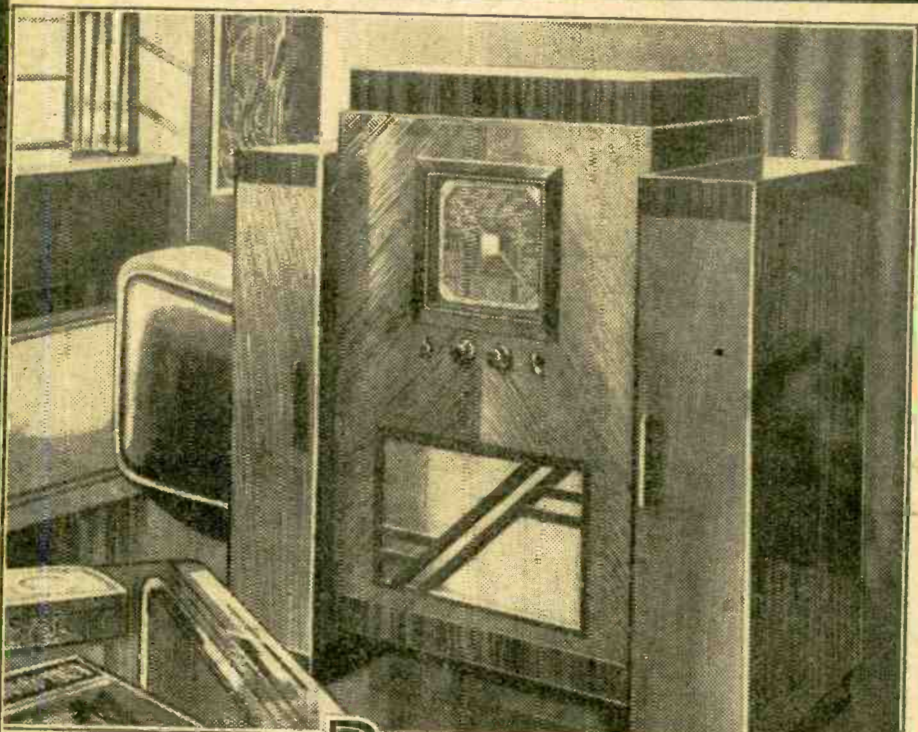
FITTING A "BABY ALARM"

1/-

Vol. 28. No. 548
JUNE, 1952

EDITOR:
F. J. CAMM

PRACTICAL WIRELESS

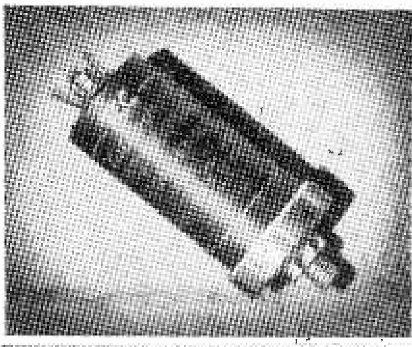


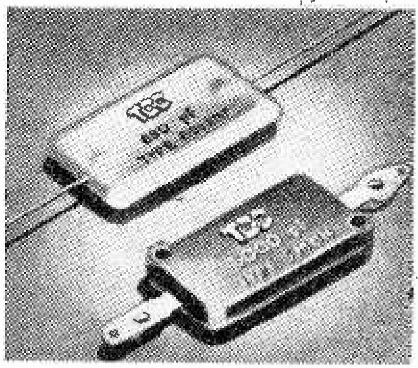
BUILDING THE PW 3-SPEED AUTOGRAM

IN THIS ISSUE:

CONDENSERS

The abbreviated ranges of two popular types given here are representative of the wide variety of T.C.C. Condensers available.





'VISCONOL CATHODRAY' CONDENSERS

Cap. Range: ·0005mfd. to 1 mfd.
Voltage Range: 750 to 25,000 at 60°C.

Cap. in µF.	Max. Wkg. at 60°C.	Dimens. (Overall)		Type No.
		Length	Dia.	
·0005	25,000	$5\frac{15}{16}$ in.	$1\frac{3}{4}$ in.	CP.57.HOO
·001	6,000	$2\frac{3}{4}$ in.	$\frac{27}{32}$ in.	CP.55.QO
·001	12,500	3 in.	$1\frac{7}{32}$ in.	CP.56.VO
·01	6,000	3 in.	$1\frac{7}{32}$ in.	CP.56.QO
·1	7,000	$6\frac{1}{8}$ in.	2 in.	CP.58.QO
·25	5,000	$5\frac{3}{8}$ in.	$2\frac{7}{8}$ in.	CP.59.MO

Regd.

MOULDED MICA CONDENSERS

Stacked Foil. Capacities from 50 to 10,000 pF
Voltage Ratings, 350 to 2,500 v. D.C. Working.

MOULDED SILVER MICA CONDENSERS

Capacities from 10 to 10,000 pF.
Voltage Ratings, 350 v. D.C. Working.

WAX PROTECTED SILVERED MICA CONDENSERS

Capacities from 5 to 12,000 pF.
Voltage Ratings, 350 v. D.C. and 750 v. D.C. Working.

THE TELEGRAPH CONDENSER CO. LTD.

Radio Division: **North Acton, London, W.3** *Tel: Acorn 0061*

RADIO MAIL

4, RALEIGH STREET, NOTTINGHAM

INTRODUCING A RESISTANCE-CAPACITY BRIDGE AT 30/- ONLY

Note the following points

LESS THAN ONE FIFTH THE COST OF A COMMERCIAL INSTRUMENT OF SIMILAR RANGE.

THREE CAPACITY RANGES, TESTING UP TO 50 MFD. THREE RESISTANCE RANGES, TESTING UP TO 5 MEGOHMS.

EASILY AND QUICKLY ASSEMBLED WITH THE SIMPLE INSTRUCTIONS AND CIRCUIT DETAILS SUPPLIED.

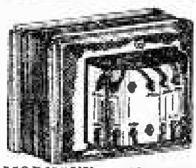
NO CALIBRATING NECESSARY AFTER ASSEMBLY.

ALL CALIBRATIONS, SWITCH RANGE MARKINGS, TERMINAL FUNCTIONS, ETC., READY LAID OUT ON A HANDSOME ESCUTCHEON COVERING THE ENTIRE OPERATING PANEL.

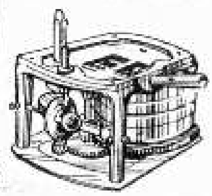
THIS IS THE FIRST TIME THAT AN INSTRUMENT OF THIS CALIBRE HAS BEEN AVAILABLE AT SUCH A LOW PRICE. ORDER NOW WHILE SUPPLIES LAST.

STAMP FOR LIST AND WITH ALL ENQUIRIES PLEASE

DUKE'S



TRANSFORMERS. Mains (Salvage). 260-0-260, 6.3 v., 3 A., tapped for 250, 210, 110 v. Price **12/6.** Post 2/-. Also standard O.P. Trans. at **3/9.** Post 1/-.



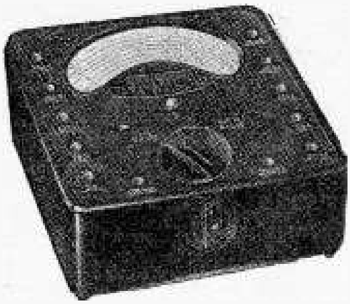
GRAMOPHONE MOTORS. Unused. Made by E.M.I. Need cleaning, but in working order. Complete, but no winder handles. Ideal for building your gramophone, wire recorder, saucepan stirrer, wool, cotton or wire re-winders; or anything requiring a strong spring motor. Speed control down to 33. Two main springs alone worth price of 25/9. Post and packing, 2/3.

VALVES. Salvaged, ECL80, 6AB8, **11/9.** W142, U142, UF41, **10/9.** EF36, EB91, Z77, 6F6, ILC6, 6V6, 77, PP225, 12SJ7, 6F7, ECC31, 37, 6Q7, IT4, IR5, **8/9.** OZ4, Pen220A, VPT210, 8D2, 9D2, 15D2, SP2, KT32C, Pen383, VP133, **6/9.** We are London's largest stockists. Stamp for complete list.

SALVAGE RADIO CHASSIS. Price £7/17/6 each. Write now for details, valve line-up, etc., of these 1952 all-wave radiogram chassis, with latest pin type midget valves, which were made to sell at three times this price. Many satisfied customers. Also Record Changer units. All units tested and guaranteed.

EXTENSION SPEAKERS, 6 in. in new type baffle stand, polished, with metal fret. Price 19/6. Post 1/-. Other types and sizes in stock.

C.W.O. or C.O.D. *Money Back Guarantee.* **DUKE'S** GRA 6677 Stamp for Catalogue. **621, Romford Road, London, E.12.**



'AVO' Precision ELECTRICAL TESTING INSTRUMENTS

Registered Trade Mark.

A dependably accurate instrument for testing and fault location is indispensable to the amateur who builds or services his own set.

D.C. Voltage	A.C. Voltage
0—75 millivolts	0—5 volts
0—5 volts	0—25 „
0—25 „	0—100 „
0—100 „	0—250 „
0—250 „	0—500 „
0—500 „	

D.C. Current	Resistance
0—2.5 milliamps	0—20,000 ohms
0—5 „	0—100,000 „
0—25 „	0—500,000 „
0—100 „	0—2 megohms
0—500 „	0—5 „
	0—10 „

GUARANTEE: The registered Trade Mark "Avo" is in itself a guarantee of high accuracy and superiority of design and craftsmanship. Every new AvoMinor is guaranteed by the Manufacturers against the remote possibility of defective materials or workmanship.

The UNIVERSAL AVOMINOR

(as illustrated) is a highly accurate moving-coil instrument, conveniently compact, for measuring A.C. and D.C. voltage, D.C. current, and also resistance; 22 ranges of readings on a 3-inch scale. Total resistance 200,000 ohms.

Size: 4⅝ins. x 3⅝ins. x 1⅝ins.
Nett weight: 18 ozs.

Complete with leads, interchangeable prods and crocodile clips, and instruction book.

Price: **£10 : 10 : 0**

The D.C. AVOMINOR

is a 2¼-inch moving coil meter providing 14 ranges of readings of D.C. voltage, current and resistance up to 600 volts, 120 milliamps, and 3 megohms respectively. Total resistance 100,000 ohms.

Size: 4⅛ins. x 3⅛ins. x 1⅛ins.
Nett weight: 12 ozs.

Complete as above
Price: **£5 : 5 : 0**

Sole Proprietors and Manufacturers :—
AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
Winder House, Douglas Street, London, S.W.1. 'Phone: VICtoria 3404-9

LASKY'S RADIO

MAINS TRANSFORMERS

All 200-250 volts 50 c.p.s. primary. Finest quality, fully guaranteed.

MBA/3. 350-0-350 v. 80 mA., 6.3 v. 3 a., 5 v. 2 a. Both filaments tapped at 4 volts. An ideal replacement trans. Price 21/-

MBA/5. 350-0-350 v. 125 mA., 6.3 v. 4a., 5 v. 3 a. With mains tapping board Price 27/6

MBA/6. 350-0-350 v. 100 mA., 6.3 v. 3 a., 5 v. 2 a. With mains tapping board Price 22/6

MBA/7. 250-0-250 v. 80 mA., 6.3 v. 3 a., 5 v. 2 a. Both filaments tapped at 4 volts................. Price 21/-

AT/3. Auto transformer. 0-10-120-200-230-250 volts, 100 watts. . Price 19/6

AT/4. Auto transformer. 100 volts and 230 volts. Step up or down. 60 watts Price 9/6

Postage 1/6 extra per transformer.

ACOS REPLACEMENT PICK-UP CARTRIDGES
LASKY'S PRICE 10/6 each. Post 6d. extra.

SPECIAL BUY. BRAND NEW T.C.C. T/V CONDENSERS

32 + 100 mfd., 450 v.w. LASKY'S PRICE 8/6 each. .04 mfd. 12.5 Kv. LASKY'S PRICE, 10/6 each. Postage 6d. per item extra.

EX A.M. COMMUNICATION RECEIVER TYPE R1155 BRAND NEW IN WOOD TRANSIT CASE. Aerial-tested before despatch. Supplied complete with 10 valves. Circuit: B.F.O., A.V.C., R.F. Amp., two I.F. stages, magic eye, etc. 5 frequency ranges: 18.5-7.5 Mc/s; 7.5-3.0 Mc/s; 1,500-600 Kc/s; 500-200 Kc/s; 200-75 Kc/s.

LASKY'S PRICE **£12/19/6**

Carriage (in wood case) 7/6 extra. Full modification data and circuit details supplied.

POSTAGE STAMP TRIMMERS AND PADDING CONDENSERS

Paxolin	Ceramic
3-35 pf. 40-80 pf.	3-35 pf. 40-80 pf.
30-100 pf.	30-100 pf.
LASKY'S PRICE 6d. each, 5/- per doz.	LASKY'S PRICE 9d. each, 7/6 per doz.

550 pf. and 350 pf. Ceramic. LASKY'S PRICE 1/- each, 10/6 per doz.

MINIATURE TWO-GANG TUNING CONDENSERS. Type A. .0004 mfd. With trimmers, and Perspex dust cover. Size: 1¼" wide, 1¾" high, 2¼" deep. ¼" Spindle. LASKY'S PRICE 8/6. Postage 9d. extra.

TYPE B. .0005 mfd. With trimmers. Size as A above. LASKY'S PRICE 8/6. Postage 9d. extra.

GERMANIUM X-TALS. Wire ends. Supplied with circuit. B.T.H. Type. LASKY'S PRICE 3/11 each. Post. 3d. G.E.C. Type. LASKY'S PRICE, 4/3 each. Post. 3d.

NEON TUNING INDICATORS

LASKY'S PRICE 2/6 each. Postage 4d. extra.

CONDENSER SPECIALS

8 mfd. 500 v. w.	3/-
8 mfd. 450 v. w.	2/8
8 × 8 mfd. 500 v. w.	4/6
12 mfd. 50 v. w.	1/-
16 mfd. 450 v. w.	4/11
16 mfd. 500 v. w.	5/3
16 × 16 mfd. 450 v. w.	5/6
24 mfd. 450 v. w.	6/11
25 mfd. 25 v. w.	1/6
20 × 40 mfd. 350 v. w.	6/11
32 mfd. 450 v. w.	5/11
32 mfd. 500 v. w.	6/6
32 × 32 mfd. 350 v. w.	5/6
50 mfd. 12 v. w.	1/9
50 mfd. 50 v. w.	3/9
50 mfd. 350 v. w.	4/11
55 mfd. 350 v. w. A.C.	17/6
12 × 12 mfd. 350 v. w.	3/11
16 mfd. 350 v. w.	2/11

Postage extra.

COILS. Long, medium and short Ae. H.F. and Osc. Wearite type "P." PRICE 3/- per coil. Post 3d. extra. Osmor type "Q." Latest type miniature, dust cored. Price 4/- per coil. Post 3d. extra.

SETS OF BUTTON BASE VALVES. Comprises one each of the following valves: 1R5, 1T4, 1S5, 3S4. Complete with bases. LASKY'S PRICE 40/- the set. Post 1/6 extra.

LASKY'S RADIO, 370, HARROW ROAD, PADDINGTON, LONDON, W.9. (Opposite Paddington Hospital.)

(Lasky's (Harrow Road) Ltd.)

'Phone: Cunningham 1979 and 7214. Hours: Mon. to Sat., 9.30 a.m. to 6 p.m. Thurs., half-day.

TERMS: Pro Forma Cash with Order, or C.O.D. on post items only. Postage and packing extra, unless otherwise stated. All goods fully insured in transit.

Practical Wireless
EVERY MONTH
VOL. XXVIII, No. 548 JUNE, 1952
Editor F. J. CAMM
20th YEAR OF ISSUE

COMMENTS

By THE EDITOR

TV EFFECTS ON RADIO

THE BBC's Audience Research Department, in a recently-published analysis, makes a statement that there is less radio listening as a result of the development of TV, that there is less cinema-going, and less reading. From these facts it is concluded that TV is changing the life of the nation. Some of the conclusions reached are not justified by facts, however. It simply is not true to say that the public is reading less. The circulations of newspapers and periodicals and the sales of books, both technical and non-technical, have never been higher, and it thus must be true to say that the public is reading more, possibly because TV keeps them at home. Owners of TV receivers at present are restricted in programme time and, presumably, they are reading when not viewing or going to the cinema.

According to trade reports, it is true that the sales of TV receivers are now in excess of the sales of radio receivers, but that is what one would expect at the commencement of a new form of entertainment. TV in 1947 was an entertainment which could only be indulged in by the well-to-do and by constructors sufficiently skilful to be able to build a TV receiver. In the short space of four years viewers have grown in numbers from just over a quarter of a million to well over a million and a quarter. It is obvious that as the service expands, the demand for TV receivers will go up. This does not mean that TV will eventually entirely supersede radio. There are certain aspects of each which the other cannot supplant. In other words, sooner or later everyone will own a TV as well as a radio receiver. Radio has continued to expand, as the licence figures show, for 30 years, but there are still some hundreds of thousands of homes without radio. It is obvious, however, that in the passage of time absorption point must be reached and that the demand for commercial broadcast receivers must decline. Money is not now so plentiful that people can afford to scrap a receiver and purchase a new one every two years or so. They are compelled to make everything they purchase last as long as possible. There is no sign that purchase tax will be removed, and therefore no indication that the spending power of the public will be increased for some years to come. This is a fact of which the trade should take cognisance. On the other hand, because of high costs more and more sets are being built by constructors, as the demand, ever increasing, for our blueprints shows. The free blueprint of the Mini-Four, recently presented with this journal, was phenomenally successful, and the demand for components and kits and cabinets from the suppliers has been higher than for any pre-war receiver.

Hundreds of thousands of those who received radio training during the war have entered the ranks of constructors and augmented the demand for components. The industry, which was largely built up as a result of constructor demand, might usefully once again turn to the manufacture of components for constructors and thus make good from this source what they are losing from the sales of receivers.

A large amount of Government surplus equipment is on the market at low prices and constructors are drawing their components from this source. This, however, cannot last for ever.

One good thing has developed from the advance of television and that is the change that has now taken place which separates in important particulars TV and sound broadcasting. For example, the control of TV outside broadcasts and drama is divorced from sound-radio. The two are now under separate control and TV is achieving the self-government and autonomy which its development needs and deserves.

QUERIES

MAY we once again stress that we cannot undertake to answer queries over the telephone. They must be submitted in the ordinary way through the post and be accompanied by a stamped, addressed envelope for reply, and the hints coupon which appears in every issue. We are sure that readers will understand that if everyone with a query transmitted it by telephone the editorial lines would be occupied for twenty-four hours a day and for seven days a week !

Another point. While we are always delighted to help readers encountering problems in the normal course of their radio studies and experiments, we regret that we cannot undertake to deal with modifications of the surplus material which is on the market.—F. J. C.

ROUND the WORLD of WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended February 29th, 1952.

Region	*Number*
London Postal ..	2,407,000
Home Counties ..	1,678,000
Midland	1,773,000
North Eastern ..	1,964,000
North Western ..	1,661,000
South Western ..	1,086,000
Welsh and Border Counties	747,000
Total England and Wales	11,316,000
Scotland	1,135,000
Northern Ireland ..	211,000
Grand Total ..	12,662,000

"Marabu" Equipped with Radio Dolphin

THE 26-ton yacht *Marabu*, which will join in the Newport-Bermuda six hundred miles race on June 21st, has just been fitted by Rees Mace Marine Ltd. with the Pye "Radio Dolphin" marine radio telephone.

The demand for the low cost "Radio Dolphin" sets has increased so much that Rees Mace are expanding their installation and fitting-out staffs in all depots. A "Radio Dolphin" set can now be installed within 24 hours anywhere in Great Britain or the Channel Islands.

Amplification System Accepted

PAMPHONIC REPRODUCERS LIMITED, of Westmoreland Road, London, N.W.9, state that their system of D.S.R. (Delayed Sound Reinforcement) which was recently reported in these columns, has now been approved by the Dean and Chapter of St. Paul's Cathedral and a permanent installation is now under way.

British Radio Aids Baltic Shipping

FOR the benefit of shipping in the treacherous coastal waters around Sweden, the Swedish "Trinity House" has installed V.H.F. radio equipment at certain pilot stations of importance along the coastline. The combined transmitting-receiving equipment, for use within a radius of ten miles, is designed by Marconi's Wireless Telegraph Co., Ltd.

Because of prevailing fogs and other navigational hazards it is often difficult for the pilot cutters to catch pilot-seeking vessels. The new wireless installations will establish a short distance ship-to-shore network, primarily between the pilot cutters and their land stations. At the Bramo lighthouse. off Sundsvall in the Bothnia, a fixed radar station in addition to the V.H.F. communication equipment facilitates manoeuvring in and out of the pilots' waters.

Plessey Social Club

ON Friday, March 14th, Mr. T. White Wilson, executive director of the Plessey company, opened the company's new social club premises at Cricklade Road, Swindon.

The building, with a main hall to accommodate 200 people, provides facilities for billiards, darts, table tennis and card games for the 2,700 employees of the Swindon works.

Twice a week informal dances are held.

Technical Training

MR. A. V. ALLDAY, general works manager of the E.M.I. factories at Treorchy (Rhondda), had a word to say on opportunities for technically trained young men when he spoke at Glamorgan Technical College, Pontypridd, on April 1st.

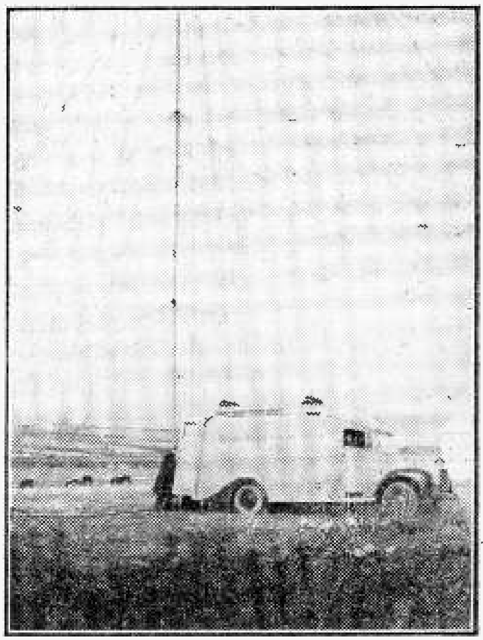
On behalf of the association, Mr. Allday, a member of the education committee of the Industrial Association of Wales and Monmouthshire, was presenting certificates to two engineering students.

Industrial progress in South Wales since the war had been faster than in the London industrial belt, he said, and this meant ever-increasing opportunities for young men with the necessary technical training.

Marconi Apprentices Win Awards

SEVEN apprentices of Marconi's Wireless Telegraph Co., Ltd., who have recently completed courses in the company's training school, have been successful in the 1952 Physical Society Craftsmanship and Draughtsmanship Competition for Apprentices and Learners. The competition has a nation-wide coverage.

The apprentices have gained awards in every class for which they



The Marconi V.H.F. survey team during their first tour covering the mountainous districts of North Wales. The Commer headquarters van, coupled to the two dipoles at the top of the 80ft. mast.

had entered, and were awarded first prizes in all draughtsmanship classes. There were 11 Marconi entries.

In addition, a 21-year-old ex-student apprentice of Marconi's Wireless Telegraph Co., Ltd., George Brown, has won the Whitworth Prize for his performance in the Ordinary National Certificate, 1951, for the Institute of Mechanical Engineers.

The prize is awarded to those who attain more than 90 per cent. in their examination marks, and this year there were only 18 recipients of the prize out of 6,235 entrants in Britain.

Lee Products at B.I.F.

LEE PRODUCTS (GREAT BRITAIN), LTD., will be on show, as usual, at this year's B.I.F. (Stand No. H.17), Olympia, May 5th-16th. Gordon S. Lee, chairman and managing director, states that it will be the sixth successive B.I.F. at which this company has exhibited, and they are the only radio component manufacturers with this record.

The idea was first considered during 1946 when details of a proposed resumption of the annual pre-war B.I.F. were received from the Board of Trade, and it was decided to participate. Results from this and subsequent fairs were astonishingly successful particularly from overseas where substantial orders were received from Australia, New Zealand, South Africa, South America, India, Greece, Turkey, and many other countries. Also, a host of contacts were made, many by Mr. Lee himself, with other possible buyers and agents of numerous nationalities, many of whom were to be seen again and again at subsequent B.I.F.s.

A full range of "Elpico" radio and TV component parts will be exhibited, for which a new illustrated catalogue will be available.

B.S.R.A. Exhibition

ON Saturday, May 17th, and Sunday, May 18th, 1952, the British Sound Recording Association will be holding an exhibition at the Waldorf Hotel, Aldwych, London, W.C.2, from 10.30 a.m. to 6 p.m. on both days. The official opening will be on Saturday, May 17th, at 2.30 p.m., by John Snagge, Esq., O.B.E.

Admission is free to members, and non-members may gain admission by catalogue available at the door priced 1s. 6d., or post 1s. 8d., from the Hon. Secretary, R. W. Lowden, "Wayford," Napoleon Avenue, Farnborough, Hants, after May 1st.

A number of firms will demonstrate high-quality recording and reproducing equipment using disc, tape and wire. Some of the latest types of loudspeakers will also be demonstrated on both days.

Mr. Ian Baxter

MR. IAN BAXTER has been appointed a director of J. Bull & Sons, the mail order house. Mr. Baxter is now in his tenth year with the company and acted as general manager prior to joining the board.

B.I.R.E.

THE following Institution meetings will be held during May, 1952:

London Section. — Wednesday, May 7th, at 6.30 p.m., London School of Hygiene & Tropical Medicine, Keppel Street, Gower Street, W.C.1. An Aerial Analogue Computer. An "Instantaneous" Radiation Pattern Tracer and "Design Apparatus" for Directional Arrays. W. Saraga, Dr.Phil., D. T. Hadley and F. Moss, B.Sc

North-eastern Section. — Wednesday, May 14th, at 6 p.m., Neville Hall, Westgate Road, Newcastle-upon-Tyne. Annual general meeting to be followed by a programme of technical films.

Radio Component Manufacturers' Officers

MR. HECTOR V. SLADE, M.B.E., T.D., A.M.I.Mech.E. (deputy managing director of the Garrard Engineering & Manufacturing Co., Ltd., Swindon), was elected chairman of the Radio & Electronic Component Manufacturers' Federation in succession to Mr. W. F. Taylor (Telegraph Condenser Co., Ltd.). Vice-chairman is Mr. P. D. Canning (Plessey Co., Ltd.) and treasurer is Mr. C. M. Benham (Painton & Co., Ltd.).

BBC Engineering Division Appointments

THE BBC announces the following new appointments in the Engineering Division:

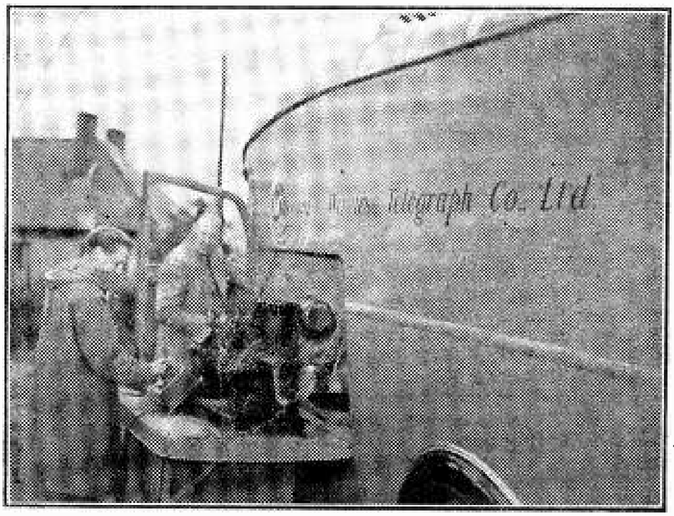
Mr. H. W. Baker, A.M.I.E.E., becomes Superintendent Engineer Television Studios.

Mr. T. H. Bridgewater, M.I.E.E., becomes Superintendent Engineer Television Outside Broadcasts.

Mr. H. Walker, O.B.E., A.M.I.E.E., becomes Head of Technical Operations, Television Service.

Mr. M. H. Hall becomes Engineer-in-Charge Television Studios.

Mr. W. D. Richardson becomes Engineer-in-Charge Television Outside Broadcasts.



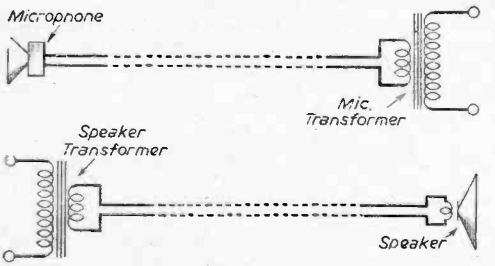
Two of the engineers preparing the generator plant on its special table at the side of the Commer headquarters van, shown opposite.

Fitting a "Baby Alarm"

DETAILS OF THE ARRANGEMENT AND THE VARIOUS METHODS WHICH ARE AVAILABLE

By W. J. Delaney (G2FMY)

MANY readers have a child who may need attention during the evening and find that their radio pleasures are restricted due to the need for having the volume turned so low, in case the child cries or calls for attention, that the strain of listening for a call above the radio becomes unbearable, and in many cases they have to deny themselves of the pleasures of the evening programme. Others try to listen, and in a break in the broadcast hear the child screaming, probably due to the fact that it has been crying for some time. The use of a



Extension leads from room to room should always be on the low (impedance) resistance side, whether in the input or the output circuit.

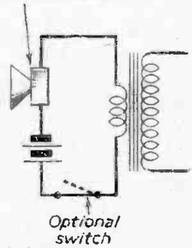
"baby alarm" overcomes these difficulties and is adopted by many listeners, and details have been touched upon from time to time in these pages. Briefly, it consists of some device by means of which the child's call can be heard above the radio signal—either as a separate reproduction, or superimposed on the broadcast, and it is fairly simple and costs very little to fit. In essentials it consists of a microphone which may be suspended over the child's bed or cot, or placed on a suitable stand near the sleeping place, and it is coupled to an amplifier and loud speaker. As the normal broadcast receiver contains both the amplifier and the speaker, it is obvious that it may be possible to make use of these and this leaves only a microphone to be obtained. Unfortunately, however, some radio circuits do not lend themselves to the combined simultaneous use, and a separate amplifier and speaker then may become necessary. However, let us examine the position stage-by-stage.

Microphones

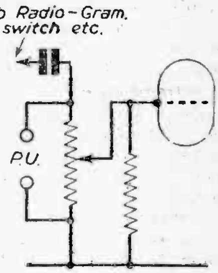
Firstly, the microphone may be of any desired type, and there are two which are simplest and most popular. These are the carbon or transverse current, and the moving-coil. The former consists of a container housing carbon granules which are moved by the movement of a diaphragm, and a current flowing through the carbon is thus modified or varied as the resistance of the carbon varies. The moving-coil operates in the same manner as the modern moving-coil loudspeaker, only in the reverse direction. The diaphragm moves a small coil which is suspended in a magnetic field, and the current through the field is varied by the moving coil. There are other types, but they are more expensive and are not needed for the present purpose. It is obvious that we are not concerned with high quality, and anything which will transfer any noise near it to the loudspeaker in the distant room will be sufficient signal to indicate that attention is needed. Ex-government components of both types are readily available, but it must be remembered that with the carbon type a current must be passed through it and this calls for a battery. As most ex-government items are sold without any technical data, the exact voltage which must be applied will have to be determined by experiment, but it is usually between 4.5 and 9 volts. Ordinary flash-lamp or torch cells may readily be used and the current taken is very small so that they last quite a long while. If it is desired, a switch can be placed in the battery circuit so that it may be "opened" during the day and thus the drain reduced, but this is hardly necessary with most types of microphone.

Input Circuit

The output from the microphone has to be fed to a valve and the grid circuit of a valve is of high impedance. Carbon microphones are of low impedance, but moving-coil mikes may be of either low or high impedance, and thus the first requirement here is a matching transformer. Small microphone transformers are also available ex-government as well as new, and the ratio will again have to be found by experiment. Once more, as quality is not a consideration, accurate matching may be dispensed with, but a low-resistance mike must have a transformer between it and the amplifier. As long leads in a grid circuit will pick up hum and perhaps interfere with performance, it is desirable to mount the matching transformer right on the amplifier chassis, as close to the valve as possible and this means that any leads running between the two rooms will be on the low-resistance side. As there may be a battery in this circuit, or in any case, in view of the low impedance



Biasing is carried out as shown here.

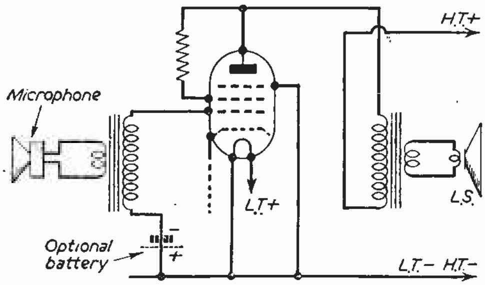


Some pick-up sockets are wired in this manner.

of this part of the arrangement, the wires from the mike to the amplifier should be fairly stout, parallel-laid plastic-covered bell-wire being ideal. Do not use thin instrument wire (cotton or double-cotton covered), and try to avoid running the wires parallel with any A.C. electric-light wiring.

Using a Broadcast Receiver

We must now consider the amplifier, and in many cases, as already mentioned, the broadcast receiver may be called into use. Many receivers (especially older models) have a pair of pick-up terminals or sockets on the back, to which a gramophone pick-up may be joined, and no radio-gram switching is provided. With this type of receiver one is expected to detune the radio when listening to records. In this type of set, the secondary of the mike transformer is just plugged into the pick-up sockets and any noise picked up by the microphone will be heard over the radio signal when the receiver is working. If a faint cry is too weak to be heard



An amplifier for either battery or mains use may be made up on the lines shown here.

above a loud signal, the mike will have to be placed closer to the bed or cot, and if this is not satisfactory a separate amplifier will have to be used. Some receivers have radio-gram switching, and these may be used provided one switches periodically from radio to gram. This is obviously not so convenient as those receivers in which the mike is permanently connected. An examination of the radio circuit may show that the mike transformer secondary may be joined across the volume control in a permanent position, where the radio-gram switch does not have any effect on the radio. Usually, the L.F. volume control operates on both radio and gram., and the switch in many cases merely short-circuits the radio input, and thus anything across the volume control will always be in circuit (Fig. 4). In many cases the inclusion of the transformer secondary will not seriously affect radio reproduction. In extreme cases it may be necessary to make up an adaptor which may be plugged into a valveholder on the L.F. side, and in which a lead may be connected to the grid socket. In this way the valve may be reinserted in the top of the adaptor and the mike thus connected to a suitable point.

If there are no pick-up sockets (such as is the case in many D.C. receivers) it will be undesirable to connect the microphone transformer without first making certain that there is no risk of one of the feed wires becoming " live." By connecting the secondary direct to the chassis as already mentioned, and only running the primary leads to the distant point, however, there should be little risk, as these wires are isolated from the receiver.

Separate Amplifier

If a separate amplifier has to be built up, this may be either battery or mains operated, and the same principles as with the receiver will apply. The loudspeaker has to be matched to the output valve by a transformer, and the primary is joined to the output valve and thus carries current. Obviously, therefore, the leads here should be as short as possible to avoid loss, and therefore the output secondary should be the extension line. This has little effect upon the matching, as the low-impedance output is usually only a matter of a few ohms and a fair length of twin bell-wire may be added without seriously affecting volume.

The other great advantage of extending the input side of the mike transformer, and the output side of the speaker transformer is that it is less likely to pick up hum which might drown weak signals. If, however, it is found that the long mike leads have to be run in such a manner that hum is introduced it may be necessary to use a screened pair, but in most cases the additional expense of such leads will not be justified.

Books Received

" **Microphones**," by the staff of the Engineering Training Department British Broadcasting Corporation. Published by Iliffe and Sons Limited, price 15s. (postage 5d.). Size D8vo. 8¾ x 5½, 114 pages, 78 illustrations. Cloth bound with jacket.

THIS book, originally written as a textbook for use in training BBC engineers, has now been made available by the BBC for general publication. It will prove of great interest and value to all concerned with microphones in sound engineering, in which field the Corporation's engineering division has, of course, gained an almost unique experience over many years.

The book should be of particular value to students, but its specialized nature assumes that the reader already has a basic knowledge of electrical engineering and, in particular, of alternating current theory.

" **Wireless and Electrical Trader Year Book** : Radio, Television and Electrical Appliances," 1952, 23rd edition. Published at 10s. 6d. post free (with a reduction to subscribers to *Wireless and Electrical Trader*) by Trader Publishing Co. Ltd. Size D8vo. 8½in. x 5¾in., 264 pages. Bound paper boards.

SINCE the " Wireless and Electrical Trader Year Book " was first published in 1925, it has become firmly established as the retailers' invaluable reference book to the radio and electrical industries.

In the 1952 edition, data of practical use to dealers in the new television areas and general reference and technical information have been carefully selected. Features include condensed specifications of current 1952 commercial television receivers (with such valuable facts as valves used, I.F. values, etc.), and information on valve and cathode-ray tube base connections, with over 200 valve base diagrams. These alone are invaluable to radio and TV service engineers.

Presenting Technical Information*

AN ACCOUNT OF EFFORTS TO ACHIEVE STANDARDISATION OF TECHNICAL TERMS, ABBREVIATIONS AND CIRCUIT PRESENTATION

By John Scott-Taggart, M.I.E.E., M.I.Mech.E., F.Inst.P., F.I.R.E.†

THE need to "talk the same language," first realised by our arboreal ancestors, led to only the most moderate success. The Tower of Babel—or lack of adequate communications—prevented prehistoric grunts from developing into a universal language. With less excuse, fifty years of radio have failed to produce a universally agreed technical vocabulary even in the English tongue. Vigorous attempts, however, are now being made to stop the rot. This article sets out some of the standards we are told to follow in our use of technical terms, abbreviations, mathematical and graphical symbols, and in our presentation of circuit diagrams.

Nobody really enjoys being regimented, but the complexity of modern society has made us readier to accept rules and regulations; a generation that agrees to spending three months in gaol for sprinkling sugar on a doughnut should not cavil at a few technical rules. Who makes these regulations and what is the penalty for breaking them? The chief authority in this country is the British Standards Institution whose committees include representatives of the Fighting Services, the Post Office, Ministries, Industries, and Old Uncle Tom Cobley‡ and all. After incredibly long periods of gestation, booklets and pamphlets emerge and are sold at an incredibly high price. Probably not one in ten thousand technicians has ever seen one of these precious publications. A major tactical blunder has been the failure to consult adequately with and obtain the co-operation of technical publishers. The result is that few, if any, electronic journals and textbooks adhere completely to the Standards. Obviously, the publishers either disagree with the decisions or allow a wide discretion to their authors. In addition to the B.S.I. there are standards committees of large public bodies such as the Fighting Services, the Post Office, the BBC and the various learned societies such as the Royal Society, the Institution of Electrical Engineers (I.E.E.), the Institute of Physics. These bodies have, in the past, made parochial rules which have sometimes conflicted with the B.S.I. or with each other, but in major matters they are becoming increasingly willing to agree.

As regards enforcement of the rules, the Governmental bodies can rely on their disciplinary powers. The learned societies either edit the manuscripts or compel their members to alter them. Even the most influential scientist would have his paper rejected if he refused to comply. Many learned societies now issue booklets on the preparation of papers—and these are so fearsome and intimidatory that some independent spirits might tend to lose heart.

In general, radio and electrical concerns go their own way, using their own terms, circuit conventions etc. Clearly, a great deal of propaganda will be necessary to change this chaos. Firms having contractual relations with Government departments are being urged to keep to the standardised conventions; it is clearly undesirable that commercial blueprints and handbooks should differ in presentation from the Service handbooks. The Services and the Post Office have always tried to give some sort of unity to their publications, even if the unity has not been like anyone else's unity. The Navy clung desperately to the jar as its unit of capacitance, as if blind to the use of the microfarad by the rest of the world. It needed an Admiralty Fleet Order of 1937 to admit the microfaradic wine to the old bottles.

Periodically, the tired bleat arises: "Does it really matter?" No more, perhaps, than if every member of the Fighting Services designed his own uniform (a privilege confined to American five-star generals). No one wants to change the technical phraseology habits of a lifetime, and sales-resistance to standardisation is in the megohm range. Authors and publishers of textbooks may have their works rendered old-fashioned overnight by the publication of a new standard.

On the whole, the committees are human. They "prefer" certain terms without anathematising common alternatives. A much stronger line is taken as regards graphical symbols; the symbols are printed and you must use them. Abbreviations (e.g. db, kc/s) are likewise laid down. The learned societies go further and give rules for spelling and punctuation and tell you when to spell out words in full.

It is now much too late to say you disagree with some of the standards decisions. We all disagree with some and the "standard" is usually the result of a compromise. Some decisions cry aloud to Heaven for amendment and in about ten years' time they will, no doubt, be altered. Meanwhile, we must take the rough with the smooth. A start must be made somewhere and to condemn standardisation because one disagrees with an occasional decision, or because one feels finality has not been reached, is like objecting to the rule of law because the law will later be altered. Most of the published decisions will hold good for many years. The chief trouble is that our standards are being constantly bedevilled by the Americans. As they publish many more technical books than we do and as their research facilities are so colossal, the pressure of transatlantic conventions is almost overpowering. In the end they often win the day (our shining new word radiolocation was no sooner minted than it was ousted by radar). Unfortunately, the best American conventions are often better than ours.

Spelling

Rules for spelling have been laid down by most bodies, but there is no single universal standard. Some authorities use the ending -ize and others -ise, some -exion and others -ection. All these endings are correct, but should clearly be consistent in a book or journal. Some think -ize and -exion give "tone";

* *Based, by permission, on an article by the same author in the "Naval Radio and Electrical Review."*
† *Admiralty Signal and Radar Establishment.*
‡ *Also spelt Cobleigh, Coblegh—another case for standardisation.*

others dislike these endings because they are unnecessary educational traps and are regarded as snobbishly archaic. Many printers insist on these endings and will alter your spelling without your permission.

The suffix " ize " is used (if at all) where it derives from the Greek (e.g. realize, harmonize, economize, recognize, minimize, polarize, ionize, synchronize, synthesize, stabilize) and in invented words. Never should the following words be terminated with -ze :

advise	disguise	incise	premise
analyse	electrolyse	mortise	prise
comprise	excise	paralyse	revise
despise	hydrolyse	practise	supervise
devise	improvise		

If, therefore, you favour -ize, you must remember the above exceptions. Thus, " harmonic analyzer " is wrong. The ending -exion is optional in reflexion, inflexion, deflexion, connexion ; the Institute of Physics insists on -ize and -exion ; the I.E.E. likes -ize but insists on reflection, inflection, deflection, connection ; B.S.I. use -ize but not -exion.

Compound words are the biggest headaches. The history of terms consisting of two words follows a pattern : The words are first separate, then hyphened, then joined. This has happened to headmaster and waveguide but, absurdly enough, the time must be ripe for each step. If, like most Americans, we boldly joined words together we should avoid present anomalies. Why, seven years after B.S. 204 : 43 spelt it waveguide, should the Institute of Physics insist on wave-guide ? And why should B.S.I. use wave-trap if it likes waveguide ? Why carrier wave and spacing-wave ? On the first page of the Inter-Services Glossary we have radio-telegraphy, radio communication, telecommunication. Why does not the B.S.I. adopt afterglow, timebase and flyback (after all, they give feedback, flashover and even pushbutton) ?

A hyphen is usual in adjectival terms such as maximum-voltage setting, low-resistance path, solid-dielectric plug ; a plurality of hyphens may be necessary, e.g. barium-oxide-coated cathode. Hyphens are becoming increasingly popular but one wonders whether " 5-Y battery " is justifiable although " 10-amp fuse " is commonly found. These hyphens are correct only when the terms are adjectival. There seems to be a case for nouns such as series-resistance, dielectric-constant, tuning-capacitance, hand-capacitance.

There is a growing tendency to use lower-case (small) letters instead of capitals in abbreviations such as e.m.f., a.c., d.c., r.m.s., p.d., h.t., l.f. The B.S.I. favours capitals, but they are fighting a losing battle ; the Royal Society and the I.E.E. require lower-case letters to be used. Incidentally, the I.E.E. favours spelling-out units, e.g. 5 volts, 300 ohms. Other than technical considerations are sometimes involved. The insertion of Greek letters is an additional printing expense. The aesthetic appearance of a page is sometimes a consideration ; some publishers dislike the percentage sign % and use per cent. The absence of Greek letters on most typewriters discourages the use of Ω in reports, although μ can be faked by the typist. There is a convention that the initial letter of a lower-case abbreviation should not be a capital ; this means that A.c., E.m.f., L.f. are undesirable and a sentence may have to be recast to avoid starting in this way (e.g. after a full-stop) ; in fact, it is usually undesirable to begin any sentence with an abbreviation.

Technical Terms

Changes in some terms are inevitable. When an art settles down, the technical terms, hurriedly suggested perhaps by an inventor, are found inadequate or even vulgar. Radio has long since shed its swaddling-clothes but many of its nurses are still alive ; it is not surprising that much of the baby-talk has survived. There are few terms which could not be hotted-up, but usually at the expense of brevity.

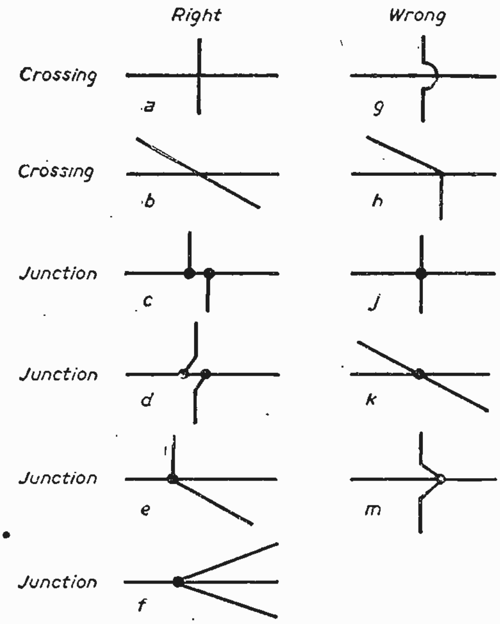


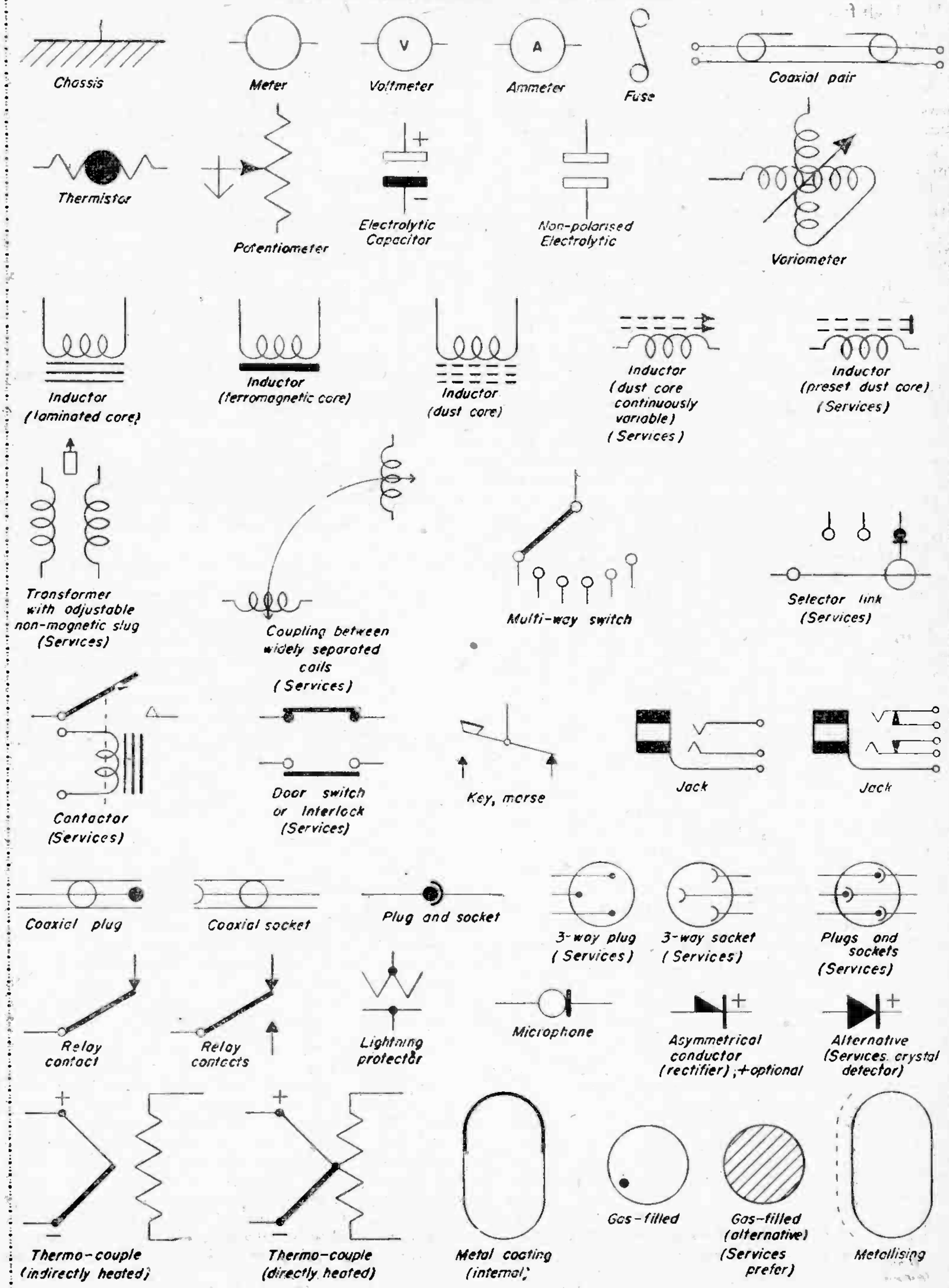
Fig. 1.—Crossings and junctions in circuit wiring.

The concrete nouns resistor, inductor and capacitor have replaced resistance, inductance and condenser. Resistor, after a fight, was accepted, but some die-hards will cease to use the word condenser only on their death-beds. The abstract noun is capacitance, not capacity. Feedback is now officially accepted but before negative feedback became popular it was regarded as a vulgarism on a par with tickler coil. The Services now call a wavemeter a frequency meter, although in B.S. 204 wavemeter is preferred.

Popular terms are, in general, on the way out. Superlatives have had a chequered career and terms like very-low, very-high, ultra-high, super-high and extremely-high frequency make one reach for the book to find out what they mean or whether they even exist. There are many electricians still alive who called 50 cycles per second " high frequency " when 25 cycles per second was becoming obsolete. The Services—for the moment—recommend that one should, where possible, speak of millimetre, centimetre, decimetre, metre, short, medium and long waves.

The coded radio frequency bands in B.S.204 : 1943 are :—

STANDARDISED SYMBOLS



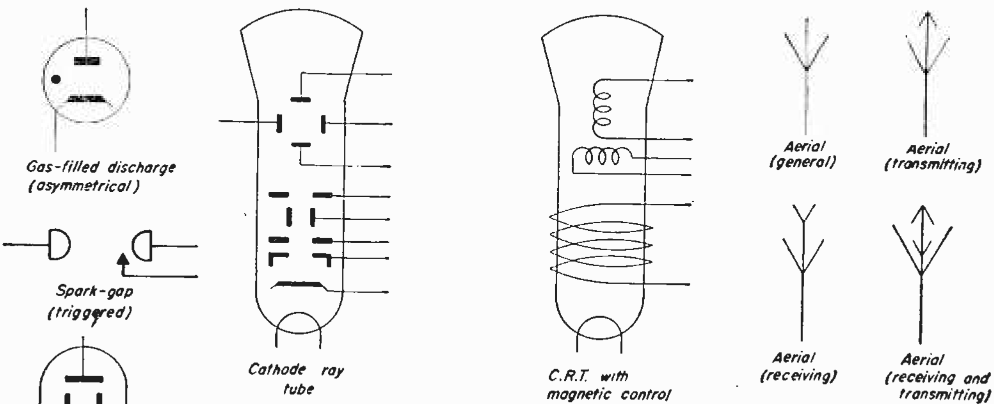
VLF very low freq. Below 30 kc/s.
LF, low freq. 30-300 kc/s.
MF, medium freq. 300-3 000 kc/s.
HF, high freq. 3 000-30 000 kc/s.
VHF, very-high freq. 30 000-300 000. kc/s.
UHF, ultra-high freq. 300 000-3 000 000 kc/s.
SHF, super-freq. 3 000 000-30 000 000 kc/s.

The Services also use this code ; super-frequency, however, is called super-high frequency, and covers frequencies greater than 3 000 Mc/s.

The term cat's whisker is still blessed by standards committees, as is keep-alive electrode. Push-pull is less favoured than balanced valve operation. Grid-leak is retained although obviously unsuitable if there is negative bias preventing grid current (why not grid-resistor ?). As regards the multivibrator family, the official terms are stable trigger circuit, flip-flop and multivibrator, although better terms would be monostable, bistable and astable relaxation circuits. One-shot multivibrator is rightly deprecated. The word indiarubber is replaced by rubber and V.I.R. cable becomes V.R. cable.

Radiolocation now covers D.F. as well as radar. Radar covers both the ordinary echo system and secondary radar (where there is automatic retransmission) provided the delay in evoking the retransmission is sufficiently short and precise for the range to be measured.

Transmitter blocker is the term to be used for what has been called A.T.R. switch and anti-T.R. box ; but T.R. switch is retained. The designation of waveguide modes (H or TE, E or TM) is still undecided in this country, although most Americans have chosen TE and TM ; the order of the subscripts has, however, been standardised (though our standard is, almost inevitably, different from the American one). Voltage standing wave ratio is minimum/maximum ; in America it is maximum/minimum. The American term grounded-grid triode is preferred by the Services. The word oscilloscope is now almost always used in this country, although it does not appear in any B.S. glossary ; oscillograph does appear, but is rarely used.



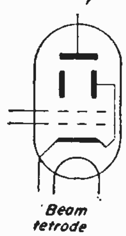


Fig. 2.—Further theoretical symbols.

The I.E.E. accepts such horrors as *outage* and *throughput*, but scorns the very useful word *circuitry*. Wattage is called jargon but is "acceptable"; one wonders when they accepted voltage. The question of laboratory jargon may be mentioned. A vivid picture is conjured up by "the cathode sits at earth, the anode dropping till it bottoms." But is it English ? Such loose shorthand as "R charges C2" has confused many.

B.S. 204 : 43 defines electrode D.C. resistance as the ratio of the D.C. component of the electrode voltage to the D.C. component of the electrode current. (The purists may object to D.C. resistance, but here is B.S. authority for it.) Electrode impedance is the ratio of a small alternating change in electrode voltage to the corresponding alternating change in electrode short-circuit current, no intentional variation being introduced into the other conditions. The reciprocal is electrode admittance. Slope resistance (preferred to electrode A.C. resistance and electrode differential resistance) is the resistive component of the electrode impedance when measured at a sufficiently low frequency. A variable-mu valve is one in which the mutual conductance can be altered smoothly over a wide range by variation of grid bias.

Transconductance (from one electrode to another) is defined as the quotient of the in-phase component of the short-circuit alternating current of the second electrode divided by the alternating voltage of the first electrode, all other electrode voltages being maintained constant. (The I.E.E. prefers active current to in-phase component of the current.) Mutual conductance is the "control-grid to anode" transconductance measured at a sufficiently low frequency.

Deflector plates (X1, X2 for horizontal deflector, Y1, Y2 for vertical deflector) and deflector coils (usually designated X for horizontal and Y for vertical deflector) are the correct terms. There are important rules for numbering deflector plates (see B.S. 530 : 48). The pattern appearing on the screen of a C.R.T. is called the trace. Time base is the deflection of the spot which is defined in relation to time. Time-base generator is preferred to time base when describing the apparatus for producing the necessary voltage or current for establishing a time base. Electron gun is the system of electrodes which produces an electron beam. Accelerator (preferred to anode), modulator electrode (preferred to control electrode and grid) and focusing electrode are electrodes in a C.R.T.

(*To be continued.*)

B7G BATTERY MINIATURES

POPULAR CIRCUITS MAKING USE OF THESE SMALL VALVES

By F. G. Rayer

A LARGE number of readers appear to be interested in building up portable and "personal" receivers employing the all-glass, button-based miniature valves now available. These valves are economical and efficient, and it is proposed to discuss some of the circuits which will be found satisfactory for use with them, indicating suitable component values, and the kind of results which may be expected. These circuits may be copied exactly as they stand, or used as a basis for receivers of similar type.

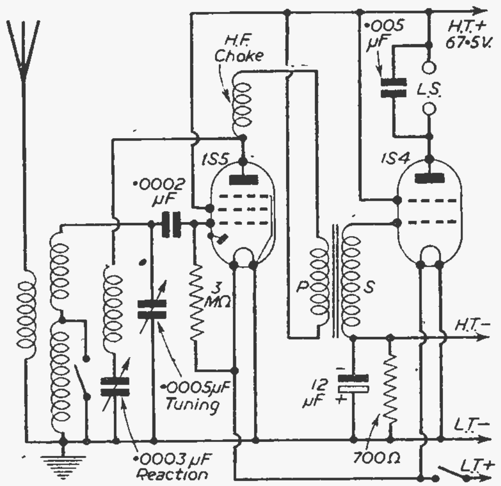


Fig. 1.—A two-valver for speaker and 'phones.

Valve Types and Equivalents

Four main valve types are available in this range. The 1R5 is a frequency-changer, and satisfactory frequency changing may be attained with anode and screen voltages as low as 20, which makes it suitable for receivers embodying miniature batteries. A.V.C. can be applied. The Marconi-Osram equivalent is the X17; the Mullard equivalent the DK91. As with the 1T4 and 1S5 types, the filament is rated at 1.4 volts .05 amp.

The 1T4 is a V.M. pentode for radio-frequency amplification. Its equivalents are the W17 and DF91. It may also be used in the intermediate stages of L.F. amplifiers, or for output purposes where small power is required (as when phones are operated).

The 1S5 (equivalents are the ZD17 and DAF91) is a diode-pentode, suitable for detection and L.F. amplification in superhets and straight receivers. The 1S4 is a beam output tetrode, giving outputs of up to .075 watt, with 45 volts on anode and screen. (Output is increased to .18 watt with 67½ volts, and .27 watt with 90 volts.) Its equivalent is the DL91, and its output sufficient for speaker operation in small portables. It has a 1.4 volt .1 amp. filament. As with the 1R5 and 1T4, the maximum anode voltage is 90, and maximum screen grid voltage 67½. The maximum anode and screen voltages of the 1S5 are 90 in each case. Except when small batteries are used, these maximum figures must not be overlooked.

In all the following circuits a 1.5 volt dry battery is used for filament supply, and any of the equivalent types described may be used, though the type numbers actually shown are readily available.

A Two-valver

This is a good starting point for a small "local station" set, and the circuit in Fig. 1 is particularly straightforward. With an ordinary dual-range coil and aerial and earth, good loudspeaker results will be obtained. Used with a frame aerial whose perimeter is preferably not less than 3ft., moderate speaker reproduction can be obtained from local stations; headphones may be used for distant reception, or if circumstances make a speaker undesirable.

A few points require note. The intervalve coupling transformer should best be of good quality and high impedance, in view of the pentode detector. A poor transformer will reduce volume. If size is no object, an ordinary 5in. or 6in. speaker is best. If a midget speaker is used it should be of reliable manufacture and supplied with a matching transformer suitable for use with it. Some midget speakers have 15 ohm speech-coils, and if used with the usual 2-3 ohm speaker transformer will give very poor results. Also make certain the transformer is definitely intended for use with a high-impedance battery-type pentode.

If headphones are to be used, a 1T4 may be used for output. This will reduce both filament and H.T. consumption. The auto-bias resistor may remain at the value shown (700 ohms).

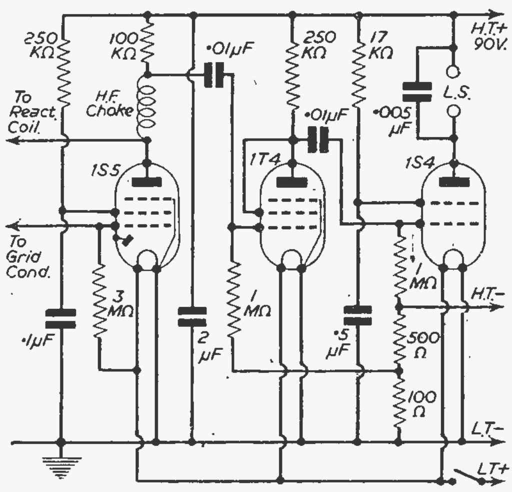


Fig. 2.—Resistance capacity coupling in a 0—v—2 circuit.

Three-valver with R.C. Coupling

Fig. 2 shows values found most suitable for the circuit given, the 1T4 being wired as a triode. Actually, a screen grid resistor of up to 3 megohms may be used with the 1S5, with up to 1 megohm for anode resistor. However, with these high values insufficient reaction will be obtained with many ordinary tuning coils, so .25 megohm and .1 megohm are recommended.

A 17,000 ohm screen grid dropper is used for the 1S4 because the screen grid voltage should not exceed 67½, and a 90 volt supply is indicated. If a 60 or 67½ volt battery is used, this may be omitted. (Compare with Fig. 1.)

It is feasible to use the resistance capacity coupling shown between 1S5 and 1T4 valves in the two-valver in Fig. 1, but this will result in a fairly noticeable reduction in volume, compared with that obtained with transformer coupling.

Four-valve Superhet

A complete circuit for such a receiver is seen in Fig. 3, and is particularly useful in small portables where extra sensitivity is necessary. In this case, L1 will be the frame-aerial, and L2 and L3 the oscillator coils. If the set is non-portable, L1 should be the usual tuning coil, with aerial-coupling winding. Though no wave-change switching is shown, any normal coil-pack with two or more wavebands can be used.

This circuit will give good speaker results from a fair selection of stations. The I.F. transformers are of usual type, tuned by pre-set condensers or adjustable cores.

In order that ganged tuning may be employed without difficulty, a superhet-type coil-pack, or pair of superhet coils, is recommended. Ready made frame aerials, with matched oscillator coils, can also be purchased.

Where space is of primary consideration, the coupling shown in Fig. 4 can be used. The anode coils can be taken from a single disused I.F. transformer, or purchased; they do not require to be enclosed in screening cans. Here, the 1S5 is used as a grid detector; this gives results almost as good as those of the diode in Fig. 3, though the pentode section cannot now be used for L.F. amplification, and reduces the number of components.

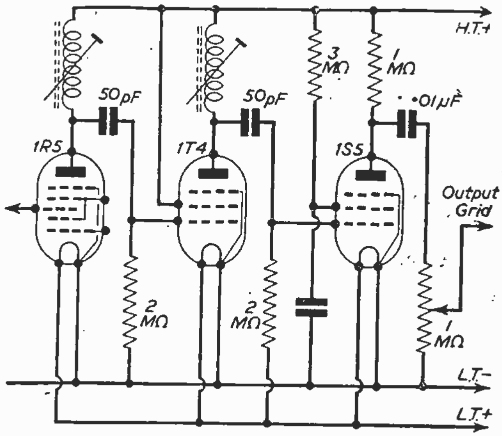


Fig. 4.—Optional form of I.F. coupling.

Gain obtained from the coupling in Fig. 4 is a little lower than when I.F. transformers are used; selectivity is also reduced. However, the circuit is a sound and practical one, and has the merit of simplicity and compactness. As with Fig. 3, the I.F. coils should be adjusted to maximum volume, variable dust cores being indicated.

Base Connections

It now only remains to provide valveholder connections for the valves mentioned, and these are

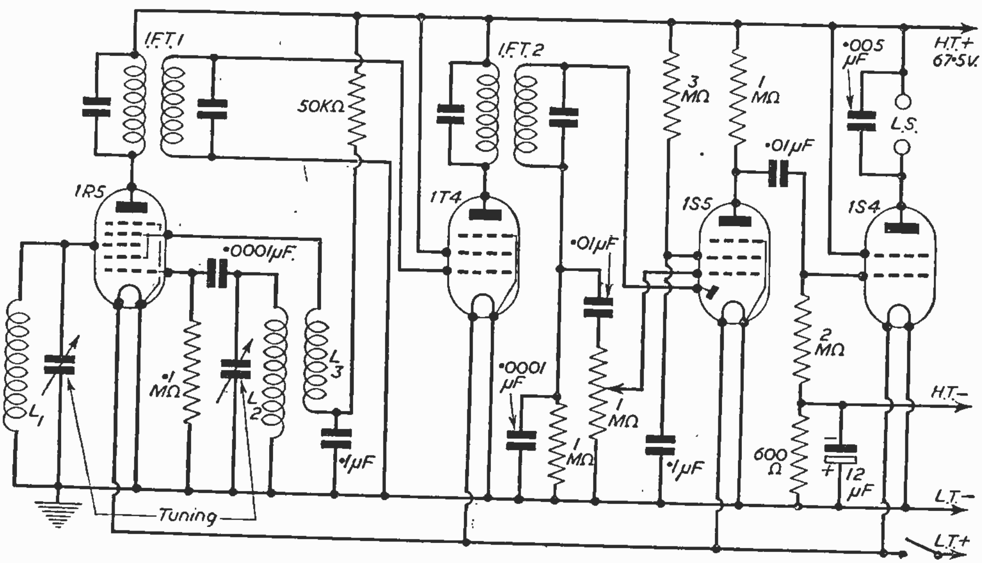


Fig. 3.—Four-valve superhet circuit.

indicated in Fig. 5. These are to be taken as viewing the sockets of the holders from below, and only one or two points require mention.

Due to the method of supporting electrodes by the valve pins themselves, some electrodes have duplicate connections. This is so with the 1S4 anode, and either socket may be used, as convenient. All valves except the 1S5 have duplicate filament negative pins; these are joined internally, and also go to the suppressor grids in 1R5 and 1T4, and internal shield, in the 1S4.

Finally, the 3S4 should be mentioned. This has a tapped filament, and with sections wired in parallel it is the equivalent of the 1S4. With filament sections in series, the filament is rated at 2.8 volts .05 amp. (as against 1.4 volts .1 amp. when in parallel).

The circuits given are the result of practical experiment and testing, and may be made up with confidence.

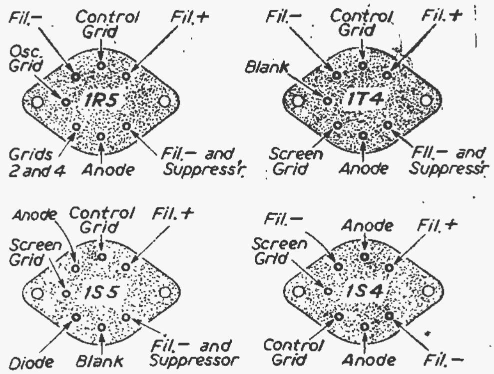


Fig. 5.—Valve base connections for the valves described in this article.

Handy Velocity Microphone

By W. A. Little

SO many war-surplus radio parts are now available that the average experimenter very often has a box full of what his wife calls "junk," which he does not wish to lose, yet can find little use for in the workshop. Here is a way of proving that it is not junk, and also providing yourself with an inexpensive ribbon microphone.

The materials required are:

A small milliammeter (with a burnt movement),
Some silver cigarette paper,
A miniature input or output transformer,
An old hacksaw blade,
A cigarette tin and a few screws and washers.

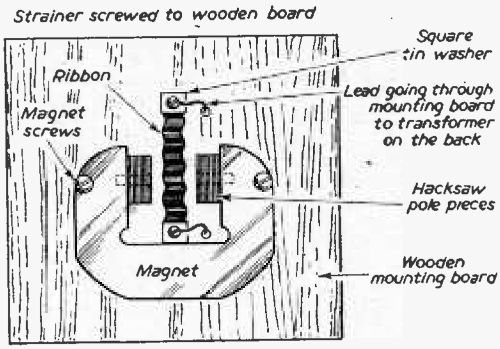
Last of all you will want a gauze kitchen sieve of about 1½in. in radius.

Construction

Remove the meter from its case by removing the three screws at the rear of it. Take off the dial and remove the two screws which hold the horseshoe magnet in place. Now the rest of the meter may be returned to the "junkbox" while the magnet is retained. Take an old miniature hacksaw blade (one with a blade about ¼in. in breadth), and break off ten squares ¼in. by ¼in. and hammer these flat. Pile these on to the poles of the magnet—five each side. The magnet will usually retain these in place, but if the microphone is to be subject to rough usage it would be as well to cement these pole pieces in place with a little adhesive.

The Ribbon

The ribbon is made as follows: From a sheet of foil from a cigarette packet, cut a strip 1½in. in length, by a ¼in. in breadth. Place this between two sheets of corrugated cardboard and press the two together. Carefully remove the corrugated ribbon of metal from the cardboard and mount it on the two screws as shown in the diagram. The ends of the ribbon are clamped between two flat, thin, tin washers which may be cut from a cigarette tin; and which are themselves mounted on two thick washers which raise the ribbon well clear of the mounting board. Solder a lead to each side of the ribbon holder and connect these to the low-impedance winding of the transformer. Mount the magnet so



Details of the microphone.

that the ribbon lies on the edge of the strongest part of the field, and screw it into place.

The sieve may now be screwed down to cover the whole. This gives it a professional appearance and protects the delicate ribbon from damage. The microphone is now ready for use. The output from the high-impedance winding of the transformer should be fed to a pre-amplifier or high-gain amplifier, and it will then provide sufficient power to satisfy the average experimenter.

On Your Wavelength

By Thermion

When is L.P.R. Not L.P.R.?

A READER propounds the question which titles this paragraph. He has purchased some L.P.R. records and finds the following:

1st side, 14 mins. 12 secs.
2nd side, 12 mins. 50 secs.
Total 27 mins. Cost 39/6 (12 in.).
1st side, 11 mins. 45 secs.
2nd side, 15 mins. 5 secs.
Total 26 mins. 50 secs. Cost 39/6 (12 in.).
1st side, 14 mins. 30 secs.
2nd side, 12 mins. 30 secs.
Total 27 mins. Cost 29/6 (10 in.).

From these timings, he says, it would seem that the first two recordings could have been made on a 10in. record and he asks why they were spread to 12in. at an extra cost of 10/- each. This is a matter for the manufacturers who, I am sure, have a satisfactory answer. Like my reader I have a fair collection of 12in. and 10in. L.P. discs. One of them plays for 42 minutes (21 minutes each side). My reader seems disappointed and says that there is little advantage in forsaking the tried and trusted 78 r.p.m. My own experiences with L.P.R. are that the machine needs to be set very accurately with a spirit level, that the slightest walking causes the pick-up to jump and that they are more finicky than 78 r.p.m. records. The price, too, does not bear an accurate ratio to the increased playing time. That is to say, you can obtain longer playing time from an equivalent expense in 78 r.p.m. records. It would be unfair, however, in these comparatively early days of L.P.R. to be unduly critical. Those best qualified to know say that L.P.R. is inevitable, that the records last much longer because of the lower surface speed and that they are of vastly superior tonal quality. The price of a record is not, moreover, decided by its playing time. There are other factors such as royalties.

A Collector of Old Sets

MY recent reference to old time radio receivers has elicited a letter from Dr. Michael J. Dunn, of Bristol, who says that he has been searching for some of the early receivers but says that the genuine antiques of radio are extremely rare, especially in working condition. He adds that radio dealers throw them straight into the dustbin, and even when they are obtainable the price for a complete set without valves is from 2/6 to 5/-. He purchased a single-valver, complete with coils and valve, for 2/- and upon connecting it up found that it was in perfect working order and received English and foreign stations. His best find was a valve marked " Osram, valve receiving, R2A." This is one of the earliest valves and was produced for the forces in the 1914-18 war. It is, of course, a bright emitter, with a rated voltage of 3.8 with a current consumption of 1.2 amps! It is a helium-filled triode requiring a maximum anode volts of 38. At anything in excess of this it delivered a delightful blue glow! One could read by some of these early valves.

Magnetic Tape Recording.

MR. C. PARKER, of Bath, responds to my invitation to readers to send details of their experiments with magnetic tape recordings which has the advantage of continuity of playing and ability to erase a bad or no longer required recording. The tape recorder need not be dearer than the disc equivalent. A half hour programme, recorded from the radio, may be recorded on tape with ease, and a response of 10,000 c/s running on an 11in. spool at 15in. per second is possible, whereas to record the same programme on discs without a break requires two turntables and numerous discs. It would seem the tape recorder should be cheaper than a disc and very much cheaper than a twin turntable outfit.

The lack of literature on the subject is probably responsible for so little having been done by the amateur constructor. Most of the published matter is theoretical dealing with hysteresis curves, coercivity, etc. This reader gives the following specifications of what he considers to be ideal:

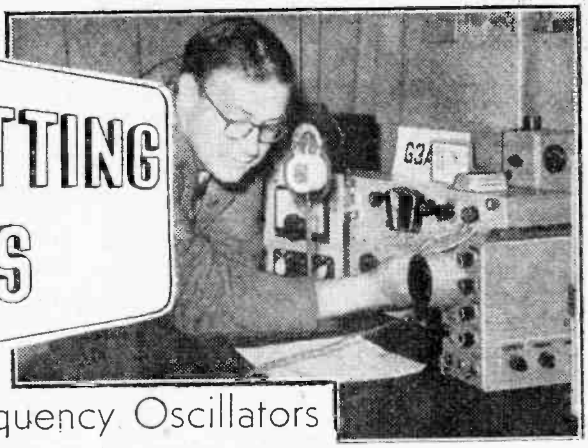
1. A.C.-operated 230 v. 50 cycles.
2. Two speeds. One for hi-fi reproduction of music, and a slower one for occasions where hi-fi is not required, i.e., speeches, parties, etc.
3. Dual-purpose amplifier giving adequate playback output, say 8 watts.
4. Standard ¼in. tape in preference to wire.
5. Erase head.
6. Combined record/playback head if saving in cost justifies it.
7. Desirable response on the fast speed, 50 to 10,000 c/s.

I understand that a tape recorder is the subject of experiment in the P.W. laboratory.

The R.E.C.M.F. Components Show

THE 1952 Components Show, organised by The Radio and Electronics Component Manufacturers Federation, mirrored the process in component design which has taken place during the past year. Although the exhibition is a private one and, indeed, was organised during the war, it has become of increasing interest to designers and manufacturers of radio and television receivers and of radar and electronic equipment. It attracts overseas buyers of components. This year it was obvious that the armament programme was responsible for some of the components shown. The specifications of some of them are much higher than is required for ordinary domestic apparatus. Components suitable for the home constructor were not so conspicuous as in former years for this reason.

TRANSMITTING TOPICS



Variable Frequency Oscillators

CONSIDERATIONS IN TRANSMITTER DESIGN By O. J. Russell, B.Sc. (G3BHJ)

TWO previous articles have covered fairly completely the subject of ordinary crystal oscillators. However, it is not intended to cover more than certain considerations involved in the various stages of amateur transmitters. For those who prefer a specific design, it is hoped later to describe complete units which will illustrate the practical realisation of design practice.

It is certainly very true that a number of relatively minor points may decide the correct functioning of a piece of equipment. This is very true even of a simple and "sure-fire" item, such as a crystal oscillator. Thus the oscillator valve may greatly influence the ease and certainty with which the oscillator will key satisfactorily, especially when operating on harmonics. In point of fact the 6AG7 is an extremely satisfactory valve to use for both crystal oscillators and variable frequency oscillators (V.F.O.s), as the isolation between the anode and grid circuits is superior to other popular tetrode and pentode oscillator valves. This superior isolation greatly reduces "pulling" effects, so that frequency is little affected by loading changes in the anode circuit.

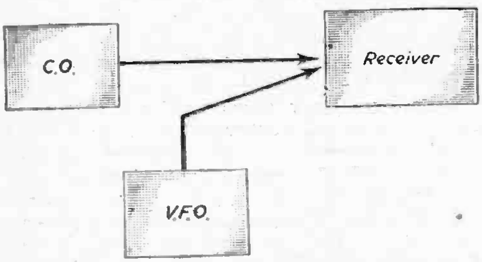


Fig. 1.—Test Set-up for checking V.F.O. A harmonic of the V.F.O. is checked against a harmonic from a crystal standard. In this way V.F.O. defects are multiplied by the order of the V.F.O. harmonic.

Stability

Stability is, of course, the most desirable feature in a V.F.O., and this means not only freedom from drift during a period of use, but also dynamic stability in the sense of freedom from chirp under keying. For this reason it is as well to put the cart before the horse, and to emphasise the test routine desirable in checking a newly constructed V.F.O. It might be said that a V.F.O. with a fundamental frequency in the 1.7 or the 3.5 Mc/s band will sound perfectly steady and chirp-free if monitored upon its fundamental frequency. However, as recommended with crystal oscillators, it is desirable to check a high harmonic of the oscillator, and for this reason the 14 Mc/s or the 28 megacycle harmonic should be monitored. With a normal communication receiver there is no difficulty in locating these harmonics. A rapid check may be made, using the receiver B.F.O., and it will be found that a clear steady note under keying on a low harmonic may deteriorate to an unsteady, chirpy note on the next harmonic. Thus on 3.5 Mc/s the note on a quick check may sound rock steady and equal to crystal; on 7 Mc/s chirp and drift may be imperceptibly slight, yet on 14 Mc/s the same oscillator will sound chirpy with detectable drift; while on 28 Mc/s it will sound rough, chirpy and have a marked degree of drift.

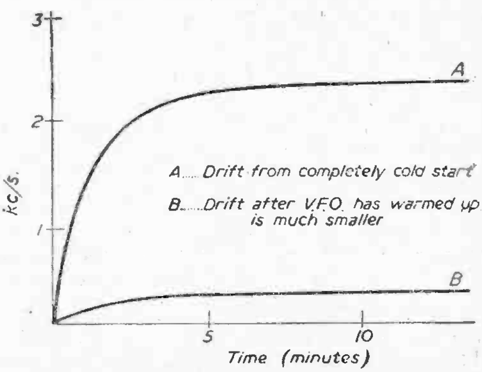


Fig 2.—This graph shows the differences in starting up from cold and after being warmed up.

Observation will soon convince the experimenter that a degree of chirp and drift that is tolerable on one frequency becomes intolerable when these defects are doubled by moving to the next highest amateur band. There is in fact about a two-to-one difference between a passable note and a bad, chirpy one. This is quite apart, of course, from such items as A.C. ripple and hum modulation, as no serious amateur is likely to feed a V.F.O. from an unstabilised, badly-smoothed power pack. However, a little listening upon the C.W. section of the 20-metre band should soon prove that it is by no means "easy" to produce a good V.F.O. signal at 14 Mc/s. Yet on 7 Mc/s signals are by contrast much better, and a really bad note is seldom encountered.

The aim of the V.F.O. constructor should be to produce as satisfactory a performance as possible before actually going on the air. Even here there is a trap for the unwary, for when coupled up to a transmitter operating at a reasonable level of R.F. power, interaction, loading effects on the V.F.O. and R.F. feedback effects may cause the overall stability to be much worse than when the V.F.O. alone is being tested. For that reason the ultimate test of a V.F.O. is the functional one of operation in a complete transmitter. In view of the complete monitoring of the bands, quite apart from questions of courtesy and regard for others, such a test should not be performed while radiating a signal. The transmitter can just as easily operate into an artificial load of a high-power lamp bulb, so that direct functional testing can be carried out without causing unnecessary Q.R.M. Even then the final proof will need an air test, as direct R.F. pickup of energy radiated from the aerial can cause disturbing effects. However, if a systematic series of tests is carried out *before* attempting to radiate a signal, then it will be easy to effect improvements stage by stage, rather than be faced with correcting a bad signal with no guide as to *how* the defect is caused.

All this may seem very tedious to the newly licensed amateur anxious to get on the air. However, it should be realised that most amateurs in the past slowly advanced through the difficulties of evolving a stable transmitter. Nowadays, with a V.F.O. controlled installation a virtual necessity for competitive D.X. working, the newcomer has to try to telescope the results of experience into a short period, and has little time to spend on laborious trial and error. Unless he is prepared to start on the right lines, he is likely to take the path of least resistance and radiate a less-than-perfect signal. This is, in fact, by no means a monopoly of the newcomer, and anything which helps to ameliorate some of the worse effects of imperfect notes is welcome today. It is fatally easy to "get on the air" at all costs, and be so eager to operate, that a poor note is overlooked and the job of correcting it put off indefinitely. To start "right" is thus ultimately a great saver of time, and an even greater contribution to pleasant listening for others.

With this object in mind, we can consider a simple test set-up for checking the stability and performance of a V.F.O. Under the licence conditions, an approved form of wavemeter should be available and this almost invariably contains a crystal check oscillator. It is much more satisfactory to use a crystal oscillator for checking purposes than the B.F.O. of the station receiver. A receiver itself contains—if, as is certain, a superhet is used—its own V.F.O. in the shape of the mixer oscillator. If the receiver B.F.O. is used, the receiver stability sets a limit. To avoid complications, therefore, switch off the receiver B.F.O. and locate a suitable crystal harmonic. This should preferably be one lying in the 28 Mc/s band to give a critical and sensitive check on stability. At any rate, choose as high a harmonic as possible. If the test crystal is a high-stability 100 kc/s or 1,000 kc/s standard crystal, this will give excellent results, but an amateur band crystal used in a very low-power, under-run crystal oscillator can be used if nothing else is available. Locate the crystal harmonic upon the receiver and, with the B.F.O. switched *off*, tune the V.F.O. so that one of its harmonics beats with the crystal. The crystal oscillator, allowed to warm up for some ten minutes or so, will maintain frequency to a high degree of precision to within a few cycles over long periods. Having located the V.F.O. to beat with the crystal harmonic, tune the V.F.O. to zero beat and switch it off. After allowing a few minutes for cooling, switch on again and observe the drift from a cold start. At 28 Mc/s it is quite likely that drift will exceed a kilocycle, and may even be enough to take the note out of the audible range. With the V.F.O. warmed up, the effect of keying can be noticed and chirp and ripple noted. It is likely that a neon-stabilised power supply will be used, and the effect of removing stabilisation can be observed. A large amount of the drift on warming up from cold is due to the heating effect of the valve heater. When the cathode has been warm for a considerable time under these various tests, the amount of drift likely in a period of transmission can be checked. To do this keep the heater

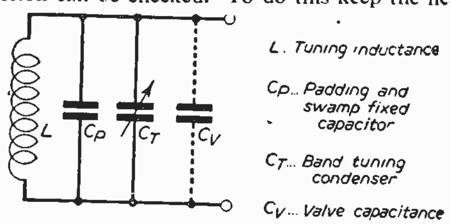


Fig. 3.—V.F.O. tuned circuit.

alight, but keep the key up so that the oscillator draws no current. Then depress the key, and notice the degree of drift occurring over a period of a couple of minutes. This will be far less than the drift from a cold start, as shown by the curves of Fig. 2. If a large amount of drift does occur under these conditions, it indicates that the V.F.O. valve is running with too much power input, so that the heat dissipated at the anode contributes appreciable drift. The cure, apart from circuit modifications, is to reduce the power level of the valve to minimise heating. In the interests of stability a V.F.O. should be lightly loaded and run at a low-power input.

Design Factors

The above tests have been placed first before considering V.F.O. circuit designs, because it is essential that careful tests be made upon the operation of a V.F.O. at the start. With a systematic test procedure, optimum performance can be obtained during construction and will obviate many pitfalls. We can now consider some of the design factors before referring to actual V.F.O. circuits. In point of fact, if the correct design precautions are taken there is little to choose between *any* of the popular oscillator circuits. However, certain circuits enable satisfactory results to be obtained conveniently.

Before considering the oscillator circuits themselves, consider a tuned circuit. A tuned circuit in some form is an essential part of a V.F.O. A crystal oscillator derives stability from the fact that the crystal is mechanically a stable device, and is equivalent to a very high Q circuit. A high Q circuit in a V.F.O. assists stability and, other things being equal, the V.F.O. with the higher Q circuit has the higher stability. It must be remembered that the oscillations in the V.F.O. frequency-determining tuned circuit are maintained by a valve. The influence of the valve on the tuned circuit largely contributes to instability. Thus, the valve by itself has a physical capacity which must be included in the total tuning capacity resonating the tuning coil. When the valve warms up due to the heater, and also due to the anode dissipation, its physical capacity changes slightly, and this will affect the operating frequency. Electrically, however, the total effective capacity of the valve will also vary with the cathode emission, the reflected effects of the loading on its anode with the current drawn, and with electrode potentials. These electrical variations are extremely important in determining stability. Thus, variations produced by overall variations in the H.T. supply are a case in point. Neon stabilisers are commonly employed in order to minimise these changes.

The successful design of a V.F.O. largely depends upon minimising the effects of the variations in valve capacity effects, and there are several ways in which this can be done. Thus, if Fig. 3 is studied, it will be seen that we have a swamping fixed capacity to pad out the tuning range so that the variable tuning condenser just comfortably covers the required tuning range. An additional small capacity represents the total effective valve capacity. There are several artifices for minimising the effects of the varying effective valve capacity. The most obvious one is the use of very large values of total tuning capacity, so that the valve capacity is as small a fraction as possible of the total. That this is seldom appreciated is shown by the fact that in a normal oscillator circuit for an 80-metre V.F.O. the *total* tuning capacity may be made as much as 1,000 pF. Incidentally, it is easy to show that, provided the oscillator circuit is designed for a constant L.C. ratio, there is no advantage to be gained by using a very low-frequency V.F.O. and multiplying up. The intrinsic stability of the final signal due to valve capacity changes is no greater than a V.F.O. operating on a higher frequency with fewer multiplication stages. The only gain is the greater freedom from pulling and feedback due to the use of more isolating multiplier stages. A further means of reducing instability due to valve effects is very loosely to couple the valve to the tuned circuit. Practical circuits use either or both of these methods to obtain high stability, as we shall see later. It is, of course, essential that the tuned frequency determining circuit of a V.F.O. should be mechanically designed to minimise vibration and possibility of movement. Wiring should be carried out with heavy-gauge wire.

(To be continued)

North East Broadcasting

THE Postmaster General, the Right Honourable The Earl De La Warr, received representatives of the North East of England to discuss the possibility of providing a television station at Pontop Pike and to improve sound broadcast reception. The deputation consisted of:

Alderman Wm. McKeag, The Lord Mayor of Newcastle upon Tyne.

Lord Ravensworth, Rural District Councils (Rothbury).

Alderman E. Hill, South Shields County Borough Council.

Councillor D. Richmond, Borough Councils (Hartlepool).

Councillor Dr. K. Mitchell, Urban District Councils (Hexham).

Mr. C. W. Hurley, Deputy Clerk of Northumberland County Council.

Mr. A. S. Ruddock, Clerk of the Whitley Bay Urban District Council.

Lord Lambton, Miss Irene Ward, M.P., Sir Fergus Graham, M.P., Mr. R. Speir, M.P.

Alderman McKeag, Lord Mayor of Newcastle upon Tyne, said that the North East felt that they had had a raw deal both in regard to television and the sharing of a sound wavelength with Northern Ireland.

Lord De La Warr said he felt quite unable to attempt to controvert the Lord Mayor in what he said about the difficulties from which the North East was suffering in relation to its broadcast services. For that reason he regretted deeply that at the present moment demands on material and skilled labour could give no hope of rectification of the position.

"Frig." Interference

THE Postmaster General's Advisory Committee on Wireless Interference from Refrigeration Apparatus, which was appointed to sit under the chairmanship of Dr. F. T. Chapman, as announced in the House of Commons on July 26th, 1950, has presented its Report.

The Committee considered the abatement of interference with reception in both the sound and television wavebands caused by the various types of refrigeration apparatus.

The Committee's recommendations for limits of permissible interference from refrigeration apparatus are based on the assumption that reasonable precautions will be taken to minimise the susceptibility to interference of receiving installations. The Committee consider it unnecessary to specify requirements in terms of the direct radiation of interference energy. They recommend that the voltage of interference from refrigeration apparatus injected for continuous periods of not less than 1/5 second or more frequently than once in any two-second period into the electricity supply mains, measured in the manner and with the apparatus described, should not exceed 1,500 microvolts for the waveband 200-1,605 kilocycles per second (the major part of the broadcast band) or 750 microvolts for the waveband 40-70 megacycles per second (the present television band).

The Committee recommend that these requirements should be specified for both new refrigeration apparatus and for that in use and recommend that six months should elapse between the promulgation of any regulations and the time of their coming into force.

Radio Receiver Design at V.H.F.—8

By G. P. Lowther

(*Continued from page 215, May issue*).

NOTE that a 600Ω or 75Ω resistor would cause a drop of only 3 db since the terminated or working impedances across A and B and C and D are 300Ω and 37.5Ω respectively.

Since unbalanced (i.e., with a single central conductor) coaxial cable is generally used for aerial feeders, an unbalance-balance device should be used to connect it to a balanced antenna, e.g., a centre-fed dipole, or energy loss will result, but in practice this is usually ignored, the central conductor and outer sheath being taken to the two halves of the dipole.

Polarisation

This is of far less importance at V.H.F. than at lower frequencies where transmission is via the sky wave. Generally speaking the receiving and transmitting arrays should be in the same plane though twisting often occurs in towns, horizontal polarisation usually being best for long distances. Between 30 Mc/s and 100 Mc/s it has been found to give improvements in signal level and S/N of about 6 db when the transmitting aerial was more than a few wavelengths above earth. Vertical directivity is only important when phase relationships are upset by multi-path propagation.

Practical Circuits

—*R.F. Stage*

This is often dispensed with, the signal being taken directly to the frequency-changer, but if greater sensitivity is required it may be added with advantage. Above about 150 Mc/s, frequency-changers are very noisy and in the absence of an R.F. stage the S/N deteriorates considerably unless a strong signal is available. The R.F. stage may take the form of a grounded-grid amplifier as in Fig. 25 or a straight pentode; examples are shown later. If only a comparatively narrow band of frequencies is to be received, e.g., an amateur band, the response curve of the R.F. stage can be made sufficiently flat to obviate the need for tuning while still giving worthwhile gain.

This month the frequency-changer is dealt with.

(*a*) *Diode*

There are various ways in which the signal, oscillator and I.F. circuits can be connected to the diode, examples being given in Figs. 43 and 44.

The diode must be specially designed for use at V.H.F., e.g., EB91 (half section). It may be combined in the same envelope with a triode as oscillator, an example being the Mullard EAC91. A suitable circuit will be shown later.

(*b*) *Triode*

This valve enables the R.F., B.O. and I.F. circuits to be associated with separate electrodes, thus avoiding the necessity for decoupling to prevent interaction. This type of valve is capable of giving slightly greater efficiency than the diode as a result. Either a special H.F. triode may be used or a V.H.F. pentode strapped as a triode. This is inadvisable at the highest frequencies, however, as the grid-cathode (input) capacity is raised.

Since the oscillator frequency appears across the tuned grid circuit, voltage of oscillator frequency will appear on the grid if this circuit offers appreciable impedance to it. This is minimised by using a high intermediate frequency.

The circuit of Fig. 45 utilises an RL18.

Two triodes may be combined in one envelope, e.g., 12AT7.

(*c*) *Pentode*

A pentode may be used in a similar manner to the triode; alternatively the oscillator frequency may be injected into the suppressor grid, though a level of the order of 40 volts is required.

(*d*) *Multi-electrode Valves*

The most satisfactory valves in this class are triode-hexodes and triode-heptodes. With careful circuit design they will give quite good results up to between 50 Mc/s and 100 Mc/s depending on the valve.

Beat Oscillator

If a self-oscillator is used without multiplication a Colpitt's circuit gives the best results. A modification for series tuning will be shown next month. If the inductance L_1 is replaced by 2in. to 3in. of wire, this circuit will oscillate up to about 600 Mc/s using an RL18.

Note.—That since series tuning is employed "L" comprises all the external inductance between the anode and grid.

L_2, L_3, L_4 and L_5 are all H.F. chokes consisting of 5 to 10 turns on a ¼in. former.

Fig. 47 shows a Hartley oscillator followed by a doubler. The inductances described give a range (final frequency) of 50 Mc/s to 90 Mc/s.

L_1 consists of 6½ turns of 18 S.W.G. wire on a ½in. former tapped 2 turns from the "hot" end.

L_2 consists of 2 turns of 18 S.W.G. wire on a ½in. former. (This coil can be self-supporting.)

A crystal oscillator may be used in conventional circuits multiplying up to the final, or a sub-harmonic of the final frequency and injecting into the frequency changer. The R.F. circuits need not be tuned as reception will be over a limited band. The I.F. frequency will thus vary according to the frequency of the incoming signal and may be selected by

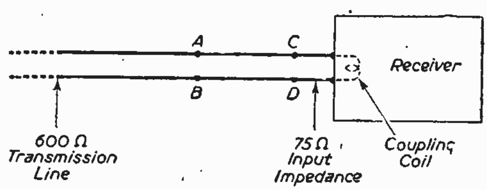


Fig. 42.—Effects of matching and mismatching may be checked as shown here.

feeding the frequency changer output into a normal selective receiver, this being tuned to the short waves. Care must be taken that a harmonic of the crystal does not fall within the R.F. band.

I.F. Stage

A high intermediate frequency is necessary in order to avoid second channel interference. Thus, if an I.F. of 465 Kc/s were used with a signal frequency of 100 Mc/s, second channel interference would be experienced on 99.07 Mc/s (assuming the oscillator frequency to be below the signal frequency as is usual at V.H.F.). With one tuned circuit at 100 Mc/s having a Q of, say, 50, it may be calculated that the

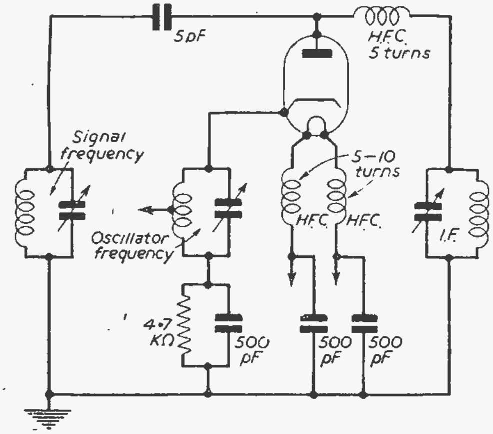


Fig. 43.—One useful diode circuit.

image response would be only 3 db below that of the wanted signal. I.F.s of 5 Mc/s to 40 Mc/s are commonly used. The disadvantage of a high intermediate frequency—apart from design technique and reduction in gain—is the resultant lack of selectivity. This, of course, is only a disadvantage if narrow-band transmissions are being received with interference from another station, and is best overcome by using triple detection, e.g., a converter.

Full winding data for I.F. transformers will not be given here as it obviously depends on the frequency, value of tuning capacity, diameter of former, use of iron core, etc., but the following information will serve as a rough guide :

½in. former, air cored.
Wire—24 s.w.g. d.w.s.

Frequency (Mc/s)	No. of turns	Tuning capacity (max.)
3	50	50 pF
6	36	30 ,,
10	25	30 ,,
30	8	20 ,,

Spacing of primary and secondary windings must be found by trial and error, but will be about ½in.

V.H.F. Units

It must be emphasised that the circuits which follow, though based on proved design and capable of giving good results, will not necessarily do so without adjustment or modification. For foolproof design at V.H.F. a complete mechanical layout—including the position of all wiring—would have to be given, as well as the make of components to be used. Since the whole aim of this brief introduction to V.H.F. is to enable the more advanced amateur to design his own equipment, this would be undesirable as well as impracticable. Probably the greatest

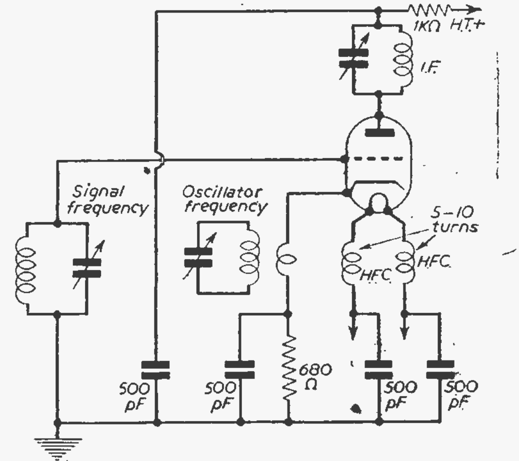


Fig. 45.—Triode oscillator circuit.

difficulty likely to be encountered in radio design at these high frequencies is that of uncontrollable self-oscillation. The following hints should enable this to be overcome :

(i) Stop the oscillation by resistively damping the tuned circuits ; this is practically always successful if the damping is sufficient.

(ii) Reduce the regeneration that is leading to oscillation.

(iii) Reduce the damping and then repeat (ii) continuing until the damping is as light as possible compatible with stability.

(To be continued.)

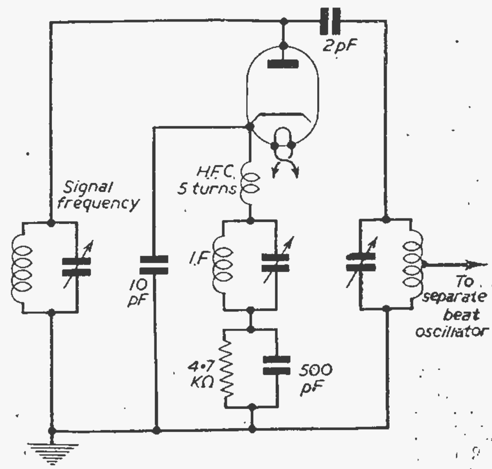
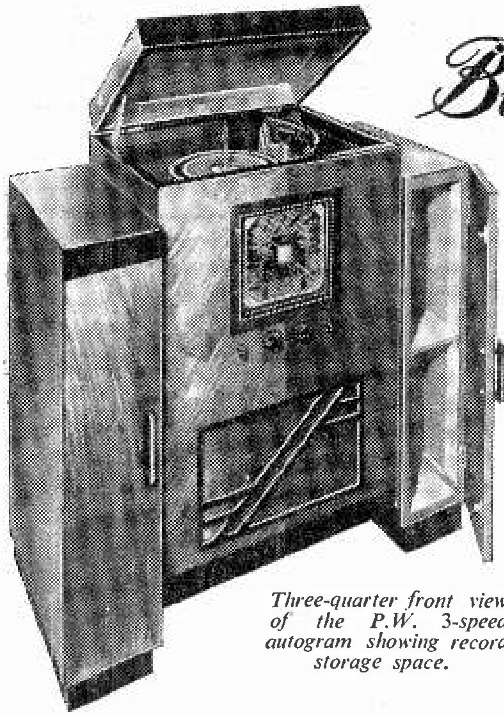


Fig. 44.—An alternative to the arrangement shown in Fig. 43.

A NEW "P.W." DESIGN



Three-quarter front view of the P.W. 3-speed autogram showing record storage space.

Building the P.W. 3-SPEED Autogram

AN EFFICIENT MODERN DESIGN COVERING FROM 15-50, 190-520 AND 800-2000 METRES, AND PLAYING MIXED 10IN. AND 12IN. RECORDS AT 78 OR 33⅓ R.P.M. AS WELL AS 7IN. DISCS AT 45 R.P.M.

IN response to many requests for an up-to-date radiogram for inclusion in our Blueprint service, the P.W. 3-speed Autogram has been designed in such a manner that it may be included in an existing cabinet. As will be seen from the illustration on page 266, the main tuner and gram. pre-amplifier was built on a baseboard to take the place of an older receiver in the cabinet which was used, but chassis-form construction was retained, and for those who prefer that method a simple standard metal chassis may be used and either stood upon a shelf or bolted into position. The main amplifier with the power-pack is built as a separate unit and is attached to the floor of the cabinet, whilst a modern Ediswan-Plessey auto-changer is fitted on to the motor-board.

Several features were considered in designing this receiver, mainly accessibility and interchangeability, so that if at any future date it is desired to make changes in any part of the equipment no difficulty should be experienced. Furthermore, it may be desired by some to construct the receiver from the first in an alternative form, and the design lends itself very well to this.

Main Features

Taking first the main features (as distinct from the circuitry), the equipment is in three separate sections, interconnected by plugs and sockets. The motor-board, with auto-changing mechanism, will take a stack of eight records, 10in. and 12in. mixed, at 78 r.p.m.; a stack of 10 records, 10in. and 12in. mixed, at 33⅓ r.p.m. and a stack of eight records, 7in., at 45 r.p.m. This particular unit employs a single pick-up head which may be set with the aid of a small knob to suit whatever type of record is to be played. The point is of the "permanent" type and should play a total of 4,000 records without replacement. Any desired record may be rejected and the mechanism works very well indeed. Power from the mains for the turntable is obtained from a short lead plugged into a mains socket on the receiver/pre-amp. chassis, and this is so connected that the motor is only "live" when the receiver is switched on. There is thus no risk of the motor being left running with undue wear on the stylus unless the set is being listened to. Screened leads are taken to the pick-up sockets at the rear of the chassis and these, as will be seen from the circuit on page 264, are fed to a separate single-stage pre-amplifier, which is not in circuit on radio. Peculiarities in some of the circuit details here will be mentioned later. The radio unit is a superhet without R.F. stage, designed to give a few stations at really high quality rather than a large number of stations at indifferent quality. For this reason special arrangements have been adopted in the detector stage to retain a measure of A.V.C. (which is not usually regarded as ideal from a quality point of view), and in the values of certain components. Tuning is effected by the now popular and well-tried Osmor coil unit, which we have used on more than one occasion and which is easy to mount, very simple to trim and gangs very well throughout all three ranges. With it we have also used the maker's full-vision dial which, being designed in conjunction with the coils, provides the user with an accurate setting for any desired station as well as adding a pleasing appearance to the finished receiver. There are four controls—main tuning, combined on/off and volume, wave-change and radio-gram. The volume control is operative on both gram and radio and the output from the control is taken via a length of standard coaxial cable to a socket on the main amplifier chassis.

Amplifier and Power Pack

The amplifier consists of a phase-splitter and two 6V6's in push-pull feeding a 10in. W.B. speaker and the quality of reproduction, as already mentioned, is of quite a high order in spite of the absence of such features as negative feed-back, etc. No tone-controls have been fitted, but the special pre-amplifier gram. stage already mentioned has been designed to take full advantage of the various types of record which may be used and record reproduction reaches a high standard. The normal full-wave rectifier is used in an orthodox power supply arrangement, with two chokes to provide the utmost smoothing in all parts of the circuit and, as a result of the values and disposition of parts adopted, hum is completely absent on radio and gram.

Pre-amplifier

Before passing on to the main constructional features it might be pointed out that the pre-amplifier

COMPONENTS FOR TUNER AND PRE-AMP

One type H.O. coil pack. Osmor.
One 2-gang .0005 μF variable condenser. J.B.
Two I.F. transformers, 465 kc/s } Denco.
One maxi.-" Q " coil, range 1 (Blue) } Denco.
One type " A " glass dial assembly and associated drive, pulleys, etc. Osmor.
One 250 K Ω volume control with S/P switch (type C). Dubilier.
One rotary 1-pole 2-way switch.

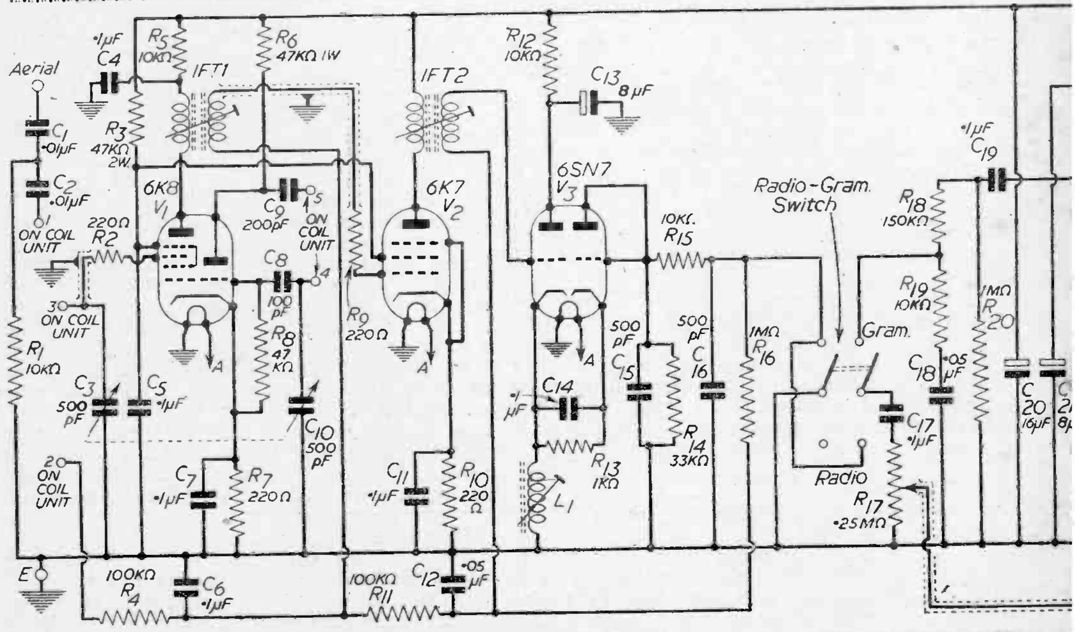
Condensers—

One 100 pF (mica) } Type CM20N. T.C.C.
One 200 pF (mica) }
Three 500 pF (mica) }
Two .01 μF, type 543 (500 v.w.) } T.C.C.
Two .05 μF, type 543 (500 v.w.) }
Seven .1 μF, type 543 (500 v.w.) }
One .1 μF, type CE37N (500 v.w.) }
Two 8 μF, type BR850 } Dubilier.
One 16 μF, type BR1650 }
One 25 μF, type CE32C. T.C.C.

Resistors—

Four 220 Ω	Two 68 K Ω	½ w. Dubilier.
One 1 K Ω	Three 100 K Ω	
One 4.7 K Ω	One 150 K Ω	
Five 10 K Ω	One 500 K Ω *	
One 33 K Ω	Two 1 M Ω	
One 47 K Ω	* See Text	

One 47 KΩ 1 w. One 47 KΩ 2 w. Erie.
Three I.O. valveholders } Clix.
One B9G valveholder }
One 2-pin plug and socket (P350) } Bulgin.
One 5-way tag strip (T24) }
One 2-way tag strip (T17) }
One 1-way tag strip (T32) }
One A.F. socket strip and plugs } Stern's Radio.
One P.U. socket strip and plugs }
One rubber grommet (⅜in.).
One coax. socket and plug (L604/S and L734/P). Belling & Lee.
Four control knobs. Bulgin.
Metal chassis, 12in. x 9½in. x 2½in.; Bolts and nuts; insulated connecting wire; two 6.3 v. dial lights, 1 yd. 75 Ω coaxial lead. Stern's radio.
One 6K8 valve } One 6SN7 valve } Brimar.
One 6K7 valve } One 6BR7 valve }



Circuit of the radio feeder and pick-up pre-amplifier.

FULL-SIZE BLUEPRI

used in this combination gives a rising bass and treble, with a cut-off round about "surface noise" level, and the gain, with the special low-microphony pentode used, is sufficient fully to load the input of the main amplifier. It will be noted that across the pick-up there are a fixed condenser and two resistors in parallel, and it may be wondered why a single resistor was not employed in place of these two. The reason is that some listeners may prefer to use old records which have a much higher output level than modern discs, and it may be found that the 6BR7 is overloaded, giving rise to a form of distortion which might be described as "throaty." This may be overcome by replacing R24 by either a normal .5 MΩ volume control or by two separate fixed resistors in series, with the output taken from the junction of them. The values will, of course, be chosen to give the desired reduction in output. If a standard variable is used in place of the tapped resistors it should be mounted on the chassis, adjusted

COMPONENTS FOR AMPLIFIER

One type PTM13A mains transformer
One type PCF18 L.F. choke (Ch.1)
One type PCF17 L.F. choke (Ch.2) } Woden.

Condensers—

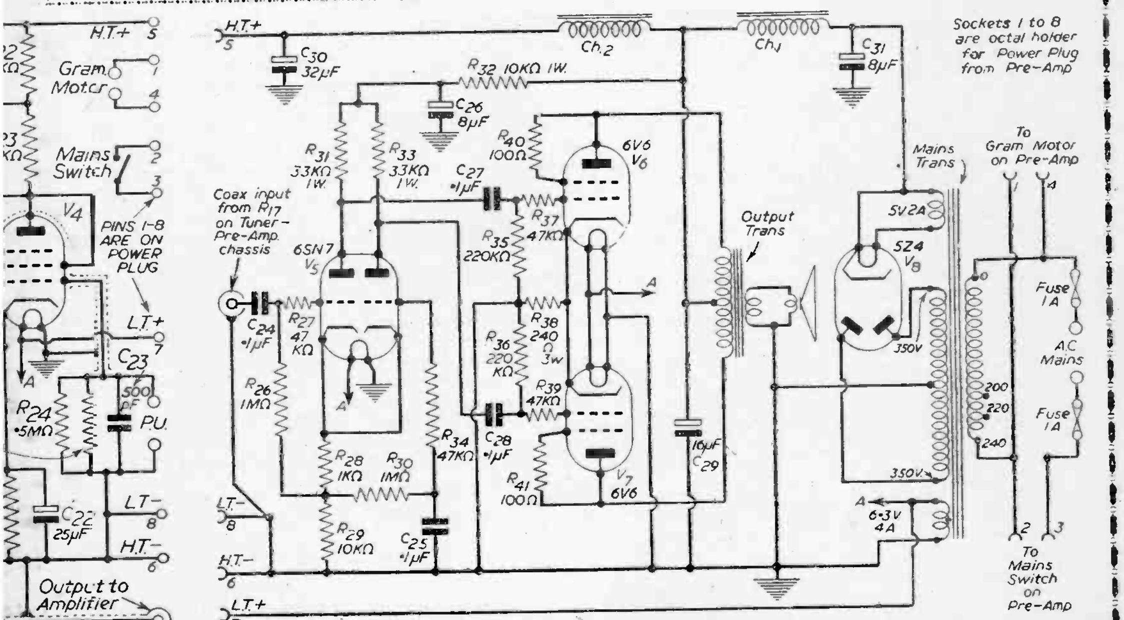
Three .1 type CE37N (350 v.w.)
One .1 type 543 (500 v.w.)
One 8 μF type CE25P (450 v.w.)
One 16+8 μF type CE28P (450 v.w.) } T.C.C.
One 32 μF type BR3250. Dubilier.

Resistors—

Two 100 Ω
One 1 KΩ
One 10 KΩ
Four 47 KΩ
Two 220 KΩ
Two 1 MΩ } ½ w.
One 10 KΩ
Two 33 KΩ } 1 w.
} Dubilier.

One 240 Ω, 3 w. Welwyn.
One plug and socket (L604/S and L734/P). Belling & Lee.
Four I.O. valveholders. Clix.
One 3-pin mains plug and socket (P162)
One fuseholder (type F141) and fuses (1 amp.)
One 8-pin plug (type P112) } Bulgin.
One 6SN7 valve
Two 6V6 valves
One 5Z4 valve } Brimar.
One W.B. 10in. Stentorian L.S. and transformer. Whiteley Electrical.
One miniature 2-pin plug and socket. Clix.
Metal chassis, 15in. x 8in. x 2½in. Insulated Connecting wire, bolts and nuts. Stern's Radio.

One multi-speed auto record changer. Ediswan-Plessey.



Circuit of the power pack and main amplifier.

to the desired level when the receiver is first put into operation and then left alone.

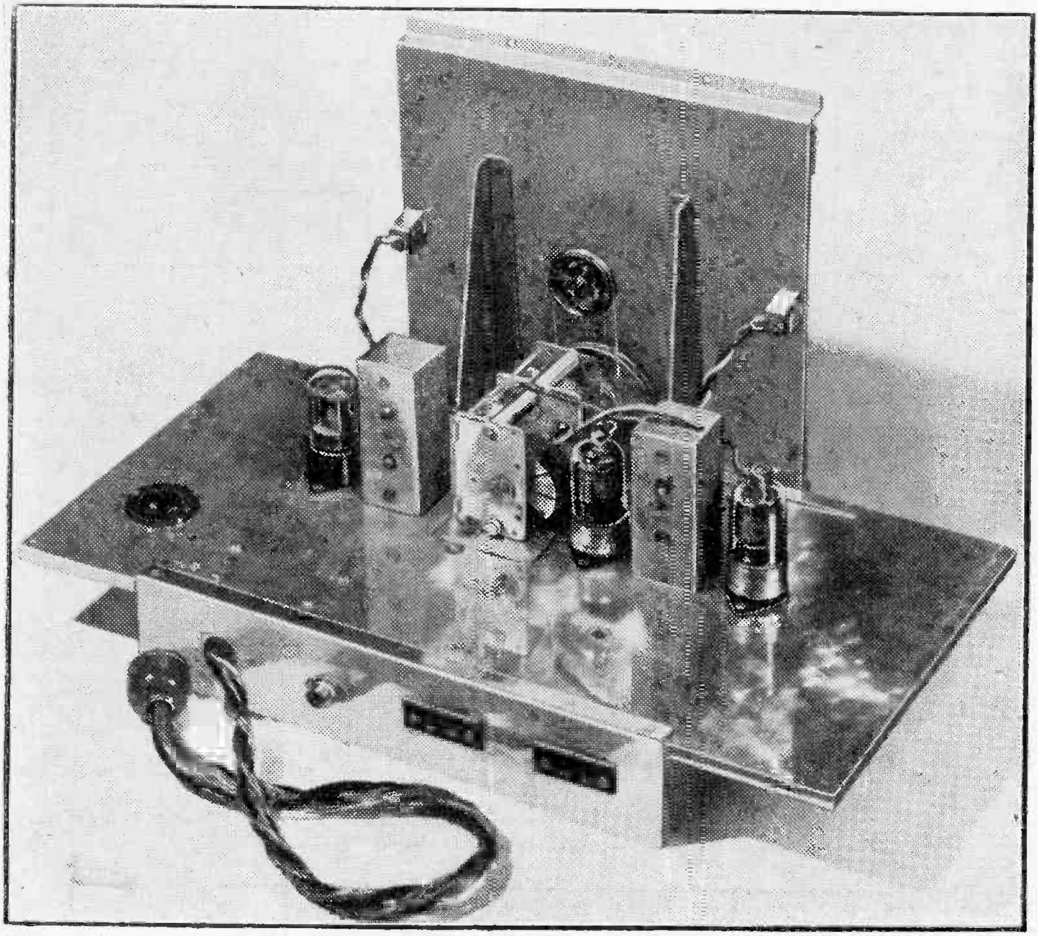
There is scope for the constructor to experiment with quite a range of values in this particular stage, and as it operates only on records it is possible to set it up for either one particular type of record (for those who prefer one make), or as a compromise for all types. It is in the latter connection that the values given have been selected, and it will hardly be necessary to inform those who find their main interest in record playing, that there is quite a difference in the reproduction of say, Parlophone and Decca discs. The latter, with the *ffrr* characteristics may prove too "topy" for some and an adjustment of R25 and C23 should be carried out in this case. On the other hand, some discs may find improvement by accentuated bass, and experiment with the tapping point between R18 and R19 should be carried out, together with a modification of C18. In other words R18 and R19 may both be increased or reduced in value, preferably keeping the total value roughly between 100 KΩ and 220KΩ, noting the effect of the variation in the tapping point. The values chosen here, as in the previous case, are those which we feel are the most suitable compromise and no criticism has so far been made concerning the quality of reproduction by those who have heard the Autogram.

Valve Screening

It is possible to obtain small valve screens which fit into the valveholder for the type of valve specified, and in some cases it has been found necessary to screen the entire valve to prevent hum. Provided that the wiring, as shown on the blueprint or in the next issue, is followed there should be no need to make use of this screen, although if the valveholder when purchased is supplied with the screen there is no objection to using it, as it has no deleterious effect upon performance.

Additional Stage

As already mentioned flexibility has been considered in this design and it may be thought that there is insufficient L.F. gain in the combination to give adequate signals on weak stations. This criticism can be upheld, but must be considered against the question of quality of reproduction, which is usually poor when a weak station is received, either because



The finished tuner and gramophone pre-amplifier.

of the low signal-to-noise ratio or because of interference. As there is thus very little entertainment value in such a signal, it is not worth while providing additional gain, but at a later date it is quite a simple matter to include a further stage before V5, and it will be noted that space has been left on the amplifier chassis for this purpose. Such a stage is quite critical, however, and there are a number of considerations which must be borne in mind. Firstly, it will follow the gramophone amplifier and this means that records will be reproduced very much more loudly. It may easily then be possible to overload the output stage. Secondly, any distortion introduced in the new stage will be heard on records also and it would not be practicable to include the gramo. pre-amplifier between the new stage and V5. We tried the circuit in this connection and using a 6BR7 with components to give a very low stage gain, obtained some improvement on the weaker stations but generally the difference on records and the main entertainment stations was such that it was not considered worth while to fit it.

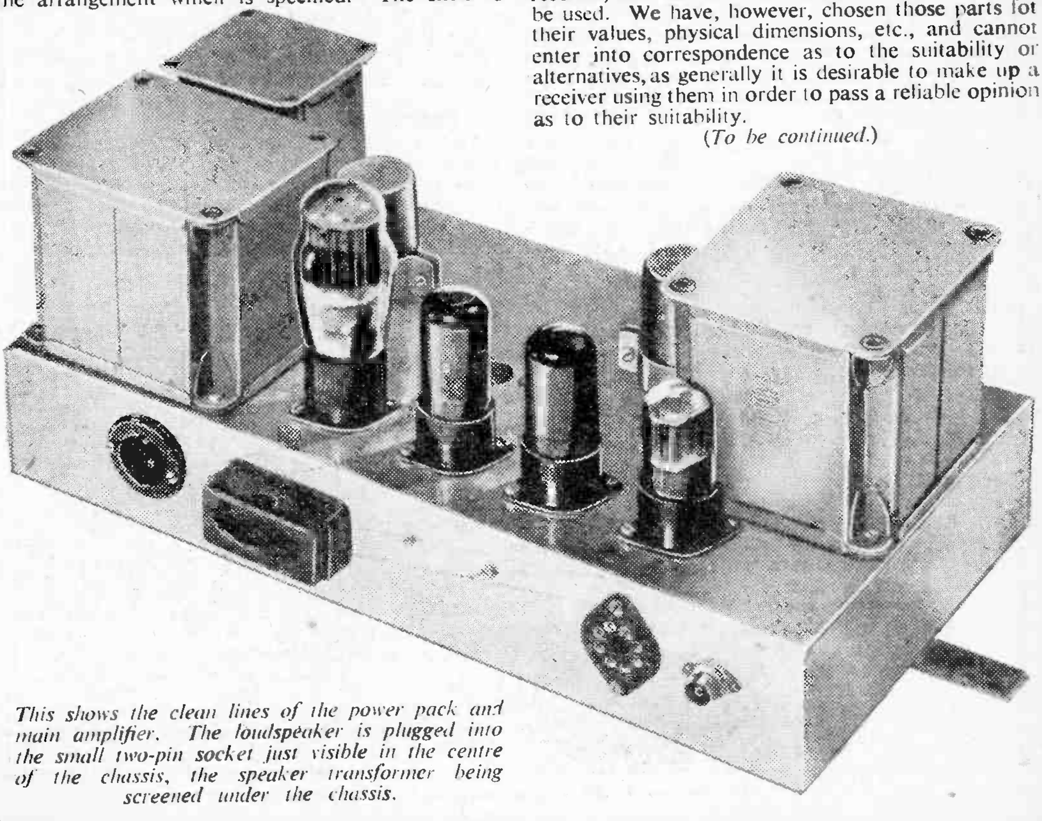
Constructional Work

As already mentioned the main tuner is built on a baseboard of the metal-covered type, merely because this particular old receiver had that type of construction, but the layout was so arranged that the rear runner may be considered, with a similar runner in the front, as the sides of a standard chassis, measuring 12in. by 9½in. by 2½in. deep, and this is the arrangement which is specified. The shelf to accommodate such a chassis must be so positioned that the large full-vision dial assembly will not foul the motor-board and this will call for individual attention according to the type of cabinet being used. The chassis for the main amplifier measures 15in. by 8in. and is also 2½in. deep, and this will have to have cut-outs in it to clear the terminals of the mains transformer and chokes. Details of these are given on the full-size blueprint which may be obtained for 3/6d. and a small reproduction will be given in the next issue for those who are unable to wire up from a theoretical circuit.

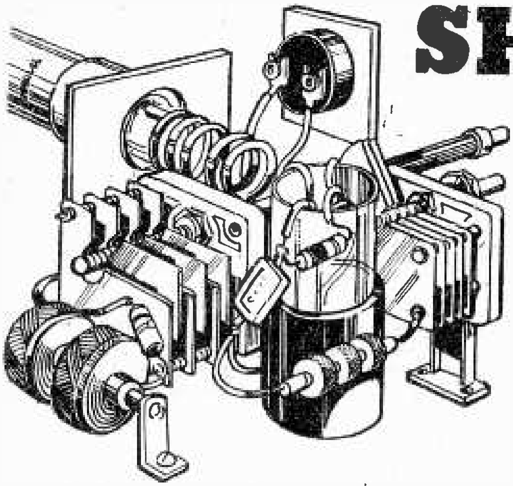
The mains socket for the gramophone motor will, of course, be mounted on the side of the chassis if this method of construction is adopted, and there is no reason why it should not be placed at the opposite end of the chassis if desired. The main interconnecting cable may be constructed from standard coloured plastic-covered flex to facilitate identification and the two theoretical circuits show the plugs and sockets in standard theoretical form with the numbers as carried on the Bulgin octal plug—which are, of course, the standard B.V.A. markings for octal valveholders. When the cable has been constructed and the socket wired a special check should be carried out as it is easy to introduce a short-circuit in this part of the operation, and should this be across the mains leads a nasty accident may occur.

Once again it should be pointed out that the particular items specified in the list of components are those which we actually used in the prototype receiver, and this does not mean alternatives cannot be used. We have, however, chosen those parts for their values, physical dimensions, etc., and cannot enter into correspondence as to the suitability or alternatives, as generally it is desirable to make up a receiver using them in order to pass a reliable opinion as to their suitability.

(To be continued.)



This shows the clean lines of the power pack and main amplifier. The loudspeaker is plugged into the small two-pin socket just visible in the centre of the chassis, the speaker transformer being screened under the chassis.



SHORT-WAVE SECTION

A Modified Folded-"V" Beam

DETAILS OF AN INDOOR SHORT-WAVE AERIAL

By A. W. Mann

IT is safe to assume that apart from an efficient receiver the most successful DX listeners have an efficient aerial for use in conjunction with it.

Opinions are divided as to which is the most suitable and efficient type of receiver. Readers who listen to discussions over the air on various amateur bands are apt to be misled so far as receivers are concerned, as they usually overlook the fact that the opinions expressed are based on the exacting requirements of the transmitting amateur.

Some, for example, swear by the AR88 and AR77 ; others favour the HRO. One also finds opinions which differ in several respects concerning these receivers. On the other hand, I have heard the R1155 described as doing all that was required after a little modification. The availability of ex-Service receivers has thus placed the amateur and short-wave listener in a position to use highly efficient equipment which otherwise he would never have been able to afford.

The best advice one can give, so far as the short-wave listener is concerned, is to buy and try what you can afford.

Aerials

Aerial discussions on the amateur bands are centred on the transmitting types which are equally good for receiving.

Here again, the opinions expressed are of little value to the short-wave listener. When writing about short-wave receivers and aerials one should take into consideration the fact that it is but the minority who can afford the more expensive types of communication receivers, and that the average reader's location does not allow aerial systems based on text-book recommendations to be erected.

Few, for example, have the space required to erect a half-wave horizontal doublet. Among those who have it is probable that broadside directivity problems and their solution do not fit in with space factors.

I am aware of one amateur transmitter who must perforce use an oddly-shaped aerial system which does not conform to the textbook by any stretch of imagination. At first he regarded his position as a hopeless one. So far as practical results are concerned this is far from being the case.

When one has no choice in the matter the only thing to do is to erect the best aerial one can, in the space available. This may be based on original ideas, or on the ideas of others who are similarly situated. If the results obtained show promise, follow a long-term policy, for by so doing a true sense of values will be acquired.

In the April, 1950, issue of PRACTICAL WIRELESS I described in detail an original type of indoor short-wave receiving aerial, which was devised with the idea of obtaining a useful amount of pick-up together with variable directivity. This folded-" V " beam aerial has provided me with some valuable data during the past two years.

The Modified Aerial

Fig. 1 shows the indoor folded-" V " beam in its

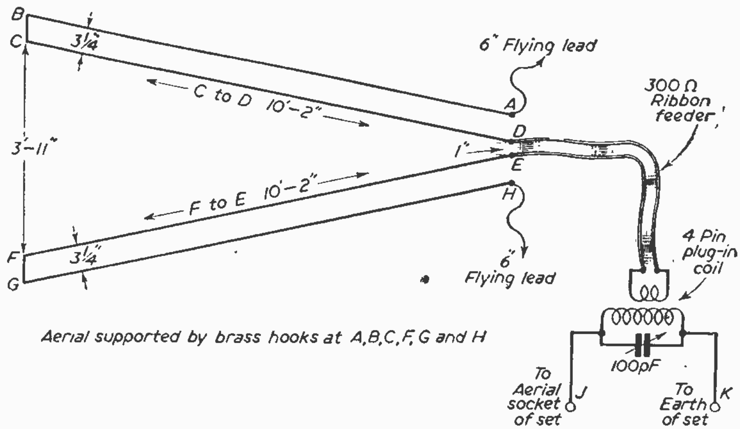


Fig. 1.—General form of the folded-" V " aerial.

modified form. For the benefit of new readers it may be as well to describe briefly the salient features of the original model.

The aerial consisted of one unbroken length of stranded, insulated aerial wire. That is from A to B, continuing to B-C, C-D, D-E, E-F, F-G and G-H, continuing with a 6in. length of flying lead at A and H. In this case the aerial was also tuned by means of a suitable tuning unit of simple construction.

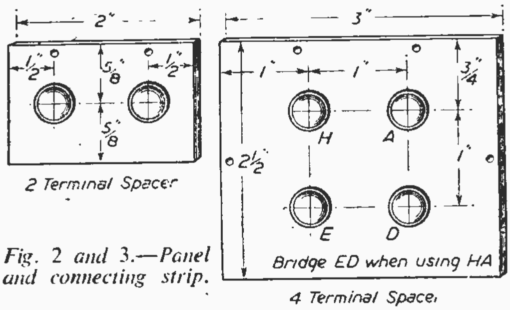


Fig. 2 and 3.—Panel and connecting strip.

A single down-lead is used, and the following coupling or tapping combinations are available. Between E and D, at H or A, and with the flying leads H and A coupled together, the down-lead can be coupled to the mid-point. In this way variation of directivity is possible.

Modifications

Examine now the modified version as shown at Fig. 1. While the free ends A and H are retained, a different type of down-lead is used. Also, we do not employ a single length of wire, but introduce a break between E and D. Thus we have, in effect, two separate aerials of "U" shape and in "V" formation.

A divided aerial of this type requires a twin feeder as the coupling medium. In order to obtain a satisfactory match we decided to use 300-ohm ribbon feeder as advertised in this journal. While heavy duty ribbon is used in the original model, the lighter and more flexible 300-ohm ribbon would, I think, be better.

Coupling

If the receiver with which the aerial is to be used has provision for doublet coupling, the twin leads can be coupled directly to the appropriate sockets. Many home-constructed receivers can be adapted, as will be shown later. Where this is impossible, as in the case of the R1116, R1116A and R1155A receivers, a suitable coupling device must be used. This may be of the fixed or variable type respectively. We prefer the latter, and although in adopting it an additional control is introduced, its inclusion will prove to be warranted.

A modified version of the 1083 tuner was at first considered, but as these are now scarce it was decided to use one which could be built with standard components and four-pin type plug-in short-wave coils covering the tuning range of the receiver to be used.

The Tuner

Theoretical details of the tuner will be found at Fig. 1. The components required are one 100 pF. tuning condenser with slow-motion dial; two terminals or sockets; one coil base. The complete unit can be built on a small panel and baseboard assembly.

This tuner and the feeder recommended will be found to provide an excellent match between the aerial and receiver input, the aerial being inductively coupled to the tuned circuit.

Four-pin base connections are as follows: Reaction winding sockets to twin feeder; top of grid winding to fixed vanes of tuning condenser; bottom of grid winding to moving vanes. Leads between J and K should be taken direct from the coil base sockets and not from the tuning condenser terminals.

Queries Answered

Before dealing with the practical application of the aerial system it occurs to the writer that there are certain points about which questions may be asked, because it must be borne in mind that we are not dealing with an aerial specially designed for one band operation, but rather with one intended for general coverage purposes.

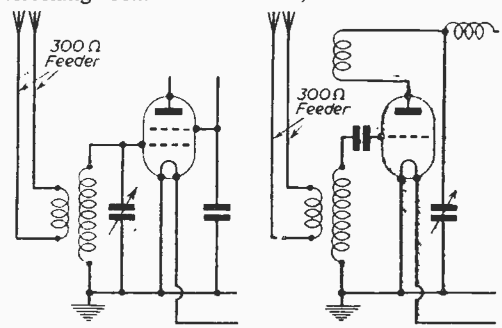
The first question might be: *Can the length of the legs be increased where space will allow?* The answer is "yes." Increased pick-up will result with some loss in selectivity, but the angle and other dimensions must not be altered.

Wherever possible the exact specification should be adhered to. *Can other than the 300-ohm feeder line be used?* The answer to this is definitely "no."

Fig. 2 shows the form of spacer required, which consists of two terminals mounted on suitable insulating material. The spacer shown at Fig. 3 will allow the "V" to be taken to E and D and the flying leads to H and A. The terminals E and D should be bridged with a short piece of wire when the feeder is coupled to H and A. Strong directional effects are obtained with feeder as shown and A and H joined together.

The Set Up

The aerial ready for use, we couple the down-lead to the tuner, as previously described. If the receiver is in a cabinet or screening box and has wave-change switching (such as the R1116, R1116A) the tuner unit can stand on top of the set, the connection on the aerial side of the tuner being coupled direct to the aerial socket of the set. The earth side connection, however, need not be taken direct to the earth terminal, but to the nearest earthed point of the screening box. The receiver, should be earthed.



Figs. 4 and 5.—Connections to the input stage of two types of receiver. The grid coil in the right-hand circuit is, of course, turned in the usual way.

When using this form of coupling with an R1155A receiver (unmodified) the feeder connections should be taken to the aerial and earth points of the Jones plug. The shortest possible lead is allowable from the internal aerial and earth tags of the plug, while the receiver is directly earthed from some part of the screening box. Tuned coupling as A, Fig. 1, is the better method.

Tuning Procedure

This is as follows. Set aerial tuner condenser to half-way position, tune in the desired transmission on the receiver for maximum signal strength. Follow by tuning the aerial tuner. This will improve the matching of the aerial to receiver input, and further increase the gain.

Alternative Connections

As previously mentioned, alternative connections can be made to the flying leads H and A. This will be found to have some directivity effect.

At the moment the writer is using spring clip connections between feeder to aerial. It is intended however to arrange matters so that quick changes can be made from the receiver operating position.

T.R.F., etc.

Fig. 4 and Fig. 5 show how the aerial down-leads should be connected to T.R.F. receivers, using plug-in four-pin coils, and regenerative receivers using the six-pin type plug-in coils respectively.

The writer will be pleased to hear of the results obtained by those short-wave listeners who give it a trial. In the meantime the problems relative to outdoor aerials for erection in limited space are being studied, and certain ideas will be tried out in practical form, with various types of receivers. If successful they will be dealt with in a future article.

Automatic and Manual Tuning

DUAL TUNING COMBINED IN ONE RECEIVER

By S. W. Clements

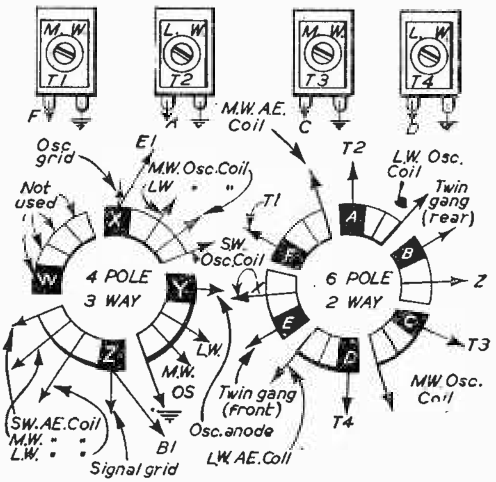
MOST of the time, the average domestic receiver is tuned either to the Home Service or the Light Programme, and therefore both may advantageously be pre-set. But there is always that odd occasion when the flexibility of manual tuning is required to tune a station on another wavelength for a particular programme, or for touring the short waves. The average superhet, normally tuned by a twin-gang variable condenser, can be modified to receive one medium-wave and one long-wave station pre-set, with the alternative of complete manual tuning, at a cost of a shilling or two.

The components required are a 6-pole 2-way switch and 4 trimmers. It may be necessary to wire small fixed condensers across the trimmers to give the necessary capacity.

Space must be provided on the panel for the extra control; next to the wavechange switch. This can usually be effected by moving the tuning control, either to the centre of the dial or above it. Alternatively, a little-used tone control may be dispensed with or put at the side or back. The lay-out is immaterial provided that the new master switch is adjacent to the existing wavechange switch. The four trimmers should be mounted at the rear of the chassis where they can be easily adjusted. The wiring of the switches and trimmers is shown diagrammatically, and it will be seen that the connections to the wavechange switch remain as before except where poles X and Z are linked to the master switch. Note that the top tags on the twin gang are now unused because the grid cap of the frequency changer is connected to the switch.

When the wiring is completed, set the wavechange switch to "medium" and the master switch to "manual" and tune in the local station, if it is desired to have this pre-set. The alteration to the wiring may cause some small adjustment to the aerial and oscillator trimmers on the coil-pack. When the station is properly tuned, turn the master switch to "auto" and adjust trimmers 1 and 3 at the rear of the chassis until the same station is received. A non-metallic screwdriver or trimming tool should be used. The station should be heard at a volume at least as great as the manual setting and, in fact, if the twin gang is not fitted with trimmers the pre-set volume may be appreciably greater. Carry out the same procedure on long wave with the Light Programme, using trimmers 2 and 4. An indication of the capacity required can be obtained by observing what part of the vanes of the twin gang are in mesh when the station is tuned manually.

The modification is now complete. With the master switch at "manual," the letters "L" and "M" on the wavechange switch stand for "Long" and "Medium"; when set to "auto," they stand (in my case), for "Light" and "Midland." There is no provision for a pre-set station on the short wave.



Details of the coil and switch connections.

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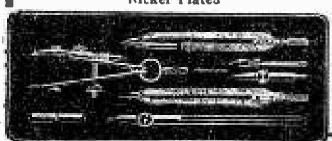

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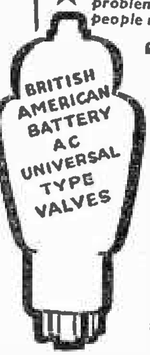

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A Voice-operated Relay

USES AND A RECOMMENDED CIRCUIT

Described by W. S. Fowler, M.A.

THE voice-operated relay has three main uses. The first is to provide absolute interference and "mush" limitation below a desired level. For instance, in an aircraft, when the radio operator is merely listening out for base calls of fairly good strength, the relay is adjusted so that it "shorts out" all signals below this strength. The result is that the wireless operator is not distracted from other duties by being compelled to listen to constant "mush" and to weak, unwanted stations. Instead, the set remains dead quiet until the relay is energised by the comparatively powerful signal of the base, or by an accompanying aircraft.

The second use of the voice-operated relay is that it can act as an automatic monitor on any desired frequency in conjunction with a tape or wire recorder. The apparatus is set up, the receiver is tuned to the desired frequency, and the recording mechanism is automatically started and stopped by the voice-operated relay, when it is energised by an incoming signal.

The third use of the relay is that it can provide a switch over from "receive" to "transmit" without the operation of any manual controls on the part of the operator. As soon as the operator begins to speak into the microphone the relay switches over the set from "receive" to "transmit." When he stops speaking the set goes automatically back to "receive."

There are no doubt many other uses to which the relay can be put and, once the principle is understood and the circuit has been built, the reader can experiment for himself.

Principle and Circuit of the Relay

The principle upon which the operation of the relay depends is simply the fact that varying grid voltages in a valve result in varying anode currents. The more negative the grid is made with respect to the cathode, the *less* anode current flows. Finally, a point is reached at which no anode current flows. This is known as the "cut off" voltage.

The relay used in the circuit is a sensitive one, needing only a few milliamps to operate it. The relay to be found in the government surplus TR5043 transmitter-receiver works very well, but a home-made relay can be constructed from an old earphone. The relay is inserted between the anode and H.T.+ of any A.F. amplifier triode. A 6J5 serves the purpose very well. The relay takes the place of the normal anode load of the valve.

A variable resistance is inserted in the cathode lead of the valve (about 3-5 KΩ). By adjusting this, the negative bias on the grid of the valve can be altered until there is insufficient anode current flowing to close the relay.

Finally, a positive voltage is applied to the grid by tapping off a portion of the rectified A.F. signal from the receiver via a fairly large condenser and resistance (a suitable C.R. value is given by a .05 μF condenser and a 1 MΩ resistor).

When a signal of sufficient strength is received the condenser and resistance supply a steady positive voltage to the grid, in exactly the same manner as an A.V.C. circuit (with reversed polarity) operating on a variable-mu valve. This acts in opposition to, or cancels out, part of the existing negative voltage on the grid, and the result is a flow of anode current sufficient to operate the relay. The precise point at which the relay operates can be controlled by adjusting the variable resistance.

The points of the relay are, of course, connected appropriately according to the purpose for which the relay is being used, i.e., they may serve to break a short-circuit in the A.F. output, if the circuit is being used to act as a noise suppressor, or they may serve to switch on a motor if the relay is being used to monitor a frequency. Again, they may be connected so as to switch over from "receive" to "transmit."

The circuit diagram below shows a suggested arrangement for using the relay to monitor a desired frequency. A proportion of the rectified signal is tapped off from the diode load (1 MΩ volume-control) and serves to alter the bias on the 6J5 valve, in order to close the relay and thus operate the recorder mechanism when the required signal is received.

(*Continued on p.* 282)

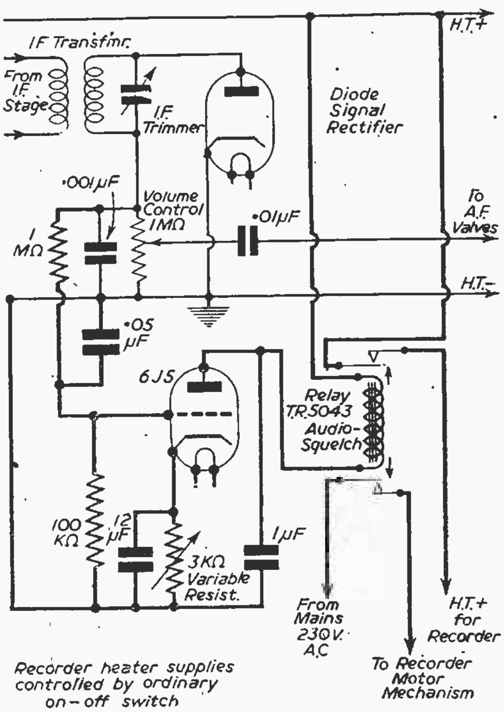


Fig. 1—Circuit of a superhet-controlled relay for various purposes.

Simplified Set Construction

ADVICE FOR THE BEGINNER IN RECEIVER BUILDING

By Henry G. Russell

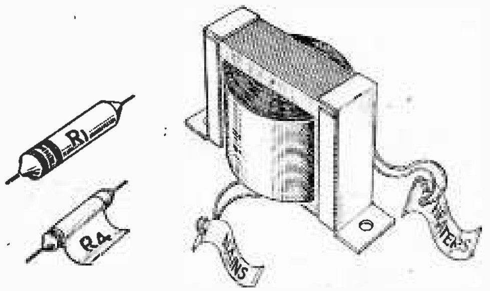
ALTHOUGH many readers may be competent technicians capable of reading a theoretical circuit and wiring up a receiver without hesitation, there are many who, like the writer, only occasionally build a set, and have to tread warily when following a circuit.

Until a year ago I invariably slipped up somewhere, usually in the omission of a connection, or using the wrong resistance in the right place or the right one in the wrong place. I also found that much time was spent in ascertaining the value of a resistor from the colour code.

I have since simplified my procedure, and find set construction much quicker with satisfactory results first time.

Marking Resistors

With the circuit before me, I sort out all the resistors and find their values from a resistance chart. These are either marked on the resistor body with Indian ink or, where they are of the ¼-watt variety, I stick on the resistor a piece of adhesive paper upon which is marked either its value or its number in relation to its place on the circuit, such as "R4" or "100KΩ R5".



Figs. 1 and 2.—Labelling components and leads.

The same procedure is followed with components such as coils, I.F. transformers, leads from mains transformers and so on, so that when I am ready to mount the components, or begin wiring, everything is marked exactly as on the circuit. This means that where the diagram is marked L1, I just take the coil marked L1; or instead of looking for a .002μF capacitor I take the one marked C3, or whatever it is. This preliminary marking can be done at odd moments, saves much time, and greatly reduces the margin of error; no longer is it necessary to look up the value of a component in the list of parts, which is marked on the circuit with a number.

Foolproof Wiring

Possibly more errors are made in constantly looking from circuit to set than in the correct choice of resistors and condensers. In a maze of lines and shapes it is easy to miss a vital connection, but if the following method is used there can be no errors in wiring.

If you are using a blueprint, buy a small tube of students' ultramarine water-colour. This costs about 4d. A cheap camel-hair brush is good enough for applying the colour. As each connection is made, paint over the line with the blue water-colour. It will be obvious now that if you have completely wired the set, there will be no white lines remaining on the print; if you have missed a connection it will be seen immediately.

If you are wiring up from a circuit published in PRACTICAL WIRELESS, then the connections should be painted over with some Chinese white.

Having completed the job, wiring can be cross-checked by marking over the blue lines painted in on the blueprint with white, as these are seen on the set, or with black pencil or paint over the white lines made on the "P.W." circuit. Even when you feel that a slip-up has occurred somewhere the obliterating paint-lines can be easily washed off, ready for a fresh start. For the not-too-knowledgeable amateur, this simplified method will lead to surer and quicker radio construction.

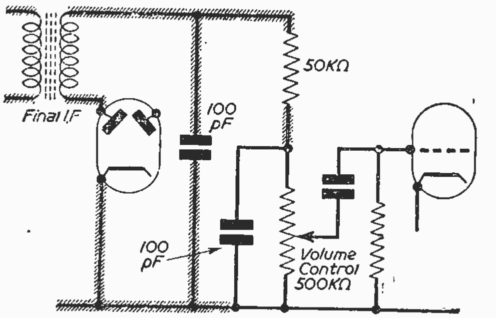


Fig. 3.—Marking off the circuit when wiring.

B.I.F. Catalogues Flown Overseas

ADVANCE consignments of the 1952 British Industries Fair catalogue have been flown overseas to assist foreign buyers in planning their visits to the Fair, which will be held in London and Birmingham from May 5th to 16th.

The catalogue is in two parts—one for the lighter industrial sections at Earls Court and Olympia in London, and one for the heavier engineering section, at Castle Bromwich, Birmingham. The complete catalogue weighs some 3½ lb. and runs to more than 1,400 pages.

Up to the time of going to press, the balance of 20,000 catalogues in the advance edition will have been dispatched to United Kingdom government offices in 63 countries for distribution to prospective visitors to B.I.F. The final edition of the catalogue, bringing the total circulation up to 65,000, will be available on May 5th, the day the Fair opens.

The B.I.F. Catalogue is valued not only as an aid to preplanning a buyer's itinerary at the Fair, but as a book of reference for British industry. Over 2,000 firms are listed. By means of cross-reference indexes, it is possible to find all the exhibitors showing any given range of production.

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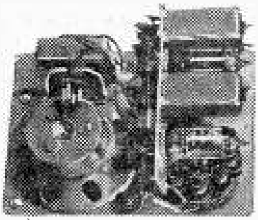


It is of midget size, being only 4¼in. x 6¼in. x 4¼in. when completely built, and is very easily assembled from diagrams supplied.

Cost of all components to completely build the set, including a drilled and cut chassis and panel, and new valves, £9/10/0 (or less valves for £6/7/6). Plus Portable Carrying Case, 16/6.

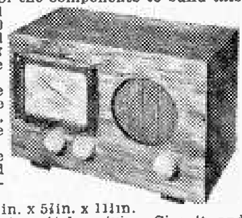
A blue print showing complete practical component layout and wiring diagram, together with an individual component price list, is available separately, 1/6.

Our Mains Units available in kit form are suitable for use with this set.

THE "WIRELESS WORLD" 3-VALVE SET

A Midget 3-valve T.R.F. Receiver for operation on A.C. mains, covering long and medium wavebands.

We are able to supply all of the components to build this set, as designed, and specified in the Feb. 1950 issue, including the drilled chassis, valves and moving coil speaker, etc., at the following prices :—



To construct complete chassis, less dial and drive assembly, £5/5/0. Ditto, including dial and drive assembly, £6.

To construct the complete Set, including dial and drive assembly and cabinet, £7/3/6.

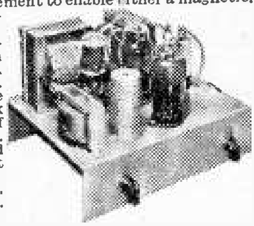
Overall size of cabinet is 7½in. x 5½in. x 11in.

A reprint of the designer's article, giving Circuit and Assembly Instructions (this is available separately for 9d.), together with a Practical Component Layout is included with each of above assemblies.

A QUALITY "PUSH-PULL" AMPLIFIER KIT

A Kit of Parts to build a 6-8 watt Push-Pull Amplifier for operation on A.C. mains 200-250 volts.

Incorporates a simple arrangement to enable either a magnetic, crystal, or lightweight pick-up to be used.



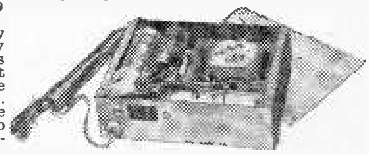
A 10-watt Output Transformer is designed to match from 2 to 15 ohm speakers. Tone control is incorporated. The overall size of the assembled chassis is 10in. x 8in. x 7½in. high. Price of kit complete in every detail, including drilled chassis and valves, £6/12/6. Component layout is supplied.

Price of assembled chassis, supplied ready for use, £8 2/6.

"PERSONAL SET" BATTERY ELIMINATOR

A complete kit of parts to build a Midget "Alldry" Battery Eliminator, giving approx. 69 volts and 1.4 volts.

This Eliminator is for use on A.C. mains and is suitable for any 4-valve Superhet Receiver requiring H.T. and L.T. voltage as above, or approx. to 69 volts.



The kit is quite easily and quickly assembled and is housed in a light aluminium case, size 4¼in. x 1¼in. x 3¼in. Price of complete kit, with easy to follow assembly instructions, 42/6.

In addition we can offer a similar COMPLETE KIT to provide approx. 90 volts and 1.4 volts. Size of assembled Unit 7in. x 2½in. x 1¼in. Price 47/6.

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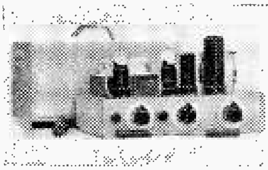

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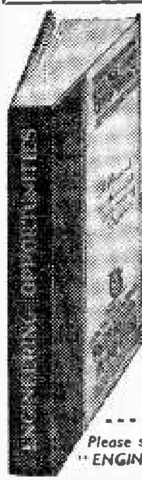

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BIET

Programme Pointers

By Maurice Reeve

THE once popular Quiz seems rather less in favour just now than recently, but the programmes which turn themselves into public forums for the airing and discussion of anything of topical moment never were in such vogue. "We Beg to Differ," "Dear Sir," "Any Questions?" and "Taking Stock"—this political discussion on Friday evenings takes on different titles—readily come to mind. The first three are entertainment pure and simple, even when serious problems come under review.

"We Beg to Differ"

I think this earns pride of place. It maintains its highly sophisticated standards remarkably well, whilst the clever handling of its questions with a cheeky insouciance is on a uniformly high plane. It was most interesting to observe, however, that no adequate substitutes could be found for the original company of John Clements, Kay Hammond and Co., and they were promptly recalled *in toto* in order to save the show. As with Itma, it was they or nobody.

"Dear Sir"

This is the reading of correspondents' letters by various people who are, I presume, supposed, by their several voices and general personalities, to resemble the actual writers. It doesn't always come off. This is usually on Thursday evenings, and "We Beg to Differ" on Monday evenings.

"Any Questions?"

But the most pretentious of these programmes would seem to be Freddie Grisewood's "Any Questions," in which the former announcer presides with great tact and charm over a team of four able "discussion men" who vary from week to week, but who include Ralph Wightman as often as not. As with Wilfred Pickles's "Have a Go!", "Any Questions?" is held in a different public hall each week, though the range of its travels is much more limited than the former, being, for the most part, let to wander up and down and round about an area of country which roughly corresponds to Hardy's Wessex.

When I hear questions debated such as "What would members of the team do if they woke up one morning and found they had changed their sex?", I wonder whether this usually diverting, amusing, yet instructing programme will eventually go the way the Brains Trust did, which, you will remember, was killed by the fatuity and imbecility of a large number of the questions which were put to it. Also, politics sometimes become a trifle acerbated, calling upon a gentle rebuke from the Question Master. But let us not anticipate these troubles enlarging themselves. At present it is a very competent and rewarding show.

Family Chronicles

The two family chronicles, "Mrs. Dale's Diary" and "The Archers," are as lusty as ever. Mrs. Dale, of course, has proved herself the feminine counterpart of Tennyson's "Brook." I haven't heard whether she was pleased at the windfall which dropped into the lap of her overworked and underpaid husband at the hands of Mr. Justice Bankwarts. Pleased she must have been; I should have referred to the degree of her pleasure.

The Archers continue to unfold daily their totally unsophisticated, uneventful and unruffled existences in pleasant quarter-hour snippets. Both these features rather remind one of popping into a newsreel theatre for an hour to watch similarly unimportant though pleasant events unfold themselves. Their whole charm and attraction would be spoiled if their compass were enlarged so that, instead of hearing about Rosie the sow's bonny family or Boris Archer's tiff with her boy friend, we were given someone absconding in an aeroplane and its subsequent wreck.

Mr. Dennis Arundell is one of the most versatile men now before the public. The range of his activities, hobbies and interests seem almost boundless. And he is an effective broadcaster. His present series, "Opera Roundabout," is a most acceptable pastiche of that most unapproachable and expensive form of entertainment. In forty minutes Mr. Arundell gets through a vast amount of operatic lore, reminiscences, interviews, recordings and whatnot. The operatic world is by reason of its musical associations, an even wider and all-embracing one than the theatrical. Mr. Arundell gathers it all together with great skill and very pleasing results.

Concerts

The most notable concerts of the past few weeks have been twelve, conducted for the BBC by the distinguished Italian Vittorio Gui. Eschewing the Latin theatricalities of his countryman, de Sabata, he is more the type of the most famous of all Italian maestros, Toscanini. Gui and the BBC Orchestra put in some sterling work. They also gave a Stravinsky concert at the Albert Hall under Cameron. The programme was largely of unfamiliar works, except for the glorious Symphony of Psalms.

Care must be taken to guard against the "Queen Elizabeth" joke, now that our Sovereign bears this illustrious title. One, in a recent "Music Hall" bill, was in questionable taste to say the least.

The best plays, and very good by virtue of being by masters of their craft, were "You Never Can Tell," "Caesar and Cleopatra," "The Prodigious Snob" (Moliere's "Le Bourgeois Gentilhomme"), and St. John Ervine's "Friends and Relations."

Converting an A.C. Bridge

By J. S. Kendall

A short article on how bridges that are not at the moment driven off the A.C. mains can be converted to work from them. Full circuits are given.

OFTEN the amateur comes across a bridge circuit that is driven either from a buzzer or separate audio oscillator, and uses a pair of phones as a detecting device. Quite a lot of people object to phones and a visual tuning indicator is a favourite alternative, but for its use one side of the bridge must be earthed. Look for a moment at a typical bridge circuit, Fig. 1. In (a) the input is earthed, whilst in (b) one side of the phones that are used as the indicator are earthed. If compared carefully it will be seen that the balance formula holds good in both cases. It is quite a simple matter to turn the bridge on its side, as it were, in order to use the earthed detector, but this means that the tone must be applied between two non-earthed

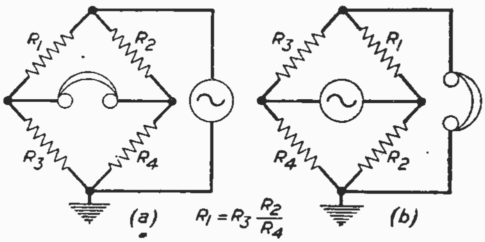

Fig. 1.—Typical bridge circuits.

points; this is quite simply effected with the aid of a close-ratio transformer.

If a buzzer of fairly low frequency was used in the original, a 50-cycle wave will be convenient. This can be obtained from the smoothing circuit, as is shown in Fig. 2, but if the rectification is full-wave, the frequency feed to the transformer will be doubled to 100 cycles! A wave obtained in the foregoing manner is of very poor shape and contains a very large proportion of harmonics. The condenser shown dotted should be joined in circuit to tune the output of the transformer to the required frequency

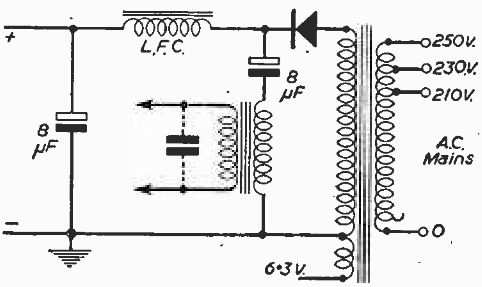

Fig. 2.—Obtaining a 50-cycle wave.

to eliminate, or at least reduce, the harmonic content.

The case of the 1,000-cycle supply is a different matter. A suitable oscillator is shown in Fig. 3. This is the well-known Franklin circuit. The valve is the popular 6SN7GT now widely available on the ex-W.D market, but if size is of consequence the Mullard ECC40 can be used. The circuit compensates itself to a very large extent for the load drawn. The transformer used should have as low resistance windings as possible in order to obtain a high Q. The tuning of the circuit is done by varying the capacity of the condenser marked "?".

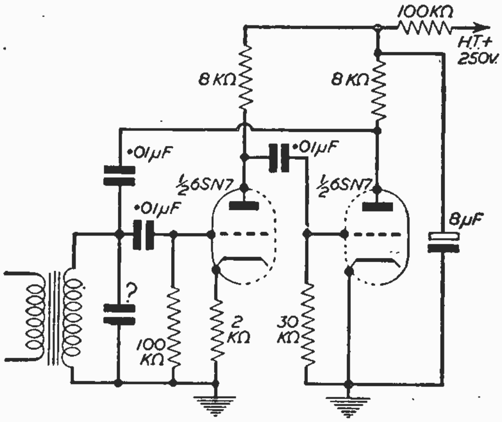

Fig. 3.—Suitable oscillator circuit.

There is a very large range of visual tuning indicators, but the writer's favourite for bridge work is the Y61, as it works over such a small voltage range. If greater sensitivity is required, the circuit shown in Fig. 5 can be used, as it gives an amplified result, but as the tube is only about one-tenth as sensitive as the Y61, there is very little advantage to be gained.

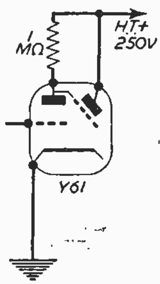

Fig. 4.—A visual indicator.

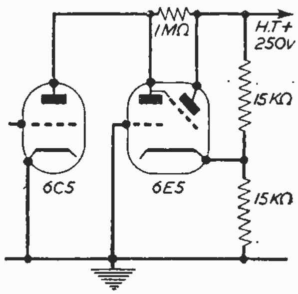

Fig. 5. Improved indicator circuit.

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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).

High-gain Amplifier

SIR,—A friend and I each individually tried an SP61 as a "high-gain" amplifier, using the resistance values given in Mr. Kemsey-Bourne's article in the August, 1951, PRACTICAL WIRELESS. These values of 50 K and 200 KΩ for plate and screen respectively, gave most disappointing performance. Far from providing a voltage gain of 150, the tube gave far less amplification than a 6J5 or L63. When, however, the values were changed to .5 MΩ and 2 MΩ, the tube worked as it should. We recommend bypassing the screen with a 0.05 μF to ground ; 2 KΩ also would be a more suitable value for the cathode resistor.

Perhaps Mr. Kemsey-Bourne has some explanation to offer : some factor we overlooked. We can hardly credit that the amplifier was worked to full output from a low-level mike. The only, and yet fantastic, explanation seems to be that the very efficient AC2PEN did most of the amplification.

As a student I appreciate your excellent magazine, especially as regards the very modest price. American magazines retail at 3s. 9d. to 5s. here (monthlies).—C. E. LATSKY (Cape Town, S. Africa).

The Modern Switch-tuned Feeder

SIR,—The coils specified for the above feeder in the April issue are our old type, which have now been superseded by a new range. Exact equivalents for those specified are available, however, and these are listed below. Tag-rings are fitted to make connections easier, but the new coils are otherwise the same as the old ones.

Perhaps this information will be of help to readers :

"P.W." circuit ref.	Osmor Type No.
L1.2	QA5
L3	QA6
L4.5	QO8
L6	QO9
H.F.C.	QC1

Retail price, 4s. each. (Data leaflet supplied free on request.)—Osmor Radio Products, Ltd. (Croydon).

Club for Tredegar?

SIR,—I have recently been enrolled a corporate member of the R.S.G.B., and for a long time I have been thinking of forming a Radio or Television Society in this district. When I first tried I had no real success, but I should be grateful if you would mention in PRACTICAL WIRELESS or *Practical Television* that I should be very pleased to hear from anyone in this district who may be interested. May I take this opportunity of saying a big thank you for the portable radio blueprint in the PRACTICAL WIRELESS, March, 1952.—K. BRYANT ("Glan Howy," Park Place, Tredegar, Mon).

Magnetic Wire Recording

SIR,—I refer to "Thermion's" paragraph in the April issue of PRACTICAL WIRELESS and write to show that I, for one, would be very pleased to see an article on the construction of this type of equipment. I have been experimenting with recording over the last 12 months, but my results as far as reproduction of music goes are far from being good. I should, therefore, be very pleased to receive from "Thermion," or any reader, suggestions for improvement in quality. The whole of the equipment is home made, including the combined record, playback and erase head.

The reproduction of the amplifier alone on both speech and music is of good quality from either a gramophone pick-up, wireless signal or microphone. But reproduction of music from the wire (recorded from the wireless) is of very poor quality ; the notes not being clear and crisp by any means, no matter what the type of recording wire used.

I have tried various values of resistors from 0-250 ohms in series with the record winding of the head, but with music, on playback I still get distortion and a definite preponderance of bass notes. Various degrees of bass cut have been tried, but these merely produce a result varying from that described above, to a tinny sort of reproduction.

My present oscillator is a 6V6, and oscillates in the order of 30 to 50 kilocycles. Both air and iron-cored oscillator coils have been tried, and varying amounts of oscillator current fed into the record head, but without showing any improvement in quality. For erasing I use a permanent magnet, because the oscillator, although it will light a three-watt lamp with considerable brilliance, refuses to erase effectively.

The recording head which I use is of the low-impedance type, and the magnetic material is Mu-metal, one single lamination 0.048in. thick. My wire speed is 2ft. per second.

I have tried other variations, but without producing any noticeable improvement in quality. These are :

(1) Increasing the wire speed.
(2) Recording at different volume levels.
(3) Trying recording heads made from different qualities and thicknesses of Mu-metal, and having various gap widths and number of turns.
(4) Using wire on which recordings had not previously been made, and recording on each length of wire once only, then playing back.

Although my mechanical arrangement for winding and laying the wire is by no means perfection, I feel sure I ought to get better results than I do. I shall be pleased if any reader who can offer any suggestions will be so kind as to communicate with me either direct, or through the columns of this excellent journal.—V. MORLEY, 220, Bolton Road, Walkden, Nr. Manchester.

Amateur Results

SIR,—I have studied the T.R.F. receiver by K. Berry, of November issue, and I thought you would be interested in my slight alterations *re* valves and coils used in my layout. First I have used four-volt valves: Marconi VMPGA, MH4, MSP Cossor, ACPEN2 and MU14. Coils used, 6-pin B.T.S., which I have a range from 9-5 to 2,200 metres. I broke up the ST900 and I am using same panel and position of coils as original; having rebuilt Mr. Berry's circuit in this style I have been through 17-80 metres. Results on 40-50 O.K., and no trouble to receive 80-250 the same. 185-580 good, with some slight breakthrough on 247 and 325, but only after 6.30 p.m. Using Eddystone for next band 500 to 1,700 better still, and on 850-2,200 B.T.S. as much as a W.B. 12in. Stentorian would give in a cabinet 39in. by 26in. by 22in., bottom part boxed off and padded with linen-covered flock and front of cabinet main fret for 12in. speaker over a lower one 15in. by 6in. boxed 7in. I used a Collaro pick-up unit complete, and I get great pleasure from this set. Quality is really grand and general tuning very sharp. —F. J. PORTER (Portsmouth).

Progress (?)

SIR,—I must agree wholeheartedly with A. E. Attwood (February issue) regarding battery sets. I am still relying on my old 12-year-old simply because I cannot find anything on the market to come up to it for selectivity and wide range of stations. Most new sets are powerful on the main stations but when I want A.F.N. or some weak one I am glad I have an old one to turn to.

I am a reader of your paper for some years now and I find one thing missing, that is, a page or so devoted to very poor amateurs like myself, these to consist of a sort of tuition for beginners. I find your paper a little advanced for a new reader.—JAMES WINTERS (Co. Tyrone).

[*We gave a short series for the beginner last year and will shortly be giving another.*—Ed.]

Balanced Twin Speakers

SIR,—I recently became interested in high-quality reproduction and after building a well-known and much advertised amplifier, also invested in a pair of special speakers. I am most disappointed in the results, most people agreeing that the reproduction is "too squeaky." This puzzled me for a time, and after some messing around I have come to the conclusion that we listeners have for so long been used to lack of the higher frequencies in our normal radio reproduction, that when we do hear it we do not like it. I am not getting too much top, as I took the trouble of going to several high-class musical concerts in order to note most carefully the "balance" of the orchestras involved, and I must say that there is more "brilliance" in the real thing than I am getting on my installation. Have any other readers any comments in this connection ?—G. HURRELL (N.W.9).

A Simple Phase Inverter

SIR,—I would like to thank D. W. Mynett for bringing to notice the phase inverter amplifier described in the April number. I have made use of it with a 6SL7, my set being universal, .3 amp. valves. I fed it straight from the diode, through the volume control, made the anode loads 220 KΩ and the cathode coupler 6,600 ohms. The triode section of the 6Q7 is now disconnected and earthed, but it could just as well be used as an infinite impedance detector. The result as compared with 6Q7 amplifier and 6J5 inverter is a better high-rate response without loss of bass, and better results on piano transients with no change in maximum volume of the set. It is a very economical circuit.—J. J. WIDDEN (Aberdeen).

Condenser Testing

SIR,—Referring to "a D.C. supply for experimental use" in the article "Preparing for the Season" of February, 1952, I beg to offer an addition to the circuit which may interest readers. By the addition of a wire-wound 50,000Ω potentiometer resistance across the D.C. supply, condensers down to 0.0005μF can be tested and quicker results obtained on larger condensers up to 10 μF. By lowering the P.D. across the condenser the neon lamp flickers more readily.

Having no 400 v. power pack, I arranged a "voltage doubler" circuit which gives an output of approx. 380 v. D.C. full wave. The rectifier used is ex war disposal and of unknown rating, but as a selenium rectifier could be identified by its 33 radiators of 1in. diameter and is about 7in. long. The neon lamp used is an "Osglim" fitted with a high internal series resistance. The condensers used are each 0.5 mfd. 1,000 v. D.C. Test.

This voltage doubles circuit, plus the potentiometer resistance has been very useful in "recharging" small H.T. batteries. When a "Batterymax" of 90 v. drops to 80 v. or so, I recharge at 4 mA. and the voltage is restored to 90 v. in about six hours.—K. COOMBS, A.M.I.E.E., A.M.I.Mech.E. (Cape Town).

A VOICE-OPERATED RELAY

(*Continued from page* 273.)

The only point which needs emphasis is that in all circuits the relay has a slight time-lag, since it will not operate until the condenser-resistance unit has built up the required voltage. This, however, merely results in a slight "clipping" of the call-signal or the first words spoken, which are usually unimportant.

If the relay opens again too quickly, i.e., at the end of a sentence instead of the end of the transmission, then experiments will be necessary to alter the C.R. factor until it provides a sufficiently slow discharge to hold the relay closed for the required time. The factors governing this are, of course, exactly the same as those which operate in a normal A.V.C. circuit, and no difficulty should be experienced in finding suitable values.

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MODULATOR TYPE 67.—Contains fully-smoothed normal A.C. Mains power pack, transformer being 345 v.-0-345 v. at 200 ma., 6.3 v. 5 a., 6.3 v. 250 ma., 5v. 2 a. Also contains 6 valves SP61, 3 of EA50, 2 of EB34, and 1 of 5Z4. Complete in metal case, size 18in. x 8½in. x 7½in. ONLY **72/6** (carriage, etc., 5/-).

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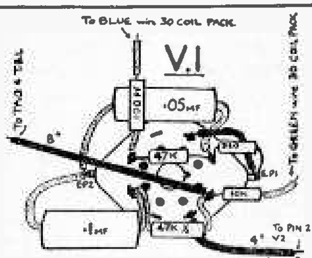

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News from the Trade

T.C.C. Revised Retail Prices

IGNITION CONDENSERS.—All types listed at 4s. each now increased to 5s. each. All types listed at 5s. each now increased to 6s. 6d. each.

"*Caradio*" *Interference Suppressors.*—The following types have all been increased to price indicated. S. 6485, 7s.; S. 6536, 8s.; S. 4481, 6s.; S. 4494, 6s.; S. 6585, 7s.; S. 6586, 7s.; S. 6775, 6s.; S. 6537, 6s.

"*Hikonal*" *Energy Storage Condensers.*—The following new list prices will apply to all of the following standard types: HK. 15, £5; HK. 28, £8 15s.; HK. 33, £10; HK. 34, £22; HK. 50, £15 10s.—**Telegraph Condenser Co., Ltd., North Acton, W.3.**

Two New Ekco Export Sets

E. K. COLE, LTD., announce the introduction of two new radio receivers for the export market—the A172 and the A173. The former is an extremely high quality 5-valve superhet all-wave table model designed for use in European and Near East countries. It is housed in an attractive and substantial horizontal cabinet, in walnut veneer, with a tuning scale carrying approximately sixty station names on medium waves alone. A slightly sloping front presents the scale and controls at a natural angle.

The A173 is a high grade 6-valve superhet incorporating an electronic tuning indicator and covering five wave ranges with band spreading on 11-13-16, 19-22-25, 27-31-38 metres. Suitable for use in medium tropical countries, it is contained in a handsome walnut veneer cabinet of entirely new design. Negative feedback in the output stage, and a high grade speaker ensure excellent quality reproduction.

Both receivers operate on 100-135 volts and 200-250 volts A.C.—**E. K. Cole, Ltd., Southend-on-Sea.**

Ingenious New Sequence Valve

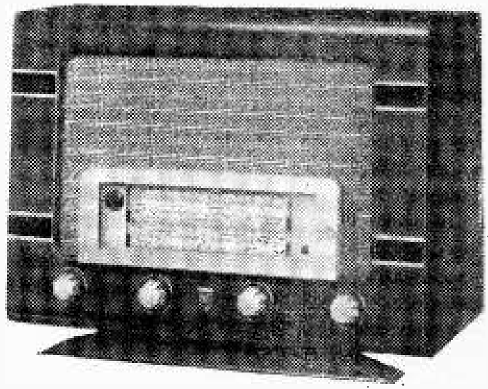
A SPECIAL pneumatic valve for controlling the sequence of operations involved in retracting and, subsequently, lowering an aircraft's undercarriage has recently been designed by the Aircraft Division of The Hymatic Engineering Company.

When the pilot of an aircraft fitted with this automatic sequence valve operates the "undercarriage down" control, the valve sets in motion the following series of events: first, the undercarriage doors open; then, just as this ram stroke is completed, it opens a lock, releasing the leg and allowing the undercarriage ram to lower the wheel. This movement completed, the valve clicks over mechanically, the doors shut around the leg and at the same time the valve is positioned for the next undercarriage sequence.

On the selection of "undercarriage up," the valve controls the reverse procedure. The doors open, the wheels retract, and the doors shut.

The basic principles of the valve, which has an operating pressure of 750 p.s.i., are simple and foolproof. Contained in its lightweight magnesium alloy casing are four on-off valves which, when operated by the internal switching mechanism, feed shuttle valves controlling the air flow to the door actuating rams. The movement of the switching mechanism is effected by the undercarriage leg through a slotted link to a lever mounted on the central serrated spindle.

Measuring approximately 6½in. H x 5in. L x 2in. W, the complete unit weighs only 1.14 lb.—**The Hymatic Engineering Co., Ltd., Redditch, Worcs.**



Ekco Model A173—Export only.

World's First Five Core Solder

A CLOSELY guarded secret, disclosed at the opening of the R.E.C.M.F. Exhibition on April 7th, was the development by Multicore Solders, Ltd., of the world's first five core solder.

This new type of Ersin Multicore Solder has five separate cores of flux with each core situated very close to the circumference of the wire. Extremely rapid melting of the solder and quick liberation of the flux is achieved by the flux area being concentrated in the outer 10 per cent. area of the cross section of the wire.

Advance samples of the new five core Ersin Multicore Solder were shown at the exhibition, including wire in 22 s.w.g. which was little thicker than a hair. When magnified the five separate cores could be clearly seen.

Production of bulk supplies of Multicore five core solder will commence later in the year when new plant is installed at Multicore Works at Hemel Hempstead. Initial supplies incorporating Ersin Flux will be allocated to export and defence contracts. Substantial orders for the new five core Ersin Multicore Solder have already been received from U.S.A.—**Multicore Solders, Ltd., Multicore Works, Maylands Avenue, Hemel Hempstead, Herts.**

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RELIABLE Mail Order Service.—V/Controls, **3/-;** miniature, **3/9;** with switch, **5/-;** miniature, **5/3.** Transformers, 350v, **21/-.** Condensers (branded makes only). 8 and 16 mfd at 500v, **4/-** and **6/6;** 10pf to .05, **11d.** each, all values. Television: Viewmaster instructions, **5/-,** and all Components supplied. C.T.S. ELECTRONICS, 44, Lower Church St., Croydon.

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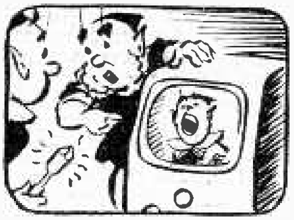

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