres, 'phone: ZS6DN, W7GRL, VP4TS, CM2LT.

I am using Cossor VSG220 for H.F., Marconi LP2 triode detector and Marconi KT2 pentode output, with Premier 4-pin coils. May I also take this opportunity of thanking you for a splendid mag. Keep up the good work!—A. BLAIR (Farnham).

Ex-R.A.F. Equipment

SIR,—I have seen many letters expressing gratitude for the fine bargains obtained in ex-Government radio and radar equipment, but, although these may seem to be bargains to the average man in the street, I wonder what many satisfied buyers would say if they knew the huge profits made by the trade on this stuff. Here are some examples:

Cost to Trade	Sold to public	Profit
Valves, all sorts, 3s.	6s.	100 per cent.
V.H.F. receivers, with rotary converter, complete with valves and ready for use, 12s. 6d.	£5 12s. 9d.	900 per cent.
C.R. tubes, complete with all valves and power unit, £1 5s.	£4 15s.	400 per cent.
R1116 receivers, £3 10s.	£12	400 per cent.
L.F. M. and S. wave 8-valve C.M. receiver, with power pack, £5:		
Receiver	£11	
Separate power pack.. ..	£3 10s.	300 per cent.

These are just a few items and I know of people who bought this stuff and I have seen it being sold at the prices as stated. If one considers that a trader usually gets a profit of 33⅓ per cent., I call this real black-marketing, and I would suggest that the public gets a chance to buy direct, instead of allowing traders only to attend the sales.—K. A. ROOSENBURK (Liverpool).

SIR,—Regarding Mr. J. A. Brockie's letter in the January issue, the power plug on the front of the receiver of the set, No. 18, Mark III, to which he is referring, couples the receiver to the transmitter, and the connections to this plug are: Pin No. 1, aerial; pin No. 2, G.B.—; Pin No. 3, L.T.+; Pin No. 4, H.T.+; pin No. 5 (centre pin) (L.T.—, H.T.—).

Please note that this set is not operated on 120 volts H.T., but from a 162-volt battery, tapped at 12 volts for grid bias.

The L.T. supply also is normally contained in this battery, but a 2-volt accumulator is quite adequate for this purpose.

I have a limited number of circuit diagrams, lists of component values and other information regarding this receiver, which I shall be pleased to pass on to any enthusiast.—B. E. HARRIS (12, Hillside Road, Harpenden, Herts).

Receiver R1147A

SIR,—Could any reader come to my rescue? I have recently purchased an ex-R.A.F. receiver, type 1147A, but have been able to obtain no information whatever concerning it. The R.A.F. are unable to supply me with their handbook relating to the receiver and thus I am at a complete loss regarding the information necessary to put it into operation. If any reader has the relevant Air Ministry (or other) publication relating to the set, or its associated control unit, which he is prepared to sell, or to lend me for a few days, I should be extremely grateful to him.

May I take this opportunity of congratulating PRACTICAL WIRELESS upon the fine job it is doing in spite of the paper shortage.—W. F. JACOBS ("Trehaven," Stapler's Road, Newport, I.W.).

Information Wanted

SIR,—I have an ex-R.A.F. 4-valve short-wave (communications type) receiving set. It is a Model 3 Mark II. I believe it was used in the "resistance movement."

Could any reader please give me any information regarding it? What sort of aerial should I use? It is used for L.R. 'phones; can I use a speaker with it? Are any alterations necessary for speaker use?

It is very good indeed on an ordinary horizontal aerial. I get Radio Australia, Canada and many U.S.A. stations on it. I also receive Manila (Voice of Phillipines) and dozens and dozens of others. I would welcome any letters about it from readers who have one. Specification, I think, is 4-valve communications receiver, covering 3-16 Mc/s. in 3 bands, using 2 7R7 and 2 7Q7 loctal valves, mains 9-100 at 8-10 mA., 6.3 v. L.T., 4½ v. G.B. At least, that's what someone told me.—PETER P. B. SKIVINGTON (16, Banood Road, Enfield, Middlesex).

SIR,—I have a German radio which I cannot get working. It is a Telefunken 612 GW. This is an A.C. and D.C. set, with the usual valve heaters wired in series with barretter. It also has a transformer inside; this I take it is for A.C. operation. The trouble started when the correct barretter got broken.

EU VI 220/240 v.
EU VII 110/130 v. ?

This I take it is for working on 220-240 v. A.C. The correct barretter for D.C. working is EU VII 110/130 v.; both of these are marked on the back of the set.

The barretter which was supplied in place of the broken one is a Valvo C10 IP20 Wehrmacht.

When this was placed in the set the filament of the rectifier valve burnt out, which to me proves that it must have been an incorrect replacement. However, if anyone can help me with the valve data, I might be able to fix it up.

Valves for set as per diagram on set :

EU VI 220/240 v. (A.C. barretter) } ?
EU VII 110/130 v. (D.C. barretter) }

Telefunken AZ1, 4 volt { Bie Gleichstrom. Widerstand. Bie Wechselstrom. AZ1.

Telefunken Valvo CL4
Telefunken CF7
Replacement barretter, Valvo C10, 1P20.

The set is to be used on A.C. 230-250 v.—F. L. MEDHURST (88, Marsglas Crescent, Newport, Mon).

SIR,—Can any reader please give me the answer to my valve puzzle? I have no particulars as to types or wiring of base; a friend tells me that they are American base valves, but they will fit an English base (octal) if the centre is filed out.

Valve one is marked ZA7023, ARP12; has six pins and a top cap and lights up with 2 volts applied (metallised). Valve two: only marks are on electrode support, viz., T 350 PRP; has 8 pins and top cap; has two plates inside which are connected to the top cap and lights up with 2 volts applied. On both valves the locating spigot measures 11/32in. I would be very grateful for details of the types of these valves and the valveholder connections.—H. A. STAINSBY (27, Dipton Avenue, Newcastle-on-Tyne 4).

SIR,—Could any reader supply me with information about an Austrian valve, S.D.2?—R. E. TURNER (179, Branstone Road, Burton-on-Trent, Staffs).

Ex-Service Cathode-ray Tubes

SIR,—Thanks for publishing my letter in the December issue, and thanks very much to S./Sgt. L. J. Avery for the information he gives, and also to H. G. Weatherhead for calling my attention to the article in the April issue. But the ACR 10 lights with a green, not a blue, glow. The General Electric Co., Osram Valve Dept., Kingsway, inform me that the ACR 10 is not exactly the same as their 2¾in. tube, but the contacts are the same. They also informed me that the Army 6in. tube, VCR97, is the equivalent of their E4504-B-16 6in. tube.

Readers who have purchased ex-service indicator cathode ray units are well advised to examine the set-up presented by the Admiralty to the Science Museum, South Kensington (first floor), and they might perhaps recognise some pieces of equipment that they have bought, all assembled and explained, and also visit the Electronic Exhibition on the ground floor.

One of the Admiralty sets includes a VCR97 indicator unit with time base. This set in turn is only one piece of a set of equipment so complex, and with so many units in it, that anyone can see at once that it is out of the question thinking of using any one of the units for their original purpose, either the receiver unit—which also includes the indicator unit power pack—or any other. But each one must be dismantled and rebuilt to a less cumbersome and involved design. In other words, ex-service equipment for the main part is only useful for the valves and parts one can get out of them.—WM. J. LAW (Ealing).

Speaker Networks

SIR,—Thanks are due to yourself and to Mr. Kemsey-Bourne for further information of speaker filter networks in January issue.

Could I add a little further useful information?

I see no objection to making the chokes iron cored, thus reducing the number of turns needed and also the resistance of the choke winding.

I use a mains transformer core of about 2in. square and 50 to 80 turns tapped every 5 turns for fine balancing.

Mr. Bourne's method of matching unlike units should interest many readers—as I myself have had many letters asking a similar query.—S. I. HOLT (St. Annes).

Assistance Required

SIR,—I wonder if any of your readers can assist me to identify the leads of the Canadian "58" "walkie-talkie," as I have only the instrument but no accessories. I have succeeded only in finding those of Rx section up to now.

Also, particulars required of the ex-army TX/RX No. "19" and where circuit diagram may be obtained!—THOMAS WILLS (43, Tideswell Road, Firth Park, Sheffield, 5).

Cathode Follower Amplifier

SIR,—Some time ago my attention was drawn to a new type of amplifier in which the output (loudspeaker) was taken from the cathode circuit of the push-pull valves. As it was claimed that this gave quality superior to any form of amplifier then in use, I decided to try it out with equipment which I had by me. I connected everything up and was greeted by the most appalling distortion, which soon ceased when the mains transformer broke down. I spoke to one or two friends about this, and then was told that a special mains transformer is required. I have not seen any circuits on this scheme, and wondered if any readers had experimented with such a circuit and what results have been obtained. It seems to me that if it is possible to obtain by this means quality superior to any other arrangement, then surely it should be popularised.—J. PORTER (Colindale).

Remote Control System

SIR,—Many thanks for the idea in your September issue on distant control. I built up this, with a little modification to suit a special type of ex-government switch in my box, and it really works fine. I appreciate radio programmes much more now, as it is not necessary to run from room to room to switch on and off. It is these little ideas and gadgets which make radio so interesting. Thank you again.—W. A. CONQUEST (Harrow).

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KITS of Radio Receivers from £7/8/0, 4 and 5 valve. All new materials. Table Models, Semi-Midget. Our latest Kit—Wylwyn Star 1948—has connections for Gramophone Pick-up and extensions to Loudspeaker. A.V.C. 6 hours average time for constructing. Full details and diagrams with each kit. C.W.O. or C.O.D.—Isherwoods, Rene House, 81, Plungington Road, Preston, Lancs. Tel. : 3348. Estd. 1936.

OSMOR A.C./D.C., 3-wave 5v. superhet receivers, excellent reproduction and sensitivity, attractive cabinet, early delivery, shipping wave-band if required. Write for literature. Trade inquiries invited.—Morgan, Osborne and Co., Ltd., Southview Road, Warlingham, Surrey.

NATIONAL RADIO SUPPLIES. Bournemouth's new style radio components shop. Everything for the constructor, amateur and experimenter. New components and ex-Govt. lines always in stock with something new each week. A large selection of chassis, cabinets and components to choose from. Denco & Raymart stockists. Send for 10-page catalogue, 2½d. post free from National Radio Supplies, 69, Holdenhurst Road, Bournemouth 5232.

OSCILLATOR KITS. 4 wave bands, modulated, BTX model, 75/-. A.C./D.C. model, 98/6 complete, including metal chassis, panel, components, valves, all new, " Coils and Switches Ready Wired," circuit, wiring diagram. Details of both models, 2/-.—Lee, 49, Booth Farm Road, Birmingham, 22.

R1585 WESTERN ELECTRIC RECEIVERS. 34-58 mc/s, 12 valve midget using 6AK5, 9001, 12A6 and EBC33 valves. Brand new and complete with valves and remote control unit less connecting leads, £5 ea., carriage paid. Receivers only, complete less valves, 50/- ea., or partly stripped chassis containing 4-g. tuning unit 7, and complete wiring for 4 RF stages, 10 button type VHs and screens, etc., 17/6. P.A. type speaker units, P.M. 3 ohms, for horn speakers, approx. 20 watts. Brand new, 25 - ea. CR tubes, brand new, 6in. elec. VCR97, £5. 5in. mag. 5FP7, 45/-. F and D coils to suit, 15/-. 3in. elec. 3FP7, 30 -. Bank of 12 MW dust tuned coils, 18 -. Bulgin panel lights, red or amber, 1/9. Other types, green, blue or clear, 1/3. 12 assorted vols and vcs, long and short shafts, 500 to 1 meg., brand new, 11/6. 12 assorted transformers, standard output, PP, mike H and L ratio, intervalve, etc., all brand new and fitted tags and panels, including 9 midget types and 9 standard or larger, worth £6, our price 24 - lot. 6 assorted LF chokes up to 120 mA., 12/-. 6 assorted HF and UHF chokes, 3/-. Assorted Res. and cons., brand new onpax panels, mica, silver mica and tubular and ½ to 5 w. resistors, 72 for 12/-. Coloured knobs, 2/- doz. Intercommunication telephone sets, 19/6 ea. S.A.E. for lists of numerous other bargains. H. English, The Maltings, Rayleigh Rd., Hutton, Essex.

PRATTS RADIO

1070 Harrow Road, London, N.W.10
(Nr. Scrubs Lane) *'Phone : LADbroke 1734*

AMPLIFIERS. College 10 watt A.C. 4-valve, mike stage, twin inputs and faders ; output matches 3, 8, 15 ohm speakers, £8 18/6. A.C. D.C. 10 watt 6-valve P.P. output, with case, £12/12/0.

ACE ASO Receiver. We can supply this popular set as a chassis and speaker for use in existing radiograms, etc, 3-waveband A.C. pamphlet available. 5 valve, price £18/5/9 inc. tax).

TRANSFORMERS. Mains 350-0-350, 4v., 4v. or 6v., 5v., 26/6 ; shrouded, 28/6 ; 150 mA. 35/-. Output Transformers, midget universal, 5/6 ; Pentode, 5/9 ; 5 watt multi-ratio, 7/6 ; 30 watt, 23/6 ; intervalve midget, 3-1, 6/3 ; 5-1, 6/6 ; class B Driver, 7/6.

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