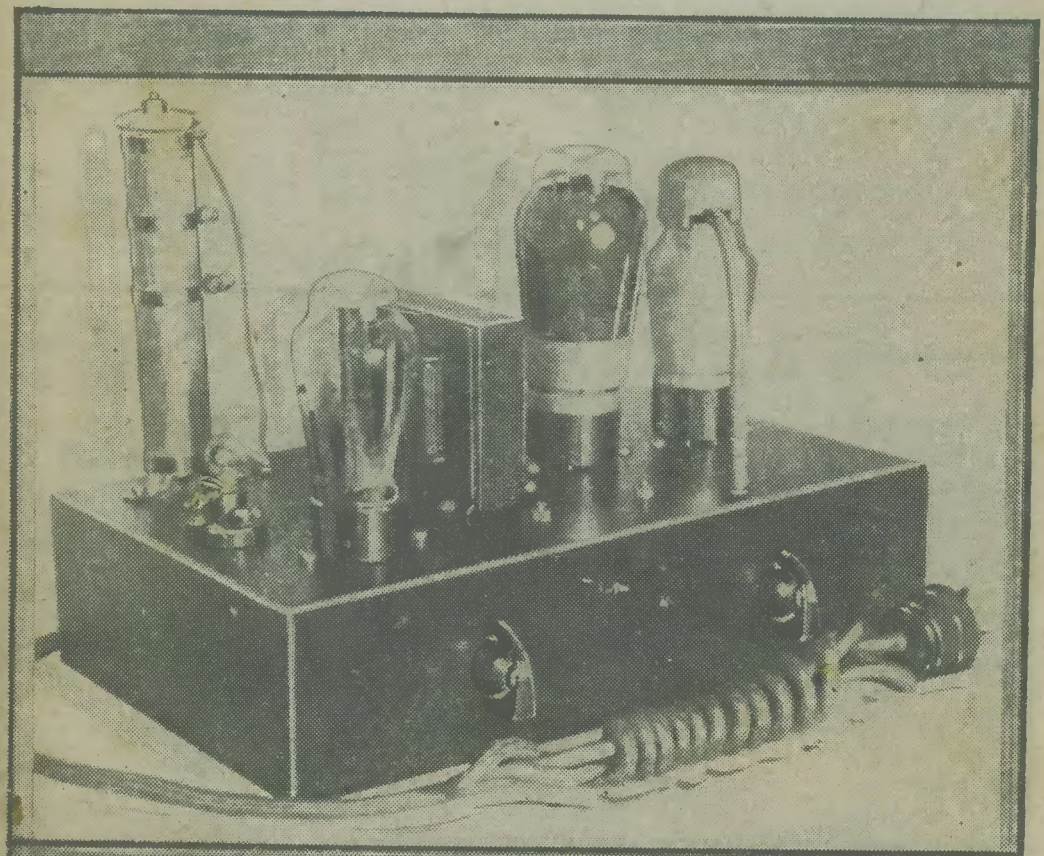
A VALVE-DETECTOR SET

Practical Wireless

9D EVERY MONTH

Editor F. J. CAMM

Vol. 22 No. 475 NEW SERIES JANUARY, 1946



Above Chassis View of a Small A.C./D.C. Amplifier. Full Constructional Details in This Issue

RADIO SPARES

MAINS TRANSFORMERS. Primaries 200/250 volts. Secondaries 350-0-350 volts.
TYPE C. 100 ma. 4v. 5a., 4v. 3a. 34/6
TYPE D. 100 ma. 6.3v. 5a., 5v. 3a. .. 34/6
TYPE E. 120 ma. L.T.s as Type C .. 37/6
TYPE F. 120 ma. L.T.s as Type D .. 37/6
TYPE H. 200 ma. Three L.T.s of 4v. 6a. +4v. 3a. Rectifier 47/6
TYPE I. 200 ma. Three L.T.s of 6.3v. 6a. +5v. 3a. Rectifier 47/6
Secondaries 500-0-500.
TYPE J. 200 ma. Three L.T.s of 6.3v. 6a. +5v. 3a. Rectifier 52/-
TYPE K. 200 ma. Three L.T.s of 4v. 6a. +4v. 3a. Rectifier 52/-
TYPE L. 250 ma. Three L.T.s of 6.3v. 6a. +5v. 3a. Rectifier 56/-
TYPE M. 250 ma. Three L.T.s of 4v. 6a. +4v. 3a. 56/-
Secondaries 400-0-400.
TYPE R. 120 ma. 4v. 5a., 4v. 3a. 40/-
TYPE S. 120 ma. 6.3v. 5a., 5v. 3a. 40/-
SPECIAL UNITS MANUFACTURED TO FRIENDS' REQUIREMENTS.
Please note that, owing to dimensions and weight of TYPES H to M, kindly add 2/6 for carriage and packing.
HEAVY DUTY MULTI-RATIO OUTPUT TRANSFORMER. 120 ma. 15 watts, tappings for 6L6s in push-pull, PX4s in push-pull, low impedance triode, low impedance pentode, high impedance triode, 27/6 ; complete instructions with each unit.
SPEAKERS. Rola or Celestion. 8in. P.M. with transformer 29/6. Less transformer 24/-. 10in. with transformer 45/-.
OUTPUT TRANSFORMERS. Special offer. Multi Ratio 30 : 1, 45 : 1, 60 : 1, 90 : 1, 6/-.
SMOOTHING CHOKES. 20 henrys 100 or 120 ma. 10/- ; 20 henrys 150 ma. 12/6 ; 30, 35 or 40 henrys 200 ma. or 250 ma. 21/6.
DRIVER TRANSFORMER, Class B, 8/-.
LINE CORD. Special offer, .3 amp. 3-way, 180 ohms per yard 1/9. Best quality.
BAKELITE PANELS, 18in. × 6in. × ¼in., polished brown, 4/6.
Orders accepted by post only. Please help us to eliminate clerical work by sending cash with order. Please include postage with order. PRICE LIST 1d. stamp.

H. W. FIELD & SON, Colchester Road, HAROLD PARK, ESSEX

THE GREAT QUESTION IS NOT SO MUCH WHAT MONEY YOU HAVE IN YOUR POCKET AS WHAT YOU BUY WITH IT.

—*Ruskin.*

Copy of our List comes to you for 1d stamp. **Every Item Fully Guaranteed.** Here are a few extracts :
Capacitors. — Electrolytic 8 mfd., 450 v., 4/- ; 8 x 8 mfd., 450 v., 5/4 ; 16 x 8 mfd., 450 v., 6/3 ; 25 mfd., 25 v., 1/9 ; Tubular or Mica, all sizes, from 5d. each, with discount for doz. lots.
Chokes.—60/80 ma., 360 ohm, 4/8 ; 150 ma., 360 ohm, 7/6 ; Heavy Duty 360/640/1,000 ohm, 11/6.
Loudspeakers.—From 2½in. to 12in. Examples : 8in. P.M. (less trans.), 21/- ; 10in. P.M. (with trans.), 35/-.
Mains Transformers.—Large selection, incl. 350-0-350 70 ma., 2 4v's or 6.3 and 5 v., 26/-.
Output Transformers. — 3 ratio 60 ma., 7/6 ; Midget 42 : 1 C.T., 4/4 ; 6L6 Push-Pull Heavy Duty, Sec. 7.5 and 15 impedance, 22/-.
Resistors,—Highest Grade Carbon, ½ watt, 5d. ; 1 watt, 7d. ; 2 watt, 9d. ; discount for doz. lots.
Tubeholders.—Paxalin, Lazda Octal, 5d. ; Int. Octal, 7d. ; Moulded Int. Octal, 8d.
Volume Controls,—All values. Less switch, 3/- ; with switch, 4/3.
Tubes.—All makes and types at list prices.
Coils.—I.F. 465 kc. in Brass Cans ; L.M. and S.W., L. and M.W., S.W. Osc., T.R.F. Midget, etc., with Circuits. See List.
Switches, Dials, Knobs, Wire, Systoflex, etc.

R. F. ARMSTRONG (ELECTRONICS) LTD.,
Dept. 475, 69, EVERSLEY ROAD, SKETTY, SWANSEA, GLAM.
Telephone : SKETTY 87419.
Telegrams : ELECTRONIC, SWANSEA.

RADIOSALES

BCM/SALES LONDON W.C.1

BERNARD'S BOOKS. Valve Manual. 3/6 ; Circuit Manual, 2/- ; Radio Test Gear, 1/- ; S.W. Station List and Log, 1/- ; Amplifier Manual, 2/- ; C.R. Oscilloscope Manual, 2/-. All contain much useful data.
P.M. SPEAKERS.—2½in., 30/- ; 3½in., 30/- ; 5in., 22/6 ; Celestion, Goodman and Rola, all less trans ; 6½in. or 8in. with trans, 28/6 each. Midget trans, 6/- ; 3 w. trans, 7/6. All pentode match to 3 and 5 ohm s.c.
RESISTORS. ¼ watt, 4d. ; ½ watt, 6d. ; 1 watt, 9d. ; 10 watt W.W., 2/6 each.
CONDENSERS. .5 mf., 2/6 ; 0.1 mf., 9d. ; 0.01 mf., 1/-. Smaller mica tubular and silver mica at 9d. each.
VOLUME CONTROLS. 5/6, less sw., 4/6 each.
DROPPERS. Variable taps .3 amp., 5/6 ; .2 amp., 4/6.
ADVICE. Free S.A.E. please.
MAINS TRANSFORMERS. 350v., 6v. and 5v., 80 m.a. or 350v., 4v. and 4v. ditto, 35/- each.
MIDGET CHOKE. 15 Henry 60 m.a., 7/6.
TWIN-GANG CONDENSER. .0005 small, 13/- each.
SOLID REACTION. Condensers .0001, 2/6.
M.W. COILS. Midget pairs boxed with circuit, 5/6 pair.
M.W. OSC. COILS. Midget for 465 k/c. I.F., 2/3 each.
I.F. TRANS. Standard screened 465 k/c, 15/- pair ; 230v. Solder Iron, 14/6 ; Solder, 6d. ; Flux, 6d. ; Copper wire, 6d. coil ; Push-back wire, 1/- coil ; Valveholders, 4- and 5-pin, 6d. ; others, 9d. all flush fitting ; Crystals, 6d. ; Tags, 3d. dozen ; Grid caps, 1d. each ; Knobs, ½in., black or brown, 9d. each ; Sleeving, 3d. per yd.

Full 4-page List for 1d. S.A.E.

Order with confidence. We aim at satisfaction.

PREMIER RADIO

MORRIS AND CO. (RADIO), LTD.

SUPERHET TUNING KIT comprising 9 midget coils for H.F., Aerial and Osc., covering 16–47, 200–557 and 700–2,000 m., suitable switch, all padders and trimmers, **38/10.** Worth double. Also available a suitable 3-gang condenser with complete S.M. Drive and Dial, **30/-.**
MIDGET MOVING COIL UNITS, 1¼in. diam. Highly sensitive, may be used as mike or speaker. Complete with trans. (state whether L.S. or Mike trans. required), **22/6.**
10-WAY PUSH-BUTTON SWITCHES, complete with Knobs and Escutcheon Plate. Six iron-cored coils. Trimmers and Padders. No circuit or other particulars available. To clear at 12/6. Original cost 45/-.

FIRST GRADE METERS, 3½in. diameter, 1 milliamp., **£2 12s.** ; 500 microamps., **£2 18s. 6d.** ; 4½in. 1 milliamp., **£3 3s. 0d.** ; 500 microamps., **£3 11s. 6d.** Westinghouse Meter Rectifier for either type, **10/-.** Multiple shunts, 10, 100, 500 m/a., **10/-.** Any value multiplier, 2/6 each.

12 WATT A.C. AMPLIFIERS, 3 stages. High and Low gain inputs. Mike Pick-up Mixing, feed-back, provision for 2, 3, 4, 8 and 15 ohms output, **£14 14s. 0d.**

SUPER QUALITY A.C./D.C. 15 w. AMPLIFIER, 3 stage, high gain, push-pull, in steel cabinet, **£15 15s. 0d.**

A.C./D.C. AMPLIFIERS, 5 watts output, high gain, three-stage feedback, **£8 8s. 0d.**

BATTERY CHARGERS, for 2 v. batt. at ½ a., 25/- ; for 2, 4 or 6 v. batt. at 1 a., 45/- ; for 6 v. batt. at 1 a., 30/- ; for 2, 6 or 12 v. batt. at 1 a., 49/6 ; for 6 v. and 12 v. batt. at 4 a., **£4.**

MAINS TRANSFORMERS, 300+300 v., 60 m/a., three 4 v. 2-3 a. windings, 25/- ; 350+350 100 m/a. 5 v. 2a., 6.3 v. 2-3 a., 29/- ; 350+350 100 m/a., three 4 v. 2-3 a. windings, 29/- ; 350+350 150 m/a., 4 v. 2-3 a., 4 v. 3-6 a., 4 v. 1-2 a., 4 v. 1-2 a. winding, 39/- ; 350+350 150 m/a., 5 v. 2 a., 6.3 v. 2 a., 6.3 v. 2 a., 36/- ; 500+500 250 m/a., 5 v. 3 a., 6.3 v. 2 a., 6.3 v. 4 a., 65/- ; 425+425 200 m/a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v., 3 6 a., 47/- ; 350+350 150 m/a., 4 v. 1-2 a., 4 v. 2-3 a., 4 v. 3-4 a., 36/- ; 500+500 150 m/a., four 4 v. 2-3 a., L.T. windings, 47/-.

SHORT-WAVE COILS, fit octal sockets, 4-pin aerial coils, 9-15, 12-26, 22-47, 41-94, or 76-170 m., 2/6 each; 150-350 or 255-550 m., 3/- ; 490-1,000 or 1,000-2,000 m., 4/- ; 6-pin H.F. trans., 9-15, 12-26, 22-47, 41-94, or 76-170 m., 2/6. S.W. chokes, 10-100 m., 1/2 ; 5-200 m., 2/6.
SHORT-WAVE CONDENSERS, all brass easily ganged, 15 mmfd., 2/11 ; 25 mfd., 3/3 ; 40 mmfd., 3/3 ; 100 mmfd., 3/11; 160 mmfd., 4/3 ; 250 mmfd., 5/3 ; shaft couplers, 6d. flexible ditto, 1/-.
MIDGET "P" TYPE COILS. 12-35, 16-47, 34-100, 91-261, 250-750, 700-2,000, 200, 557, available as H.F. trans., aerial, or osc. coils, 2/3 each. Suitable Yaxley type wave-change switches, every type available ; locators, 2/6 each ; wafers, 1/6 each. Suitable small 2-gang condensers ; .0005, 12/- ; suitable matched pairs iron-cored 465 K.C. I.F. trans., 15/- pair ; midget type, 21/- pair. Suitable 60 mmfd. trimmers, 1/- ; osc. padder 750 mmfd., 1/9.

1-VALVE BATTERY S.W. RECEIVER, with 2-volt valve 4 coils, 12–170 m., bandspread tuning, **55/-,** including tax

CHASSIS, 10 × 8 × 2½in., 7/- ; 12 × 9, 7/9 ; 16 × 8in., 8/6 ; 20 × 8in., 10/6.
MOVING COIL SPEAKERS, 2½in. Rola 5in., 21/6 ; 6½in., 22/6 Sin., 24/-. Goodmans, 3½in., 35/-. Above are less output trans Plessey 8in. P.M. with trans., 29/6. Midget standard or P.P. trans. for any above, **10/6.** Super quality giant Match maker output transformers, match any tube single or P.P to any voice coil, 15-watt, 30/- ; 30-watt, 49/6 ; 60-watt, 59/6

CHOKES 8H. 300 ohms, 40 m/a., 4/6 ; 30H., 400 ohms, 60 m/a., 9/6 ; 30H., 100 m/a., 400 ohms, 15/- ; 30H., 185 ohms, 150 m/a., 25/- ; 25 H., 250 m/a., 120 ohms, 39/6 ; 15H., 500 m/a., 62 ohms, 65/-.

SMOOTHING CONDENSERS. 50 mf. 12 v., 2/3 ; 25 mf. 25 v., 2/3 ; 50 mf. 50 v., 3/- ; 8 mf. 500 v., 3/- ; 16 mf. 150 v., 3/- ; 16 mf. 350 v., 3/3 ; 16 × 16 mf. 350 v., 8/6 ; 12 mf. 500 v., 4/6 ; 24 mf. 500 v., 8/6.
SUNDRIES. 2 mm. Systoflex, 2½d. yd. ; resin-cored solder, 6d. per coil or 4/6 per lb. ; screened 2-pin plugs and socket, 9d. ; ditto, 8-pin, 2/- ; Octal sockets, 6d. ; ditto, amphenol type, 1/-. Valve screens, 1/2. Knobs, 6d. Pointer knobs, 1/1. Crocodile clips, 4d. "Gain" and "tone" Indicator plates, 7½d. Fuses, any size, 5d. Fuse holders, 6d. 6-volt vibrators, 4-pin, 12/6. Volume controls, any value, 3/9 ; with switch, 5/-.
AMERICAN VALVES. Many types in stock at controlled prices, including 6V6, 6F6, 5Y3, 524, 25L6, 75, 6K7, 6A8, 1C5, 2525, 2526, 42, 80, 1N5, 1H5, 1T5.
ENAMELLED COPPER WIRE. 1lb. reels, 16 o 18 g., 3/6 ; 20 g., 3/9 ; 22 or 24 g., 3/10 ; 26 or 28 g., 4/2 ; 30 g., 4/4 ; 32 g., 4/6 ; 34 g., 5/- ; 36 g., 5/6 ; 38 g., 6/4.
REACTION CONDENSERS, bakelite dielectric, .0001, 2/9 ; .0003, 2/11 ; .0005, 3/3 ; .0003 diff., 3/3.
RESISTANCES. 360 × 180 × 60 × 60 ohms, .3 amp., 5/6 ; 500 × 100 × 100 × 100 × 100, .2 amp., 5/6 ; 40,000 ohms, tapped every 5,000 ohms, 10 w., 5/- ; ½ w., 1½ w., 6d. each ; 1 w., 9d each.

OUR 1946 LIST IS NOW AVAILABLE. All enquiries must be accompanied by a 2½d. stamp.

ALL POST ORDERS TO : JUBILEE WORKS, 167, LOWER CLAPTON ROAD, LONDON, E.5. (*Amherst* 4723.)

CALLERS TO : 169, Fleet Street, E.C.4. (*Central* 2833.)

Practical Wireless and PRACTICAL TELEVISION
14th YEAR OF ISSUE
EVERY MONTH
VOL. XXII. No. 475. JANUARY, 1946
Editor F. J. CAMM

COMMENTS OF THE MONTH. BY THE EDITOR

Reconversion of the Radio Industry

AN important statement by the Board of Trade gives the agreed figures for production of wireless apparatus. We give the statement in full.

The manufacture and supply of sets is controlled under the Musical Instruments and Wireless Receivers Order, 1944, and licences have been granted to some 70 manufacturers for the production of about one million sets during the next twelve months. Of this quantity 400,000 are intended for export. Undertakings have been given by the industry that 50 per cent. by value of the production for the home market will be devoted to sets to be retailed at £15 or less, exclusive of purchase tax of 33⅓ per cent. on the wholesale selling price. With the cancellation of war contracts, the supply position in respect of the majority of the principal components required for civilian production has shown considerable improvement, and adequate quantities should be available.

The supply of timber for radio cabinets, however, is not too good at present, owing to the many important claims on the limited quantities available. During the third quarter of 1945, releases were only about 50 per cent. of the industry's requirements, but the position is improving and substantial increases will be made in the fourth quarter. This improvement, together with the supplies of plastic materials which are available for cabinets, should go a long way towards overcoming the present difficulties.

Before the war, the average annual production of radio sets in this country was about 1.4 millions. Of this quantity the average export was 66,000. It will be seen, therefore, that the present programme visualises an overall production of about 70 per cent. of the pre-war figure, but places considerable emphasis on exports. If exports actually mature on the scale licensed, the industry will, in relation to its pre-war trade, be making a noteworthy contribution to the Government's policy of increasing export business.

Production of television receivers has not yet begun. Recommendations on the future of the service have been made by the Hankey Committee, and the Government has given general approval of the recommendations. The necessary action has been set in train.

Apart from sound and vision receivers, many firms are producing transmitters, communications equipment, medical and industrial electronic apparatus and many other highly specialised products for which there is likely to be a heavy demand, both in this country and overseas. No manufacturing licences are required by firms engaged on production of this character, but every effort is being made by the Board to assist the manufacturers concerned in the reconversion of their production programmes to peacetime needs.

American Receivers

IN our December issue we made a statement on American receivers and components. Messrs. A. C. Cossor, Ltd., have asked us to amplify that statement by informing our readers that American receivers and components, imported by the Ministry of Supply (all of which were initially handled by that Company on behalf of the Radio Manufacturers' Association) were not lease-lend materials but were purchased by the British Treasury. Although no spare parts were delivered with the sets, arrangements were made for the supply of valves and electrolytic condensers long before the termination of lease-lend (which does not affect the position), and, in fact, large quantities of these items have been distributed.

There are still a few types of valves to come, but assurances have been received by the Board of Trade that these will be available in "due course."

Queries

NOTWITHSTANDING the announcements we have made in recent issues concerning the discontinuation of our query service some readers are continuing to address queries to us. We regret that whilst staff shortage continues we are unable to deal with such queries. There seems little prospect of the return of our staff whilst we are maintaining a peacetime army on a wartime basis, and until there is a saner basis for demobilisation.

Under no circumstances can we undertake to answer questions concerning commercial receivers.

Editorial and Advertisement Offices: "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone: Temple Bar 4363. Telegrams: Newnes, Rand, London. Registered at the G.P.O. for transmission by Canadian Magazine Post.

ROUND THE WORLD OF WIRELESS

Underground German Radio Factory

TECHNICIANS investigating for the R.A.F. Air Disarmament Flight of B.A.F.O. found that a radio valve factory was built by the Germans under the old Reichstag. The factory had been constructed 60ft. underground, and was a subsidiary of the Telefunken concern.

Germans are now working for the R.A.F. clearing and tabulating the stock for the British Mission.

Air Chief Marshal Sir Sholto Douglas has also instructed that special attention be paid to the great Siemens factory in the British zone at Berlin, where already 150,000 radio valves, waiting delivery for the Luftwaffe, have been located and collected on our behalf. More than 500,000 partially-completed valves have been found by our investigators.

By means of this new portable radio set, carried by a caddie on a Long Island, U.S., golf course, the golfer can receive any urgent business or other call, no matter where he is on the course. The set is made by the Emerson Radio Company.

New Appointment

THE B.B.C. have announced that Mr. Maurice Gorham has been appointed to take charge of the television service when it is restarted.

Mr. Gorham has been in charge of the B.B.C. light programme since it began on July 29th, 1945. Before that he was Director of the Allied Expeditionary Forces programme from its institution on May 23rd, 1944, to its end on July 29th this year, North American Service Director from 1941 to 1944, and editor of the *Radio Times* from 1933 to 1941.

Commercial Radio in Africa

ACCORDING to a recent report it seems probable that British exporters will be able to use a new commercial broadcasting station to push their products in South Africa. A new company, African Broadcasting Services, has been formed, and the use of a radio station at Lourenco Marques, capital of Portuguese East Africa, secured.

The service is for the exclusive use of British advertisers, and its programmes, though intended for the South African listener, will also be heard on sets in Britain on the 51-metre band. African Broadcasting Services is an all-British Company.

Wireless Components

WITH the cancellation of war contracts, the supply position for the chief components required for civilian production has shown considerable improvement, and adequate quantities should be available for the present programme, for maintenance of existing sets, and for export.

The supply of timber for cabinets, however, is not so good. During the third quarter of last year releases were only about half of the industry's requirements. But substantial increases will be made early this year. Supplies of plastic materials also are now available.

West Indies Radio-telephone Network

RADIO-TELEPHONE services have been opened by Cable and Wireless (West Indies), Ltd., between Barbados and the neighbouring islands of Antigua, Grenada, St. Kitts, St. Lucia and St. Vincent. Barbados is also in direct telephone contact with Montreal, Georgetown (British Guiana), Trinidad and Jamaica.

Trinidad has radio-telephone circuits with the United States, British Guiana, as well as with Barbados.

Jamaica also has a radio-telephone service with the United States as well as with Barbados.

The services from Jamaica and Trinidad with the U.S.A. have extensions to Canada, Mexico and Cuba, and in the case of Trinidad-U.S.A., to Panama and Puerto Rico.

Georgetown, British Guiana, operates a radio-telephone service with Dutch Guiana as well as with Trinidad and Barbados.

A service is also available between St. Vincent and Union Island.

B.I.R.E. Meetings

AT a meeting of the British Institution of Radio Engineers (Southern Section) held at the Physics Lecture Theatre, University College, Southampton, on November 16th, a paper on "Engineering Methods in the Design of the Cathode-ray Tube" was read by Hilary Moss, Ph.D.

Another paper on "U.H.F. Aerial Systems" was read by S. G. Button at a meeting of the North-Eastern Section held at the Neville Hall, Westgate Road, Newcastle-on-Tyne, on November 14th.

On November 28th, in Reynolds Hall, College of Technology, Sackville Street, Manchester, a discussion meeting was held on the Radio Industry Council Report on "Post-war European Broadcasting."

New Empire Radio School

AIR forces of the British Commonwealth are to have an Empire Radio School which is now being formed at R.A.F. Station, Debden, near Saffron Walden, Essex, under the control of the Air Ministry and R.A.F. Technical Training Command.

The school has been established with two main objects, firstly to ensure that radio instruction maintains progress,

and secondly to train signals officers, signals and radar leaders and instructors.

Liaison will be maintained with all Commonwealth Air Force radio schools, with all commands, and with the Empire Air Armament School and the Empire Air Navigation School, as radio is becoming an essential part of much navigation and armament equipment.

Through the Air Ministry advice on all subjects concerning radio training will be available to Commonwealth air forces. The school is to have its own training research and development section and a small writing section for producing training publications. The latest types of radio equipment and aircraft will be available for advanced and specialised study by pupils from all over the Empire.

Television This Year!

MR. HERBERT MORRISON recently announced that the Government had accepted recommendations that Alexandra Palace should resume television programmes in the coming spring. Sound tests on 7 metres have already been made, and the vision-transmitting apparatus was tested a few weeks ago. It is estimated that the first sets, which are to be ready in about six months, will cost about £40. New and cheaper methods of cable-linking will speed up country-wide relays.

Restoring Cable and Wireless in the Far East

FOUR of the 12 Cable and Wireless, Ltd., Far Eastern stations which were occupied by the Japanese have now been wholly or partially restored. The offices at Singapore, Hongkong and Penang are open to the public.

Singapore office is operating wireless circuits both inwards and outwards via the "Press Ship" in the Harbour. Hongkong is working a wireless circuit with Colombo.

Cable and Wireless, Ltd., offices at Padang and Batavia are open for outward Press traffic only, by wireless. The company was not established at Padang before the war. Penang office is working via cable only with Colombo.

The Chinese Government is operating a wireless circuit from Shanghai to Cable and Wireless, Ltd., in London and Colombo.

More Radio Sets

A RECENT announcement by the Radio Industry Council indicates that the quantity of domestic radio sets available for the home market during the next six months is to be increased by 50 per cent. Following negotiations which have been in progress since the end of the war with Japan, the Board of Trade has agreed that for the period ending May, 1946, the allocation to the home market of sets may be increased by 50 per cent. if manufacturers so desire.

Human Waves

AS reported in the *New York Times*, micro-waves can be reflected from the human body and made to flow through pipes like water, Prof. George B. Hoadley (Polytechnic Institute of Brooklyn) recently told the American Institute. The micro-wave band of the spectrum is sandwiched in between the frequencies suitable for radio broadcasting of sound and the heat and light frequencies. Using a 24-ft. tube of ordinary 4-in. pipe, with an elbow joint in it, Hoadley showed that micro-waves can pass with undiminished power through the tubes and around bends, like water. He demonstrated that micro-waves polarise like light.

Argentine Also Starts Television

AMERICAN engineering and science had its first post-VE Day triumph in the consummation of negotiations between Allen B. DuMont Laboratories, New York, and an influential syndicate of Argentinian businessmen for the sale and erection of the first television transmitter for South America. Exact details of the installation contemplated by the purchasing syndicate were not revealed, but the original proposal provided for a DuMont 250 kw. peak video and a 12.5 kw. peak audio transmitter, full field pick-up and relay equipment, together with cameras and control equipment for three studios. It is assumed that the transmitter will be located in or near Buenos Aires.

A Radio Reporter Cited for Bravery

ARMANDO ZEGRI, special war correspondent for the NBC International Division, has been commended for bravery by Major-General J. M. Swing for his part in the parachute operation at Aparri, Luzon. The citation reads: "For displaying courage and disregard for danger during the 11th Airborne Division parachute operation at Aparri, Luzon, June 25th, 1945, Armando Zegri, of National Broadcasting Company, is highly commended. Despite the fact that heavy Japanese ground fire was anticipated, this correspondent willingly accompanied the 11th Airborne Division personnel during the long flight from Lipa, in order that by his first-hand report the American public would obtain a more accurate and detailed account of the war in the Pacific."

A typical scene of the rapid switch-over from war to peace production in America. This department formerly made plastic liners for the G.I. battle helmets. In the illustration women workers are seen putting the finishing touches on plastic radio cabinets on one of the Firestone Tyre & Rubber Company's many assembly lines at Akron, Ohio, as reconversion from war to peace gets into full swing.

A Small A.C./D.C. Amplifier

For Use with Pick-up, Microphone, or as Modulator. By S.W.P.

THE unit which is here described is ideal for general work where a large output is not required, and especially where the nature of the mains supply is liable to change, such as in districts at present using D.C. The output is sufficient to comfortably load a 10in. speaker when used in conjunction with an ordinary magnetic type pick-up, or a transverse current microphone. The amplifier will also be of interest to the amateur transmitter, who will now be busy scheming out his post-war station, as the output, when taken through a suitable modulation transformer, is large enough to fully modulate a 10 watt carrier. Furthermore, there need be no hesitation on the score of supplies, as all the components used are readily available. A list is appended giving the names of the various manufacturers concerned.

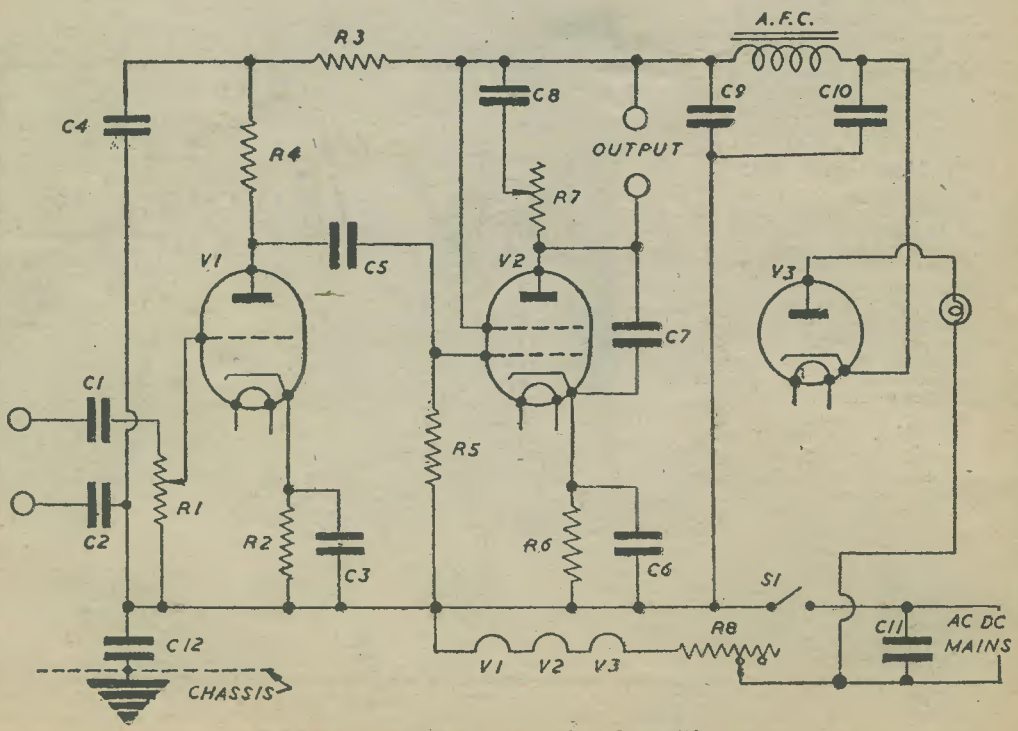
The Circuit

Fig. 1 shows the theoretical circuit. The input is taken via two blocking capacitors. C1 and C2, and a potentiometer-R1 to the control grid of a triode valve V1. Automatic bias is obtained by the voltage drop across R2 in series with the cathode, decoupled by C3. The anode of V1 derives its H.T. potential through a decoupling resistor R3 and anode load resistor R4. The output is taken via a coupling capacitor C5 to the control grid of V2, an output pentode. Bias is applied to this stage through R6, decoupled by C6, and the grid leak R5. The auxiliary grid is returned straight to H.T.+. A certain amount of tone correction is given by a small capacitor C7 connected between anode and cathode. It is desirable in some cases that the high frequency response be made variable, and this is achieved by connecting a variable resistor R7 and series capacitor C8 across the output terminals. No output transformer is shown, the nature of this depending on the use to which the amplifier is put. The power supply section follows standard practice. V3 acts as a half-wave rectifier, a fuse being inserted in series with the anode as a safety measure. The H.T. supply is smoothed by C9, C10, and an A.F. choke. The valve heaters are wired in series, with V1 at the earthy end of the chain, the necessary voltage drop from the mains rating being obtained by a series resistor R8. The on-off switch S1 is ganged with the tone control R7.

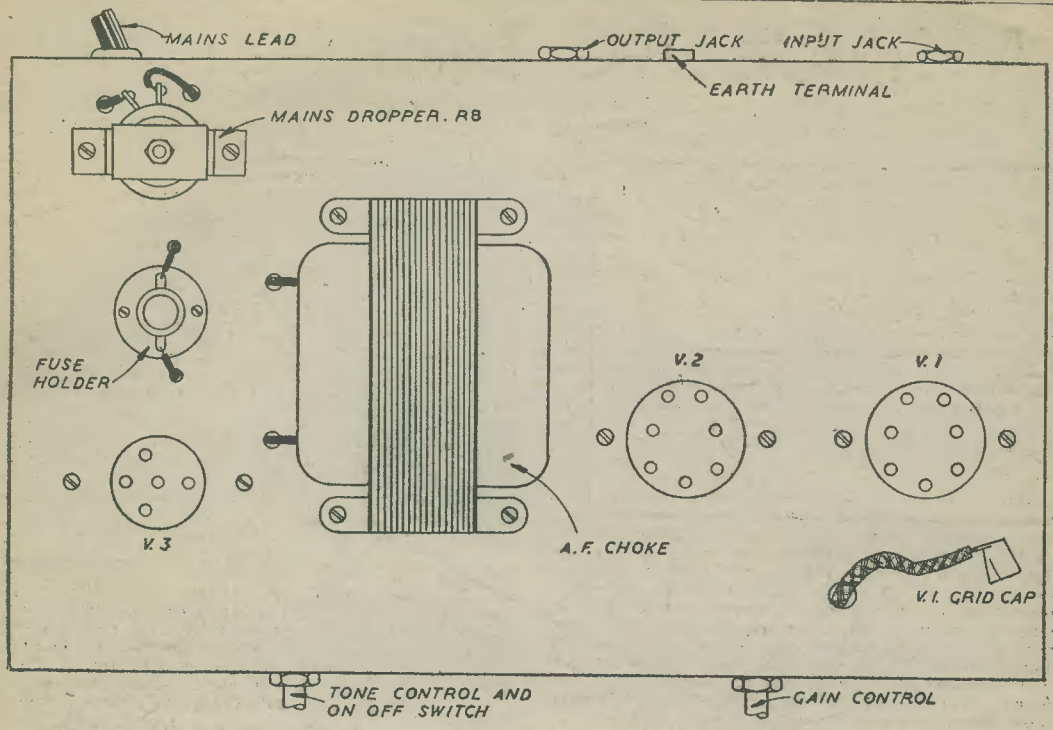
Construction

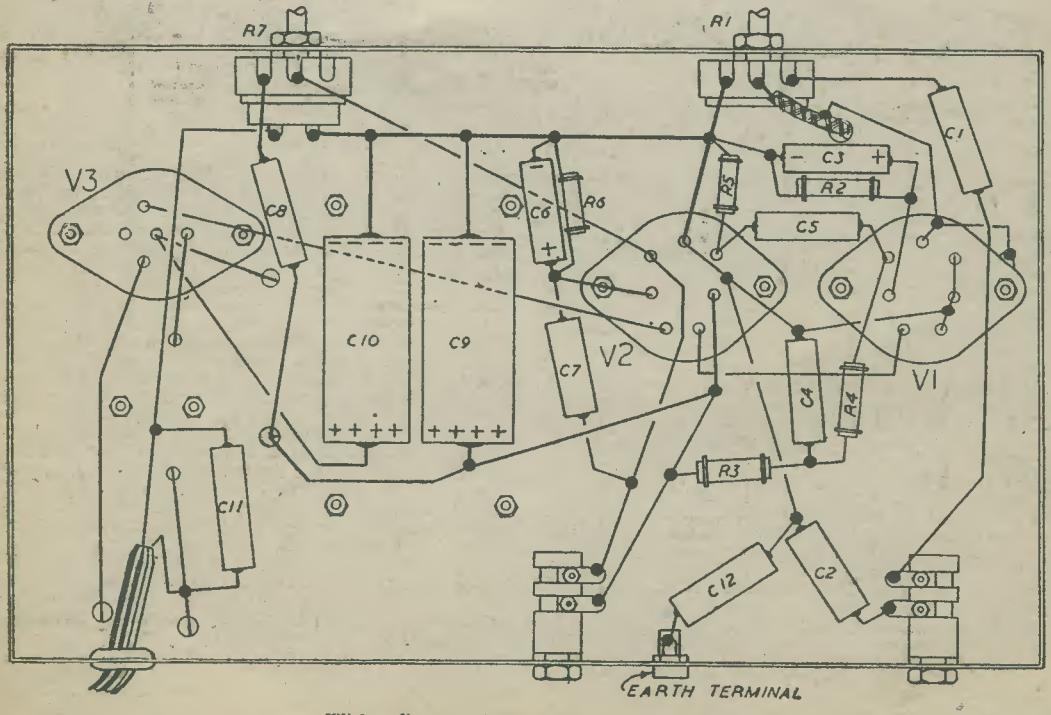
The amplifier is built on a steel chassis measuring 11in. x 6½in. x 2½in., and the first thing to be tackled is the marking-out and drilling of the various holes. Fig. 2 gives all the necessary positions of the main components, though the layout is not at all critical. An important point to note is that a "dead" chassis is employed, that is, all H.T.— wiring is isolated from the chassis by a 0.1 mfd. capacitor, so that the chassis may safely be directly earthed. Note, too, that the rectifier, smoothing choke, and associated components are mounted at the end of the chassis furthest away from the input valve. The two smoothing capacitors C9 and C10 are housed below the chassis, away from the heat of the rectifier and mains dropper R8. The remainder of the construction is quite straightforward, and will not be enlarged upon.

(*Continued on page 86*)



Theoretical circuit of the A.C./D.C. amplifier.





Wiring diagrams for the A.C./D.C. amplifier.

On the Beam—2

The Second Article of a Short Series Explains How an Aircraft is Landed, Using the "Standard" Beam Approach System.

By FRANK PRESTON

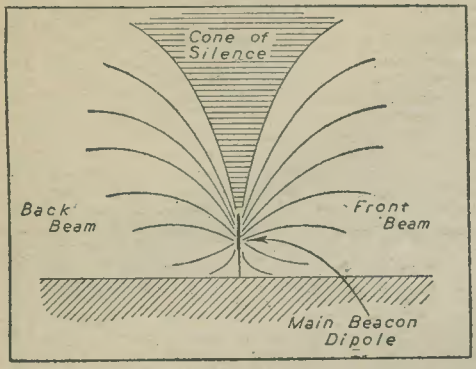


Fig. 2

Fig. 1

Fig. 1—This diagram shows one procedure used in landing an aircraft fitted with "Standard Beam" Approach. The diagram is not drawn to scale. Fig. 2—The reason for the "cone of silence" directly over the aerial system of the main beacon is explained by the vertical radiation pattern.

THE marker receiver is fed through a simple tuned matching unit from a half-wave dipole aerial. The aerial consists of two copper rods mounted in protective insulating mouldings, these being provided with mounting brackets. This dipole is mounted on the lower surface of the fuselage, and if the aerial is not of metal-skin construction, a metal foil reflector is fitted above the aerial; such a reflector is normally embodied by the airframe manufacturer. A coaxial feeder is employed to connect the dipole matching unit to the marker receiver.

Having now gained a general impression of the S.B.A. system, it is of interest to see how the equipment is employed by the pilot of an aircraft. There are, in fact, various methods of making a beam approach, but an outline of only one will be given.

First, it is necessary to understand what information is required by the pilot, or navigator, of an aircraft in which it is intended to use S.B.A. It is obvious that he must have a list of airfields at which S.B.A. facilities are provided. He must know the positions, in terms of latitude and longitude, of the airfields and also know the bearing, in degrees, of the main beam; the latter is the same as the bearing of the runway, of course.

It is also necessary to have details of the frequencies used for the main beacons at different airfields (the frequency used by all marker beacons is the same—38 m/cs) or, in the case of a main receiver of the pre-tuned type, to know the selector-switch settings appropriate to the frequencies used on different airfields.

In addition, information is carried in respect of beam coding. This takes the form of a two-letter call-sign which serves to identify the airfield. As mentioned elsewhere in this series, the steady tone modulation is discontinued for a few seconds at intervals and the two reflectors are left "open." The main-beacon output is then automatically keyed, by means of a so-called code-sender, with the morse characters of the two letters forming the call-sign. Due to the reflectors being out of action while the code-sender is in operation, the aerial radiates omni-directionally, which means that the pilot of an aircraft fitted with S.B.A. can hear by the call-sign whether he is in any of the "zones."

When a pilot decides to make a beam approach he switches on the receivers by means of the switch on the pilot's control panel. This must be done at least 20, and preferably 30, minutes before the approach is to be made, in order that the receivers may reach their normal working temperature. This is especially important in the case of a pre-tuned main receiver, for there is an inevitable frequency drift as the set warms up after first switching on. It should be mentioned in passing that the receivers must be given a similar time to warm up before any tests or adjustments are made by the wireless mechanics during the ground servicing of the equipment.

Once the receivers have reached their normal operating temperature the pilot flies his aircraft, using normal navigational aids, until either the dots or dashes of the main beacon are heard. Then, knowing the bearing of

the main beam, he sets a course that will take him directly across it at right-angles. (See Fig. 1., position 1) Immediately the aircraft passes from the twilight zone to the equi-signal zone, the navigator sets his stop-watch; he, then times the run across the equi-signal zone (Fig. 1 position 2). Having crossed the beam, the pilot makes a 180-deg. turn and flies back across the beam. He then makes a third timed crossing of the beam on a line parallel to the first. By making the two timed crossings in the same direction no account has to be taken of the prevailing wind. By comparing the two times, the navigator can tell the pilot the direction of the main beacon, as he knows in which direction the beam width is the lesser. If the beam angle is known, he can also estimate the distance of the aircraft from the beacon.

The process of timing the beam crossing is known as "measuring the beam," for reasons which will now be obvious.

After the second timed crossing of the beam, the aircraft is again turned toward the equi-signal zone and flown along the beam, over the two marker beacons (Fig. 1, position 4). As the aircraft passes over the outer marker the slow 700 c/s dashes are heard for about six seconds, and then as the inner marker is crossed the quick 1,700 c/s dots are heard for a similar period of time. When the indicator unit is fitted with neon indicators, that on the left will be seen to glow during the period of passing through the beam from the outer marker and that on the right will glow while crossing the inner marker.

As the aircraft continues on its course the steady 1,150 c/s. note is lost for a few seconds during which the aircraft is passing through the "cone of silence" directly over the main beacon. This cone of silence is due to the radiation pattern of the main-beacon aerial assembly, illustrated in Fig. 2. In fact, there are two silent points—one of which is due to the delayed action of the A.V.C.; the two are close together, and the second one is not of any practical significance.

After passing the cone of silence the pilot continues for a few minutes on the same course, along the "back beam"; as there are no rearward reflectors, radiation of the beam takes place both in front of, and behind, the aerial system. Another turn is then made, to bring the aircraft back on to the centre line of the equi-signal zone, but pointing in the opposite direction (Fig. 1, position 5). The aircraft is flown back over the main beacon again, and then over the inner and outer markers.

Having passed the outer marker (Fig. 1, position 6) the pilot brings his aircraft round for the actual approach, meantime losing height as necessary, so that the aircraft is at approximately 600ft. when passing over the outer marker on his final "run in" (Fig. 1, position 7). After checking his height over the marker he commences to lose height at such a rate that his altitude when passing over the inner marker will be between 50 and 100ft. (Fig. 1, position 8).

The correct rate of descent is, of course, governed by the speed of the aircraft; this is normally the lowest safe cruising speed. During his actual approach the pilot may find it necessary to correct course occasionally to keep the aircraft in the equi-signal zone. The need for correction would be evident, due to the change in the received signal as the aircraft deviated into a twilight zone.

After passing over the inner marker, which is near the end of the runway, it should be possible to continue at the same rate of descent, and to make a safe landing. It is to be noted that the beam is not very much wider than the runway at the end remote from the main beacon, and therefore that the aircraft must be fairly well in line with the centre of the runway if a good approach has been made.

If at any stage of the procedure outlined it is found that an error has been made, a fresh start should be made, repeating the same procedure after correcting the error. Although the process of making a beam approach may seem long, it can be done in about ten minutes by an experienced pilot.

It is possible, instead of measuring the width of the beam as described, to ascertain the direction of the main beacon, after locating the equi-signal zone, by turning the "normal-test" switch to "test," and flying along the beam. If the aircraft is approaching the main beacon the needle of the signal-strength meter on the indicator unit will slowly rise; if flying away from the beacon the needle will slowly fall.

Should the aircraft fly first into the back beam this is at once evident from the fact that dashes are heard when on the left and dots when on the right of the equi-signal zone. In addition, the marker beacons are not heard until the aircraft has passed through the cone of silence.

At this point it may be mentioned that S.B.A. beacons are sometimes used as navigational aids purely and simply. That is, the pilot may fly along the beam as a means of reaching his destination, even though the weather conditions are good, and it is not necessary to use the S.B.A. system as an aid to actual landing. In a case such as this no use is made of the marker beacons. It has been said that a pilot who is expert in the use of S.B.A. could find his way to any point in the British Isles, in zero visibility, and without any navigational aid other than his S.B.A. receivers.

Another point which is of interest from the pilot's point of view is the system of keying the main beam. Many pilots prefer what is known as "A–N" keying to the "dot–dash" keying described. With this system the morse letter A(·—) is reflected to one side, and the morse N (—·) to the other. The dots and dashes are so phased that they interlock in the equi-signal zone. For this type of keying it is necessary only to modify the reflector switching cam.

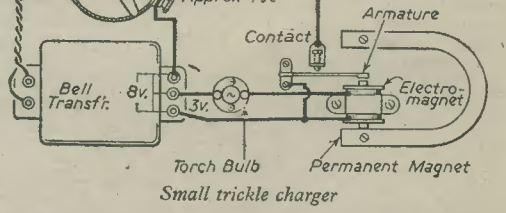
The A–N keying is preferred on the grounds that it is easier for the pilot, especially when tired, to differentiate between the letters than between dots and dashes.

When A–N keying is used the approach must be made aurally only, as the kicker meter cannot differentiate between the two letters.

A SMALL TRICKLE CHARGER

USING a bell transformer I recently constructed a trickle charger using a vibrating reed system.

The rectifier itself consisted of an armature and contact, a small electro-magnet, and a permanent magnet. The armature can be obtained from an old electric bell or buzzer. The electro-magnet is about ¾in. long. A moving-iron speaker magnet was used having a space of 1¼in. between the poles. The holes in this type of magnet enable it to be screwed directly to the wooden



Small trickle charger

baseboard, which in my case was ¾in. thick and about 6in. × 9in. The electro-magnet was fixed by screwing a strip of metal over it, and it was mounted between the poles of the magnet, its core touching one of them.

The electro-magnet is energised by current taken from the 3-volt winding, a torch bulb being used as a series resistance. Current from the 8-volt winding was rectified by the vibrating armature and contact.

The accumulator is connected across the output terminals after their polarity has been determined.

The maximum current obtained was ½ amp.—H. W. EVERITT (Ongar).

Motor-car Radio

How to Install and Service It.

By A. ROSE

MANY car radio sets have been laid up for several years, and it is not to be expected that they can be reinstalled without some previous attention. The first part of this article will deal largely with the inspection and repair of such equipments.

The problem of noise—always an important consideration in car radio—will also receive detailed attention. It should not, however, be assumed that any one installation will require all the measures described

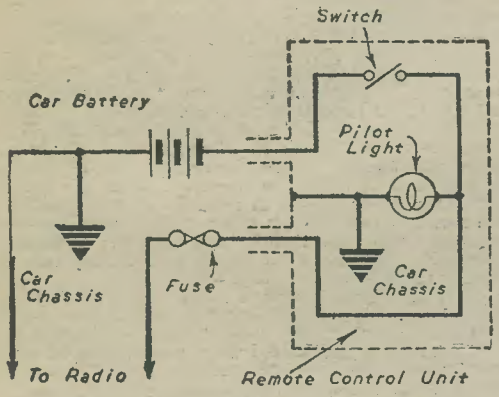


Fig. 1.—Circuit for remote control wiring.

in these notes. If, after careful test, it is found that a particular noise-suppressing device does not effect an improvement, it should be removed. An unnecessary fitment is merely a potential source of trouble.

In accordance with the usual practice, the term "earthed" will be used in this article to mean a good electrical connection to the chassis of the vehicle.

Preliminary Check

It is usually wise to inspect and test the car radio on the bench before putting it in the vehicle. If no other source of D.C. is available, it may be necessary to remove the car battery in order to run the set on the bench; but even this is less trouble than an attempt to make routine tests and adjustments after the set is installed in the car. Such an attempt would probably end in failure, and the bench test would ultimately be found indispensable.

A visual inspection of all mechanical parts is the first step to be taken. Particular attention should be paid to rubber parts: these are often used in coupling-links and for damping the vibrator unit. If the set has been stored for a long time, the rubber may have perished. In such a case it must be replaced. Any loose or broken mounting should be repaired or replaced, retaining screws and nuts checked for tightness, and valves pressed firmly into their bases.

A thorough cleaning should follow. Switches and the contact faces of terminals, plugs and sockets may be cleaned with a small amount of benzine or petrol (don't smoke while this is being done!). Commercial carbon tetrachloride is not recommended for use with car radio sets. Under moist conditions, this chemical tends to corrode metals, and tests made by the writer show that it may have destructive effects upon soldered joints. This is especially likely if, for example, the car has been left out-of-doors all night. Some proprietory switch-cleaners contain carbon tetrachloride, but it can safely be assumed that a reputable product is free from corrosive agents.

Make sure that the battery is of the correct voltage for the set, and then connect up and play the set on the bench. At least an hour's working test is desirable before the set is mounted in the car. Cases have occurred where bad vibrator noise has been cured by letting the set play for 30 minutes or so, and then tightening the screws holding the power transformer. Vibrator noise cannot be accurately assessed unless all screens and lids are in position.

Microphonic valves are a fruitful source of trouble owing to the vibration to which a car radio set is subjected. Test for microphony by tapping the envelope of each valve repeatedly with a finger-tip. A valve which shows slight microphony (recognized by a ringing or howling note when it is tapped) may be prevented from causing serious trouble by fitting a sponge pad around it.

The automatic volume control is of great importance in car radio, where reception conditions are likely to change considerably in a short space of time, and this circuit should be carefully checked for correct working.

Motor-car radio wiring is often confusing to those who are unaccustomed to it. Fig. 1 shows a typical circuit which may cause difficulty in diagnosing trouble due to a burnt-out fuse. It will be seen that the on-off switch and a pilot light are contained in a remote-control unit. When the switch is closed, the pilot lamp will light *even if the fuse is open-circuited.* This fuse will, by the way, be of high rating (often about 15 amps), since the vibrator will draw a heavy current.

Here are some miscellaneous hints about vibrators:—

Never condemn a faulty vibrator without first checking the insulation of leads inside the metal case of the vibrator. Worn or perished insulation may render the instrument completely unserviceable.

Examine the vibrator contents, and if they are dirty, clean them with benzine. *Never* use emery-cloth or a file for this purpose.

If the points appear to stick, examine the condensers in the associated circuit. A short-circuited condenser

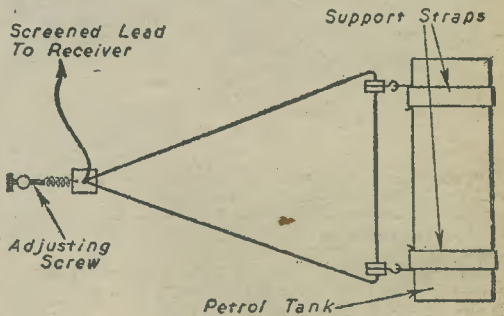


Fig. 2.—Underslung aerial.

in the "buffer" position may cause a continuous arc at the vibrator points.

Finally, ensure that the vibrator is pressed firmly into its sockets.

Installation

It will usually be necessary to drill some holes in the chassis and body of a car to which a radio set is to be

fitted. The best positions for the receiver and aerial should be studied carefully before any holes are drilled. It is important to place the units so that they do not cause discomfort to passengers, so that controls are readily accessible, and so that a short and direct lead-in from the aerial may be made.

The metal around every hole must be scraped clean and bright, so that all washers make good contact.

To make an efficient aerial installation, it is necessary to know something of the properties of the type of aerial that it is proposed to fit. The telescopic rod aerial has low capacitance and high impedance when the greater part of its length is above the body of the car. Under these conditions, if it is directly coupled to the receiver, it will be found that at the upper end of the wavelength scale the coupling efficiency is poor. A number of improved coupling devices have been designed, and it may be advantageous to use one of these. A carefully-screened choke in series with the lead-in wire is sometimes used, and if the screening-can is closely fitted (to increase the capacitative effect) a marked improvement in coupling efficiency may result.

A piece of rubber tubing about 3ins. long should be fitted over the part where the sliding member of a telescopic aerial enters the hollow tube. This will keep out rain.

An underslung aerial may be fitted in the following manner: Slacken off the support-straps holding the fuel tank, slip two metal strips into position (see Fig. 2), adjust the strips for best position, and tighten the support-strap screws. With this kind of aerial, make sure that the aerial wire does not run parallel with the exhaust-pipe or silencer.

A popular type of aerial is designed to be fitted below the running board. It should be spaced about three inches below the running board.

The sliding roof of certain cars can be insulated from the chassis, and can thus be used as an aerial.

Chromium-plated roof-fitting aerials are most suitable for cars having fabric or other non-metallic roofs. They are held in position by suction-cups, and thus have the advantage of not requiring the drilling of holes in the car.

The lead-in from aerial to receiver must be given careful attention. Even if a screened lead is used, interference may still be picked up. To minimize the likelihood of this, the lead should be kept well away from all electrical equipment and wiring in the car, and the screening sheath must be earthed at both ends and at several intermediate points. These earth connections must be well made; metal braid about 1in. wide is the best material to use, and all earthing screws and washers must make good electrical contact with the main frame of the car.

Interference Suppression

In every case it will be necessary to suppress noise

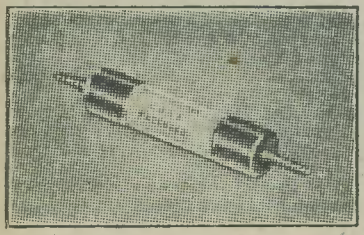
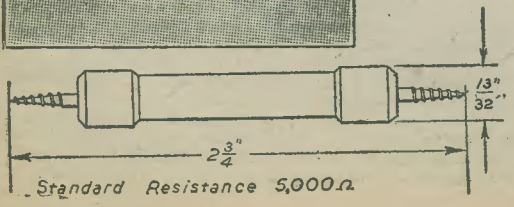
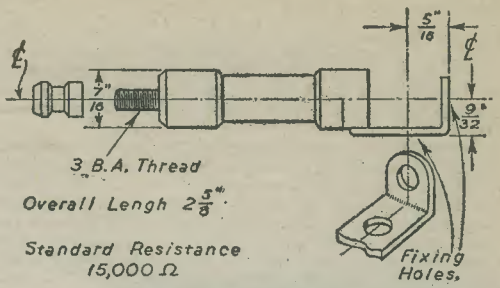


Fig. 3.—Distributor suppressor.





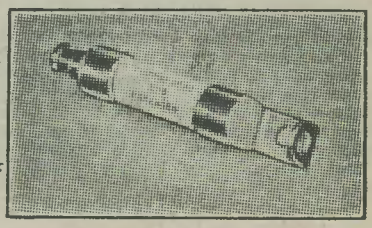


Fig. 4.—Sparking-plug suppressor.

picked up from the car distributor and from the commutator of the battery-charging dynamo.

Distributor noise is usually reduced by including a specially-designed resistor in the high-tension lead between coil and distributor, as close to the latter as possible. Fig. 3 illustrates a typical suppressor of this kind. It is constructed to withstand vibration and engine heat. This resistor will often have a value of 20,000 ohms or more; but if its inclusion is found to make the engine difficult to start from cold, it may be necessary to replace it with one of lower value—say, 10,000 or 15,000 ohms. An indicator of about 10 millihenries is sometimes used instead of a resistor in this position.

The dynamo suppressor may be a condenser having a capacitance of about .5μF. It must be designed to work at high temperatures. A correctly designed dynamo suppressor will have a metal case which is bolted to the metal housing of the dynamo. This provides one connection: the other is taken to the unearthed brush of the generator. This second connector (usually in the form of a "pigtail") must be kept as short as possible.

Some cars have a "two-wire" electrical system, instead of using the chassis as an earth return. In such a case, the dynamo suppressor condenser must have two leads, and must be connected between the positive and negative brushes.

Sparking-plug Suppressors

These are also resistors of special type, having a resistance of about 12,000 to 15,000 ohms. There are two popular kinds of sparking-plug suppressors—the "woodscrew-ended" type, illustrated in Fig. 3, and the "bracket-ended" type shown in Fig. 4. The former are screwed into the exposed ends of the sparking-plug leads, which are cut to allow their inclusion, while the latter are fastened directly to the plug terminals, the leads being attached to the other ends of the suppressors.

Sparking-plug leads should be kept as short as possible, especially if it is not intended to fit plug suppressors.

Windscreen-wiper Suppressors

If noise is heard in the radio set when the windscreen wiper is switched on, the wiper motor casing should be inspected to ensure that it is electrically earthed to the chassis of the car. If this is found to be in order, a condenser of .5μF. capacitance may be connected across the terminals of the wiper. Complete suppression is ensured by using the choke condenser unit, shown in

Fig. 5. Where a "two-wire" electrical system is in use, a .5μF. capacitor should be connected from each terminal to the chassis.

Electric Gauges

Most of the gauges on the dashboard of a modern car are electrical meters, and these may cause interference. The trouble does not originate in the meter itself, but in the unit supplying the current which the meter measures; and it is here that we must apply the remedy.

In the case of a petrol gauge, as an example, one side of a metal-cased 1μF. condenser should be connected to a screw securing the terminal escutcheon plate to the petrol tank, while the other side of the condenser is connected to the terminal which holds the lead from the petrol gauge meter.

The same principle may be applied in the case of other gauges, and a 1μF. capacitor will, in most instances, remove the trouble.

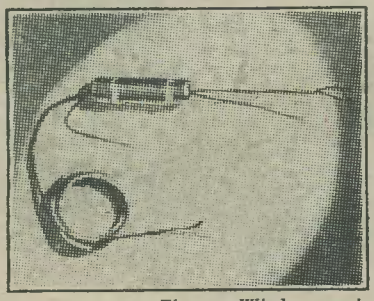
Effects upon Engine Performance

Radio and motor-car manufacturers have conducted many tests to determine the effects of noise-suppressors upon engine performance, and their main conclusions are summarised below.

Tests made by ignition specialists have proved that there is no adverse effect on engine performance or petrol consumption.

The fitting of suppressors tends to retard the ignition timing of the car, but the effect is so slight that it can in most cases be ignored. Poor engine performance when suppressors are fitted usually indicates that ignition is in any case maladjusted, and calls for a general inspection of the system.

Some vehicles are fitted by their manufacturers with suppressors to prevent interference with external U.H.F. or television receivers. These will generally have resistors of comparatively low value—about 5,000 ohms—in the sparking-plug leads. These low-resistance suppressors will not necessarily prove effective in suppressing noise in a radio set installed in the vehicle concerned.



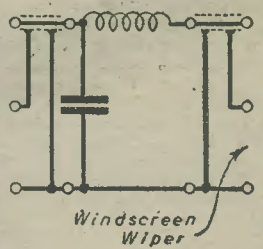


Fig. 5.—Windscreen-wiper suppressor.

Intermittent Noise

Momentary clicks will be heard when electric traffic indicators are operated. Similar clicks may be heard from horns, starters, charger cut-outs, fuel-pumps, etc., and may be eliminated by fitting .5μF. capacitors, as explained for dynamos.

Ill-fitting lamp-bulbs may cause loud intermittent crackle.

When tracing the source of noises that occur only when the car is in motion, or is rocked from side to side, it is important to remember that any momentary change in the effective metallic mass of the car chassis may produce audible effects in the car radio set. For example, loose running boards, mudguards, radiator grille, or engine-bonnet may be potent causes of trouble. The bonnet is especially important; it serves as a screen for the engine and the electrical devices housed close to the engine, and must therefore always be effectively earthed.

Loose chassis members may produce minute electrical static charges and subsequent discharges, and the cumulative effect of many such small noises may add appreciably to the general level of background "mush." Front and rear axles are particularly likely to cause noise of this kind, and it is desirable in bad cases to bond the axles to the main frame by flexible bonding strips.

The operation of control-wires and cables may be found to produce intermittent noise. The remedy is effective earthing at several different points on each wire.

The job must be tried out *on the road* before you can safely assume that it is satisfactorily completed. If possible, get the car-owner to take you for a fair run through varied surroundings.

Before passing or condemning an installation, make sure that results are not seriously prejudiced by local conditions. We once knew a chap who pulled a set out and put it back several times before noticing that he was working in a metal garage. Oh, the language!

"WIRELESS SET NUMBER 10"

DETAILS of the wireless set, which enabled Montgomery in Luneburg to speak directly to Mr. Churchill in Whitehall, with the security of a closed telephone line, and which was used by the Royal Signals throughout the campaign in Western Europe, have recently been released by the War Office. This receiver provided the only speech communication across the River Maas and the Rhine for several months and Tactical H.Q. was not out of touch for more than one hour with the whole of the 21st Army Group and the War Office up to the surrender at Luneburg, even though Tactical H.Q. moved at short intervals. Known as "Wireless set number 10" it was designed by technicians at the Ministry of Supply and in appearance it resembles Army Radar equipment. It is mounted on a four-wheel trailer with two circular mirrors mounted on top. It operates on a centimetric wavelength and this is the first time that such have been used for transmitting speech. It transmits its radio beam in the form of short pulses.

The sets are used in pairs, set number 1 sending out its pulses of short waves on which have been impressed the speech modulation and set number 2 receiving them.

Since set number 1 sends out its pulses in groups of eight and because set number 2 is able to sort these out into eight separate lines, no less than eight separate conversations can be relayed simultaneously between one pair of sets.

Although this alone would not provide complete security the great advantage of centimetric waves is that they make possible the use of a very narrow beam, not much wider than that of a searchlight. Although this beam is not affected by darkness, mist or rain, it is arrested by any fair-sized solid obstruction. This means that any pair of "10 sets" can only operate over a clear unobstructed path varying between 20 miles and 50 miles. The sites, therefore, which need to be carefully selected, are often mounted on towers or on the roofs of tall buildings.

It was at the end of 1942 that the first experimental two-stage link was set up between a building in Horsham and the roof of Berkeley Court in London. Later a link was made between Ventnor, Isle of Wight, and Beachy Head. The first operational link was between Ventnor and Cherbourg. Finally a chain of 10 "10 set" links was set up from Luneburg to Brussels, whence a normal land line connected it to Whitehall. Full information regarding this set, it should be recorded, was passed to the U.S.A.

Radio Robot Plane

Details of a Future Method of Bombing by Means of Long-range Radio-controlled Aerial Torpedoes.

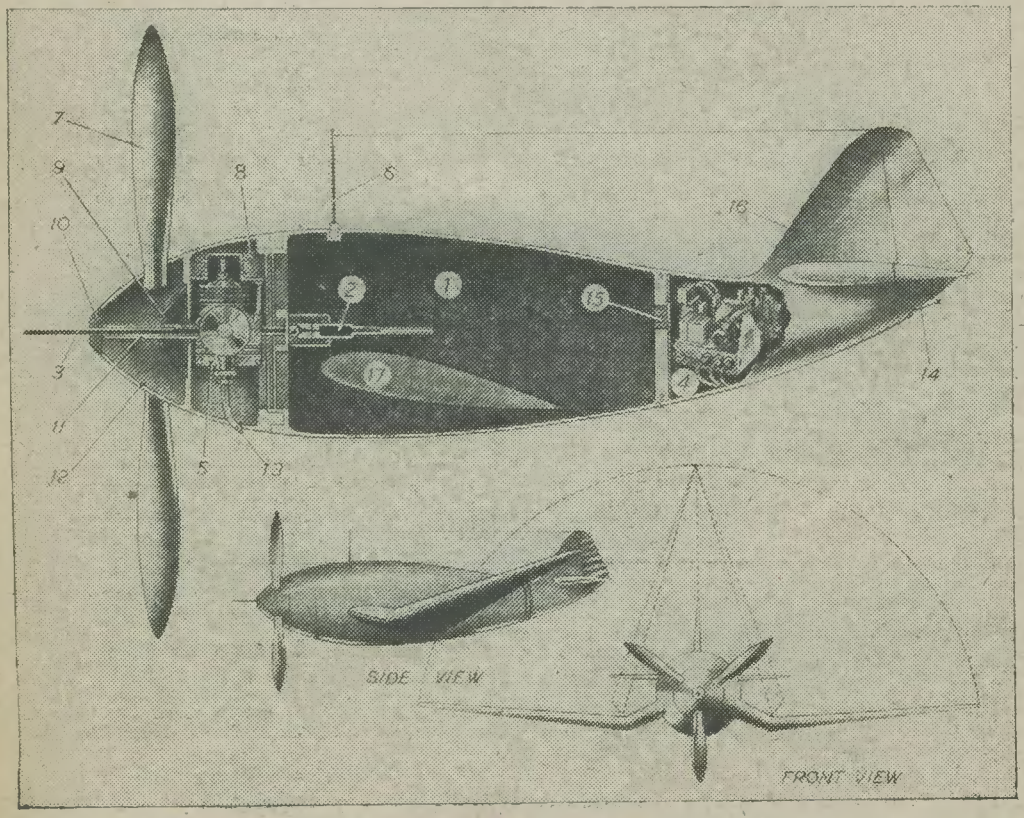
By LOUIS BRUCHISS

ONE of the most startling possibilities in future air warfare appears to be the development of radio-controlled robot airplanes that can accompany heavy, long-range bombers to their distant objectives. Large bombers, despite their numerous gun stations and heavy armament, are always vulnerable to numerically superior and faster enemy fighter aircraft because they are of themselves slower and more cumbersome. Fighter aircraft cannot accompany them on distant missions because their normal fuel capacity is limited.

As part of the bomb load, these huge flying fortresses could each carry a number of tiny radio-controlled planes. These miniature planes would have folding wings so that they could be stowed away in the fuselage of the larger mother ship, the robot planes being staggered to fit the least possible interference into the faired-away interior. They would have small and inexpensive engines of the required output, fed from fuel tanks of rather small capacity, since their radius and duration of action would be intentionally limited. They will carry a gyro pilot, controlled by robot mechanism set by radio impulses transmitted from the mother plane, as well as several bombs and smoke-screen gas tanks. The bombs could be detonated by radio.

In no branch of aerial warfare has there been any weapon exhibiting the versatile possibilities that these radio robot planes incorporate. They could be hung upon special hooks within the fuselage and the crew could lower them through the fuselage doors, open and lock the wings, start the engine, check the radio control, and release them for free but controlled flight within the visual range of the radio control operators. Carrying their timeable bomb load, they could be directed into formations of enemy aircraft to create havoc among them, and divert and prevent attacks upon the bombers themselves. They could be sent into enemy ground objectives with more accuracy and with less danger to the bombers than any precision-aimed free bomb drops. They could precede or surround the bombers they protect, sometimes emitting smoke screens to confuse the enemy aircraft.

Since they could not be retrieved, and their object would always be to destroy themselves with their deadly cargo, it is apparent that they could be constructed of



Construction of radio torpedo. 1—High explosive charge. 2—Detonator and fuse. 3—Firing pin. 4—Radio control space. 5—High-powered engine. 6—Radio aerial. 7—Three-blade propeller. 8—Fuel tank. 9—Gear. 10—Propeller hub. 11—Shaft. 12—Propeller head. 13—Exhaust pipe. 14—Rear antenna. 15—Filling plug. 16—Tail. 17—Wing.

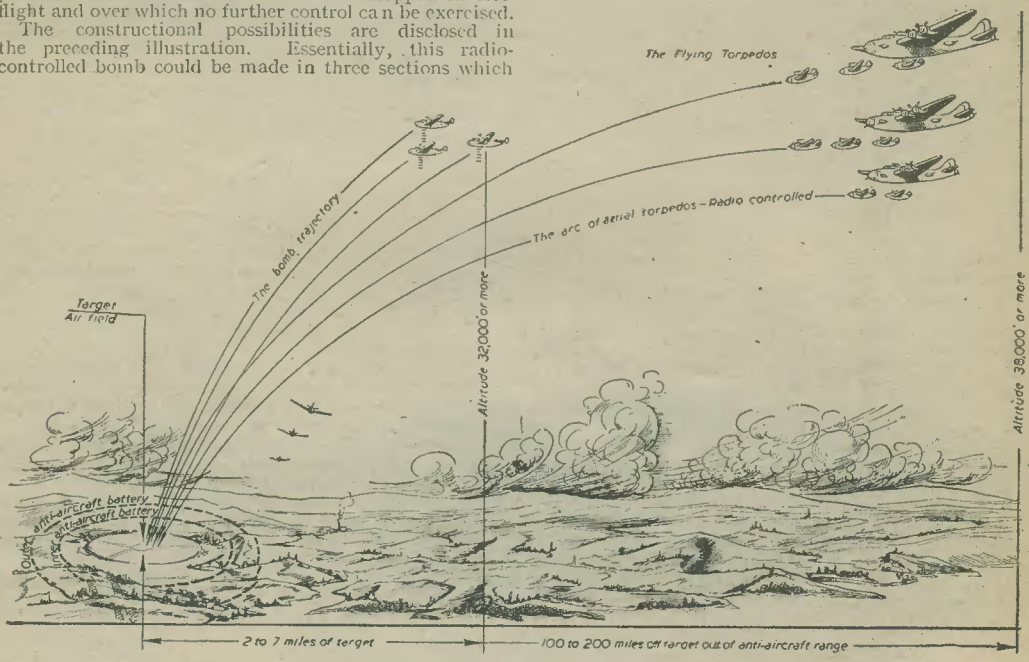
non-durable materials. Being small and light, they could be produced in huge quantities at comparatively low cost. They would represent an enormous "suicide squad," but one which would not risk a single life of the operating forces. While they could be adapted equally well to protect shipping when operated from surface vessels, their greatest all-round use would be as bomber-based flying bombs.

This particular radio-controlled bomb would have several unique features differentiating it sharply from long-range robot planes controlled by set mechanisms, such as the V-1 type used by the Nazis against England. The latter must have sufficient instruments to detect, correct and compensate for variations in air density, winds and course changes caused by exploding anti-aircraft shells. Being controlled within the limits of visual range from mother aircraft (these limits may extend up to a hundred miles under good weather conditions if observed through high-powered glasses and if equipped with smoke trail apparatus), the flying bomb is not a robot in the sense of those that are launched with pre-set controls. If anything, it becomes more of a precision bomb than those which are dropped in free flight and over which no further control can be exercised.

The constructional possibilities are disclosed in the preceding illustration. Essentially, this radio-controlled bomb could be made in three sections which could be nested into each other for final assembly. The forward section or nose would contain the small compression-ignition engine, together with fuel tanks and propeller. Due to their short-range action, fuel tanks would be relatively small. The centre section would be the actual bomb containing the explosive, which could be detonated either through the firing pin extending through the forward power section, past the propeller spinner, or by means of radio through a detonator operated from the rear section. The rear section would carry the radio receiver connected directly to the tail surface controls. Connecting rods, cables and wires therefore would be direct and short. The wings would set into special recesses and hooks on the centre section.

While controllable bombs of this type would cost more than free drop bombs of similar weight, they might in all likelihood reduce heavy bomber losses because the latter could remain well away from the target area in any direction.

Excerpt from "Aircraft Armament," published by Aerosphere Inc., N. Y. C.



A comparison of present-day short-trajectory bombing methods with future bombing, using long-range radio-controlled aerial torpedoes.

Spares for American Sets

ON page 1 of our December issue we referred to the difficult position of people who need spares for American wireless sets. Since early in the war the Board of Trade, in co-operation with importers and manufacturers of radio valves and components, have arranged for the importation of sufficient parts to maintain in operation these receivers imported from American both before and during the war. No change in these arrangements is expected.

There has been some delay in shipping certain types of valves ordered in the U.S.A., but every effort is being made to hasten delivery.

(This information, which we have received from the Board of Trade, seems at direct variance with our readers' experiences. They report that American valves and accessories are almost unobtainable.—ED.)

Proposed Radio Club for Herne Hill

IT is proposed to form a Radio Club in the Herne Hill district, and interested readers residing in the locality are invited to get in touch with Mr. K. A. Burdon, 48, Hollingbourne Road, Herne Hill, London, S.E.24.

Northern Radio Club

A N.E. branch of the World Friendship Society of Radio Amateurs has been opened in Newcastle-on-Tyne. Any radio amateurs interested in joining this branch of W.F.S.R.A. should write to: Hon. Sec., Alan F. Robson, 522, Denton Road, Newcastle-on-Tyne, 5.

Receiver Alignment with the Oscilloscope

R. P. Mackrell Describes the Advantages of Using an Oscilloscope to Enable Quality Reproduction to be Improved

THE voltmeter may be used to measure the maximum output from a receiver while its circuits are being adjusted; but the oscilloscope can not only be used most effectively for the same purpose, but, in addition, the actual response curves of the circuits in question can be studied and adjusted, thus vastly improving the quality of reproduction.

If, in the usual way, a modulated signal at the intermediate frequency (I.F.) is introduced into the frequency-changer circuit of a receiver, and the vertical deflector plates (often known as the "Y" plates) of the oscilloscope are connected to the receiver output, say, across the loudspeaker, then, if the time-base is operating and adjusted to the correct frequency to produce a steady image (a sub-multiple of the injected frequency), an A.F. waveform will be produced on the screen.

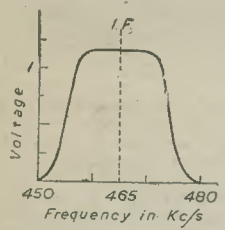


Fig. 1.—An ideal response curve of an I.F. transformer. Voltage is plotted against frequency.

Trimmers

In the normal way alignment is carried out by adjusting the trimmers of the I.F. transformers in turn, and maximum output of the injected signal is indicated either aurally or, as previously mentioned, by obtaining maximum deflection of the needle of an A.C. voltmeter. This method should be adopted as our first step, but the oscilloscope can replace the meter, and adjustments be made until the greatest amplitude of the waveform on the screen is obtained.

Now it will be appreciated that the waveform which is appearing on the screen is a graph of the wave which is being introduced to the receiver; the voltage is shown by the vertical height of the trace, and is plotted against time, shown horizontally.

The response curve of a tuned circuit is not, however, voltage plotted against time, but rather, voltage against frequency. The first step in the production of our circuit response curve then appears to be to apply the I.F. transformer voltage to the vertical deflector plates of the oscilloscope; this giving us the voltage variation by vertical movement of the spot on the tube.

Since the base of the graph has to represent a range of frequencies, these will have to be from about 15 kc/s below the I.F. up to 15 kc/s above it; by so doing the necessary sidebands will be adequately covered. If the I.F. is 465 kc/s, then it will be appreciated that in order to obtain a graph of the response curve on the screen the frequency of the injected signal must be varied from 450 kc/s to 480 kc/s. This is accomplished by using what is known as a "frequency-modulated" signal generator, or, as it is sometimes called, a "wobbulator."

The instrument in question is, broadly speaking, an oscillator (which we have tuned to 465 kc/s) with a further valve connected in parallel with its tuned circuits. The last-named valve, by having its internal resistance varied, has the effect of altering the effective capacity of the oscillator tuned circuit, and so varying the frequency of the oscillations produced.

The internal resistance of this modulator valve is varied by applying part of the varying oscilloscope time-base voltage to it in the form of grid bias; it will be obvious, therefore, that by altering the time-base frequency the frequency of modulation can be varied. The actual frequency of modulation generally used in practice is in the region of 25 c/s.

Incidentally, the effect of employing a valve to vary the frequency of a tuned circuit is also made use of in automatic-frequency-control (A.F.C.) circuits, sometimes included in modern receivers.

Amplifiers

Most commercial oscilloscopes have a built-in amplifier for use when the voltage under test is not large enough to produce sufficient deflection to provide a useful size of image. This amplifier will generally be in use when dealing with the R.F. and I.F. stages of a receiver.

For receiver alignment the vertical plates of the oscilloscope will normally be connected via the amplifier to either the "top" of the last I.F. transformer secondary and chassis, or between the coupling lead from the detector to the first A.F. valve and chassis.

By using the first-mentioned connection—I.F. transformer to chassis—the waveform produced on the screen will be that of the I.F.

It is far more likely that a patch of light will be all that will result, the time-base frequency being so low that the large number of cycles present on the screen will merge into one another. The outline shape of this image will represent the response curve of the circuits in question; it should be observed that, as the oscilloscope is connected to the receiver prior to the detector valve, rectification has not yet taken place, and, consequently, a double response curve will be produced, as shown in Fig. 2(a).

Response Curve

A disadvantage of using this type of connection is that, at such a high frequency as the I.F., the response curve of the amplifier previously mentioned may become non-linear, and result in distortion of the trace.

Another point to be borne in mind is that the rate at which the spot is forming the trace is very rapid and consequently the image is faint.

If we adopt the second method of connection, however, a much brighter, single A.F. trace will be produced on the screen; this will be similar to that shown in Fig. 2(b).

We have now reached a stage where we are in a position to consider the actual alignment operations.

Let us then adopt the latter method of connecting

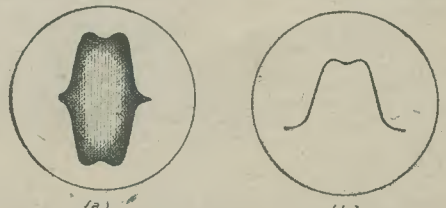


Fig. 2.—Showing the response curves by connecting the oscilloscope before (a) and after (b) the detector.

our oscilloscope to the receiver—that is, from the A.F. output lead of the detector to chassis. As previously stated, our first step is to inject a normal amplitude-modulated signal at I.F. to the control grid of the frequency-changer.

In order to ensure that distortion is avoided we must render the receiver's oscillator and A.V.C. circuits

inoperative. (Also the A.F.C. circuit if this is incorporated in the design.) This can be effectively accomplished by " shorting " the oscillator grid and the A.V.C. line to chassis.

The next step is to adjust the trimmers, or iron cores, of the I.F. transformers until maximum amplitude of the waveform on the screen is obtained. Having completed this operation, we have the I.F. circuits accurately aligned at I.F.

It is now necessary for us to remake the connections which gave us our response curve. As previously mentioned, we apply a portion of our time-base voltage to the signal generator, and also arrange for this instrument to give a frequency-modulated output. This change over from amplitude-modulation can often be effected by means of a switch, on many commercial models; also attachments are available for fitting to an existing amplitude-modulated signal generator.

Tests

Switching on the apparatus, we shall probably find that, if we have adjusted the I.F.s correctly, a response curve similar to that shown in Fig. 3(a) is produced.

Here it will be noticed that the peak of the curve is very sharp, and that the voltage developed at resonance is large. Unfortunately, though, variation of the signal to either side of resonance (due to the normal A.F. modulation of a broadcast wave), will cause severe " cut off " of frequencies differing from the I.F. by more than, say, 2 kc/s. Here, then, we are losing our high notes and reproduction will deteriorate.

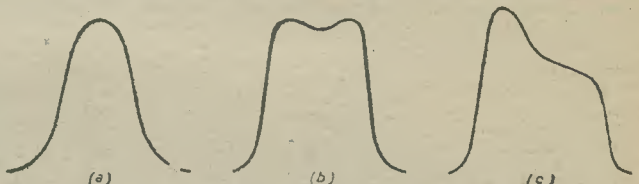


Fig. 3.—Three different response curves which are fully described in the text.

As this is highly undesirable, our object must be to flatten out the top of the response curve, and so permit a small band of frequencies to all receive equal treatment by the circuit.

No particular procedure can be laid down to accomplish this, however, and it is just a matter of judicious manipulation of the trimmers until a trace such as that shown in Fig. 3 (b) is produced. The small dip in the top of the curve will be found to be present in almost every case. If such a curve cannot be produced, one which is a near approach to it, and yet still retaining its symmetry, should be adopted.

Absence of Trace

Sometimes it occurs that no trace whatsoever, which bears a close resemblance to that of Fig. 3(b), can be obtained; under these circumstances, generally applying to a highly selective receiver, we should have to be content with merely reducing the sharpness of the peak.

The curve may not, on the other hand, appear symmetrical, and similar to that in Fig. 3(c); this indicates that the receiver is badly aligned.

It will often be found that starting with curve (a), by adjusting only one trimmer, a trace like (c) will result. Then, by adjusting the next trimmer the peak on the left of the curve will be reduced; alteration of yet another trimmer may cause another peak, perhaps on the opposite side. When all adjustments have been made, however, the result, as we have said, should resemble that of curve (b).

Inverted Images

One further point to be observed is that the images produced may appear inverted on the screen, but as this makes absolutely no difference to the alignment process, it is not worth troubling to reverse the oscilloscope connections. It should also be noted that the trace should be placed in the centre of the screen; if it is to one side, this indicates that the receiver is aligned to an incorrect I.F. (provided that the present injected signal is correct), and the error will have to be rectified.

With the I.F.s now correctly aligned, the frequency-modulated signal generator is connected to the aerial and earth terminals, preferably with an artificial aerial also connected if available, and we proceed to trim the R.F. and oscillator circuits. As there are slight variations of this process, it would be advisable to follow the makers' instructions for the particular set under consideration.

Dealing with the medium waveband, the signal generator should be set at the high frequency end of the dial to, say, 1,500 kc/s, and the receiver tuned to this frequency. The receiver's oscillator must now be made operative again, but A.V.C. and A.F.C. circuits should remain shorted.

The now familiar response curve will be visible on the screen again; if it is not central, or does not appear at all, the medium wave oscillator trimmer should be adjusted until this is so.

The aerial and R.F. circuit trimmers have now to be adjusted until the height of the curve on the screen is at a maximum; the shape of the curve, of course, should remain unaltered.

With band-pass aerial and R.F. circuits the shape may be altered, but care should be taken to keep the curve symmetrical while adjusting for maximum height of the image. This operation completed, it is now necessary to " track " the receiver at the lower end of the band, say, 500 kc/s.

Adjustments

Adjust the signal generator to this frequency and tune it in on the receiver, until the curve produced is in the centre of the screen. The " tracker " is now adjusted for maximum height of the image. The trace will be found to move to one side, as the tracker is rotated; if the height of the image increases at the same time, the rotation should be continued until maximum is obtained. In the case of the image moving completely off the screen before maximum is reached, it can be brought back to centre again by slight adjustment of the receiver tuning control. If the image decreases in height as the tracker is turned, the direction of rotation should be reversed.

When a maximum is achieved the tracker is correctly adjusted, and it will be found advisable to make any slight adjustments necessary to the aerial and R.F. circuits once more, at the high frequency end of the band.

The above procedure is carried out for all wavebands, using the appropriate trimmers; when this has been done, the alignment is then complete.

Any filters included in the receiver should be dealt with in the normal manner, adjusting for minimum needle deflection on the A.C. voltmeter, or minimum height of the trace on the oscilloscope screen.

T.R.F. receivers can be aligned in an exactly similar way to the aerial and R.F. circuits already discussed. The oscilloscope, in this instance, can be connected across the anode load resistor of the detector stage. It is advisable, however, if an inductive load is used, to replace this temporarily with a resistor of suitable value.

I have only attempted to give briefly the main points of one important practical application of this instrument, but for those interested there are several good publications at present on the market, dealing fully with the theory of the Cathode-ray Oscilloscope and its many useful applications in the radio-servicing workshop.

Accessories for the Transmitting Station

Constructional Notes on Items that can be Put in Hand Now

Described by 2ATV.

THE amateur fraternity is in a state of expectancy. It is hoped that radiating facilities will soon be restored, and it is possible that by the time this article appears in print, one or more frequency bands may have been allotted for this purpose. Even should this feeling prove to err on the optimistic side, the units to be described here will be needed as soon as licences are restored, and they can be constructed now without infringing any regulations.

Tuning Loop

The most simple item of all to build, yet one that is constantly being used, is the tuning loop pictured in Fig. 1. This consists simply of a miniature Edison screw holder mounted on an insulated handle, with the two lamp terminals connected together by a single-turn loop. A heavy gauge wire should be used, preferably covered with systoflex, and the diameter should be around 2ins. for easy insertion of the bulb. The latter is rated at 6.3 v., 0.3 a., as used for receiver dial lighting. In use, the tuning loop is brought from a distance near to the coil under test. The presence of R.F. currents in the latter resulting in a glow in the lamp. The rate of approach to the coil should be slow and steady, as otherwise the indication may be only a flash and a burnt-out bulb!

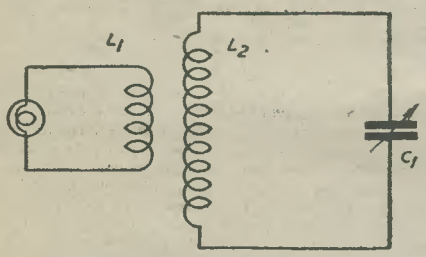


Fig. 2.—Theoretical circuit diagram of an absorption wavemeter.

Absorption Wavemeter

Once in a position to check the presence of R.F., the next step is to be able to ascertain that the transmitter is, in fact, operating within the prescribed frequency limits. Any attempt to check this fact by means of the receiver or monitor, even if a frequency meter is available, will be found well-nigh impossible owing to the difficulty of distinguishing between fundamental and harmonics. The absorption meter possesses the great advantage of operating on the fundamental frequencies only, and can therefore be justly described as a real necessity in every station. Construction is quite easy, and the cost is moderate. Fig. 2 shows the theoretical circuit of such an instrument and Fig. 3 a practical layout. The circuit shows the meter to consist of a tuned circuit L_1–C_1, to which is loosely coupled another and smaller inductance L_2, across which is connected a small lamp similar to that used in the tuning loop.

Fig. 3 shows that, like the tuning loop, the meter is built on to an insulated handle. This can be in one with the baseboard, suitably shaped, and can be of varnished wood, as can the panel. The coils are standard Raymart 4-pin plug-in jobs, series CA_4–CD_4, and the coil-holder

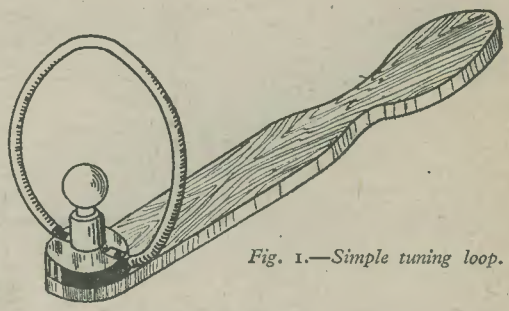


Fig. 1.—Simple tuning loop.

is a Raymart ceramic VH4G. The 160 mmfd. variable capacitor (type VC160X) and the Utility dual-ratio slow-motion drive can also be obtained from the same firm. To ensure constancy of calibration, the construction should be as rigid as possible. Wiring should be no longer than absolutely necessary, and should be carried out in 16 s.w.g. or heavier.

The absorption wavemeter must next be calibrated. In the absence of a signal generator and valve voltmeter, this can best be done with the aid of a receiver. With the receiver dial set at a known frequency, and the detector just oscillating, the wavemeter is brought near to the detector coil and the wavemeter dial adjusted until the oscillation ceases. The sharpness of the wavemeter tuning will depend on the degree of coupling between it and the detector coil, and different distances should be tried until the zero point of the wavemeter

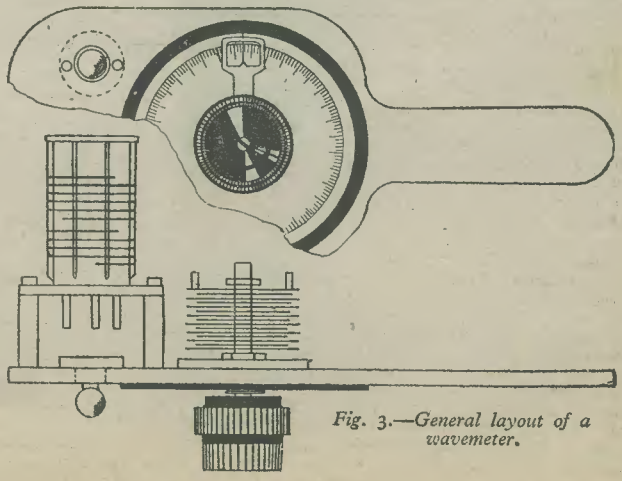


Fig. 3.—General layout of a wavemeter.

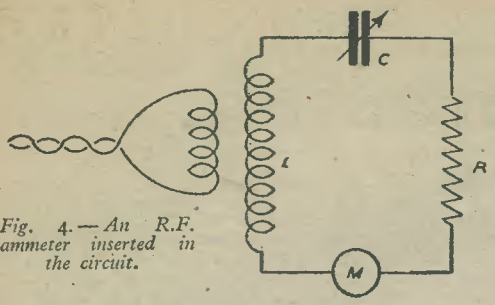


Fig. 4.—An R.F. ammeter inserted in the circuit.

tuning can be judged without fear of error. When a series of such points have been obtained, a graph should be made plotting frequency against dial readings. For checking the frequency of transmitting radiation, the wavemeter is brought near to the oscillator tuned circuit, and the dial adjusted until the indicating lamp is at maximum brightness. Reference to the graph will then show the frequency at which the transmitter stage is operating. Here again the tuning is affected by the degree of coupling, that is the sharpness of the tuning, and the brilliance of the lamp.

Artificial Aerial

It is as yet uncertain whether or not non-radiating licences will be issued again, but in any event the possession of an artificial aerial will be found invaluable, as adjustments can then be made to the transmitter without inflicting the results on listeners who may consider that they are already suffering enough! Most often the function of the dummy aerial is to absorb the power output of the transmitter to prevent radiation, and in a simple form it is thus very similar to the absorption wavemeter. A simple circuit is shown at Fig. 4, and it will be seen to consist of inductance, capacitance, and resistance, the components of a radiating aerial, in fact. The variable capacitor C enables the aerial to be tuned to resonate at the frequency of the transmitter. The resistor R must be non-inductive, of course, and must also be capable of dissipating the power output of the transmitter. Where comparisons of output only are to be made, the resistor can take the form of a lamp of appropriate wattage rating. The dummy aerial can be inductively coupled to the transmitter, as with the absorption wavemeter, but this method, like capacitive coupling, is seldom convenient for physical reasons. It is therefore recommended that link coupling between the units be used.

In normal times a special resistor is available, in various values between 70 and 600 ohms, permitting the dummy aerial to simulate very closely the loading effect of the radiating aerial. These "Ohmite" resistors are constructed in a glass envelope and are fitted with a standard American four-pin base. They will doubtless be brought over again when amateur activities are resumed, so that if it is desired to use them the constructional side of the aerial can be finished off by providing a suitable holder. When it is required to record measurements, a hot-wire or thermo-couple R.F. ammeter can be inserted into circuit at *M* in Fig. 4.

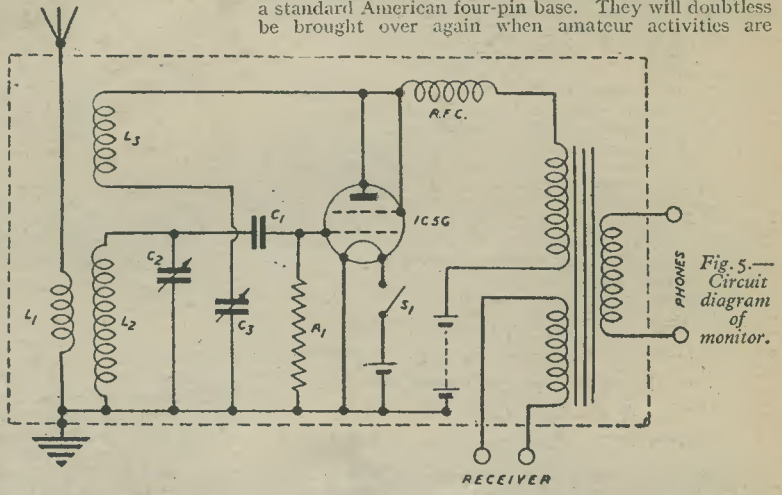
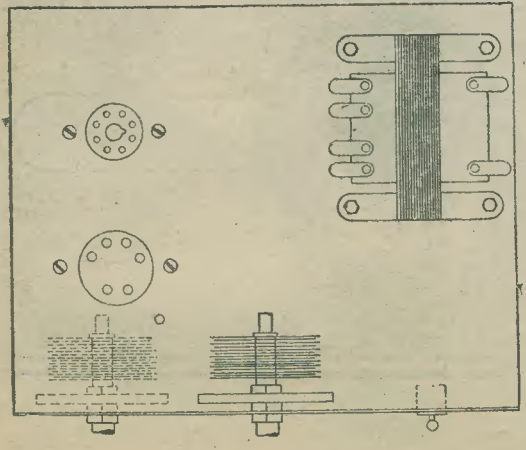


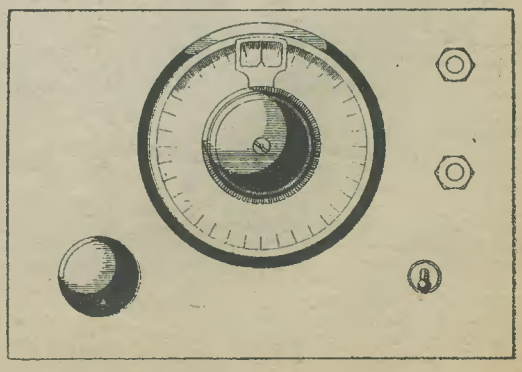
Fig. 5.—Circuit diagram of monitor.

Monitor

A simple tuned circuit coupled to a crystal or diode detector is sufficient for telephony monitoring purposes, but the extra cost to enable telegraphy also to be covered is so small that a dual purpose unit only will be considered. The theoretical circuit is shown at Fig. 5, and chassis lay-out at Figs. 6 and 7.

(To be continued)





Figs. 6 and 7.—Plan of chassis and panel layout.

pp63 - 64 missing.

sectional area increases by a certain fixed fraction of its original area for every equal increment in length. The lowest frequency at which such a horn is effective is that for which the circumference of its mouth is equal

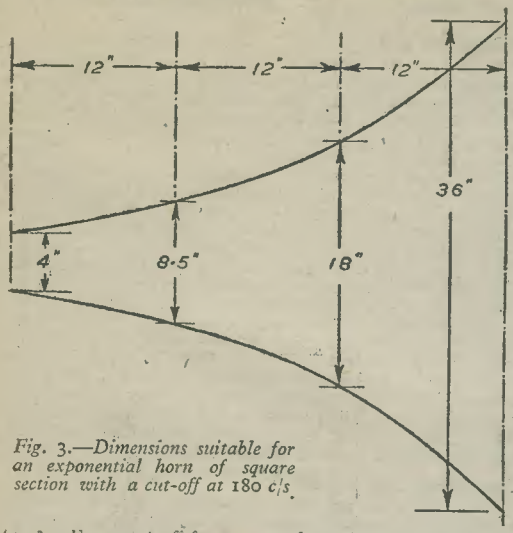


Fig. 3.—Dimensions suitable for an exponential horn of square section with a cut-off at 180 c/s.

to 2λ. For a cut-off frequency of 50 c/s λ=22ft. so that a mouth at least 11ft. square or 14ft. diameter is necessary. Such a horn would be inconveniently large in a house though easily practicable in a cinema. Let us consider a more reasonable size for a domestic horn.

If we fix the mouth opening at 3ft. square the cut-off frequency becomes 180 c/s. Below this low-frequency limit the efficiency of the horn falls off very sharply indeed. The rate of expansion of a horn is also an important factor. If this is too large so that the distance from mouth to throat is very short, then the horn becomes little better than a baffle, and although transmission of low frequencies is improved by the provision of a baffle, as explained earlier, there is no great overall improvement in efficiency such as a properly designed horn can give. There is, then, a maximum value to the rate of expansion, which should not be exceeded. To quote a numerical example; for the 180 c/s horn mentioned above, the rate of expansion should not exceed the value for which the area increases by eight times per foot length of horn, whereas if a cut-off frequency of 50 c/s is wanted, then the rate of expansion should be less than 1.8 in area per foot length of horn. Thus a horn required to radiate well down to very low frequencies needs to be very long (one radiating down to 50 c/s should be about 12ft. long.) and it is hence a good plan to fold them in order to make them of more convenient size. Alternatively, designs have been evolved in which a small horn is fitted into a corner of a room the walls and floor of which act to some extent as an extension of the horn, thus giving a possibly lower and certainly less sudden cut-off at the low frequencies. Dimensions are given in Fig. 3 for a small horn cutting off at 180 c/s theoretically. The actual cut-off frequency will be slightly higher than this in practice. The throat area has been made 4in. square, equal approximately to the area of the cone of a commercial loudspeaker of 6in. diameter. Possibly the best form a high-quality domestic reproducer can take is a combination of horn, using the walls as extension pieces as described, and some means of boosting bass response, say a box baffle, vented enclosure or labyrinth. The interested reader may like to design a compact unit embodying this principle.

Curing Noises

NOISES which occur from causes outside the set are usually far more difficult to eliminate than those which are caused through some defect in the receiver itself, since it is very rarely that they can be tackled at their source. That the source may be well known is not usually of much help for that reason.

The usual noises experienced are crackling and similar noises due to electrical machinery, mains hum, atmospherics, and heterodyne whistles.

Interference Due to Electrical Machinery

The problem of disturbances due to electrical machinery in the neighbourhood of the receiver is one of the hardest to solve. Amongst the more usual sources are trams, trains, electric signs, automatic traffic signals, charging plants, generators, etc. The radiations are apparently caused by sparking at commutators and switches, etc. These act in much the same way as a spark station, the transmitting aerial being represented by the supply mains which feed the machinery. In the case of trams, the overhead trolley which collects current from the conductor is often a prolific source of crackles and crashes, and even the ordinary tumbler switches of the house-lighting system cause a click in the loudspeaker every time they are operated.

In some of the worst cases a complete cure is often impossible unless the cause is removed. The B.B.C. are, of course, doing much useful work in this connection, but one can often supplement their excellent efforts by approaching owners of noisy plant such as electric-charging systems, sausage machines, etc. Often the fitting of such an inexpensive addition as a good earth connection or a pair of 4-mfd. condensers across the brushes, with the centre point earthed, will make all the difference.

Frame Aerial as a Cure

As regards the receiver itself, there are various dodges which may be tried, but probably the most successful of all is the centre-tapped frame aerial. An ordinary frame will generally effect some improvement, but not to the extent that a properly balanced frame will. The merit of the frame is not due to the fact that it is less efficient than an outdoor aerial, and that therefore it picks up less disturbance. If that were so there would be no advantage since signals would also be reduced in proportion, and any attempt to increase the signal strength would increase the disturbance again. Actually, however, the frame appears to be much more sensitive, at any rate, to the distant broadcast than to the local disturbance.

The circuit for the balanced frame aerial is similar to that of an ordinary frame, except that the centre point of the winding is earthed. One end of the frame goes to the grid of the first valve in the usual way. The centre tap goes to earth, while the other end is joined to one side of the tuning-condenser only.

Points to remember in fitting up the frame are: that each half of the frame should be as nearly identical as possible, electrically as well as mechanically. Both the outside leads should be the same length and equidistant from the centre of earthed lead. Naturally, one will need a sensitive receiver with a frame if it is desired to get foreign stations with any degree of volume.

A superhet is ideal, but a straight four-valver, with a screen-grid stage, will usually meet all average needs. The placing of the receiver in a metal box or in some way screening it will be an advantage when used in conjunction with the frame, although it is unlikely to be of much help with an ordinary aerial.

A Valve Detector Set

An Experimental Receiver for the Medium-wave Band.

By "EXPERIMENTALIST"

THE set here described is an experimental one, designed chiefly for tuning the medium-wave band. However, provision is made for long-wave reception, if desired, in which case an extra switch (a double-pole double-throw Q.M.B. wave-change type) is needed.

The circuit is straightforward, easily followed from

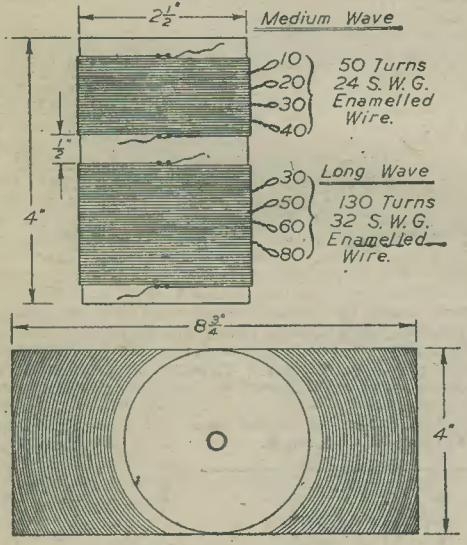


Fig. 1.—Details of the coil.

the theoretical diagram. It will be seen that the long-wave coil winding is earthed and thus short-circuited so that medium-wave tuning only is possible. Various tappings are provided on the coil, on both medium-wave and long-wave windings, so that the best conditions for tuning can be found.

You may, incidentally, have to make use of a triode valve. In the writer's case, an L.P.2 "Osram" type was used and connection made to the grid, not the anode (plate). The filaments are heated by means of a 2-volt accumulator or a 9-volt grid bias battery, supplying 1½ volts, space being provided in the base of the case for the latter, which is intended only for emergency use. In fact, the whole receiver forms an unusual emergency, stand-by type which uses a valve and an accumulator from an existing one-valve, two-valve or three-valve battery-operated set when the H.T. supply becomes exhausted and it is impossible to obtain a replacement immediately.

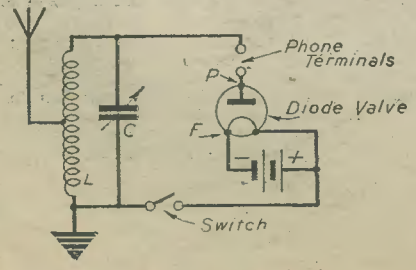


Fig. 2.—Theoretical circuit.

Making the Coil

While a 4in. length of 2½in. diameter cardboard, ebonite, etc., tubing is used for making the coil, a piece of gramophone record, cut as shown at Fig. 1, will also form an excellent tube if softened (by steeping in hot water) and bent around a suitable cylinder-shaped object, such as a bottle or rounded piece of wood. The joining edges may need treatment with a file to make them meet evenly. A wooden bottom, cut from a strip of wood about ¾in. wide by ⅜in. thick, is fitted and attached by means of a couple of small screws.

It will be noticed that the medium-wave windings begin ½in. from the upper edge of the tube, with the long-wave winding the same distance from the bottom edge, with a ½in. space separating both windings. The wire is looped at the points indicated by twisting. Each loop, after the winding has been completed, is scraped free of enamel. Allow plenty of length in the wire leads for connecting purposes, or, better still, have a heavy cotton-covered lead fixed securely to the ends of the coil wire, doing so in such a way that accidental "chugging" will not tend to affect the anchorage of the coil windings or cause a disconnection.

Components and Chassis

Owing to space reasons, a .0005 mica-spaced variable condenser is required, other components being a triode battery-type valve holder, a single-pole Bulgin switch and four terminals. The top plan, at Fig. 3, shows the arrangement of these components on the chassis.

To make the chassis, you need a base piece 6ins. long by 3⅜ins. wide by ¼in. thick. The panel, at Fig. 5, is fixed flush with one edge of the base with flathead screws. Cut it from ¼in. fretwood or plywood; the approximate position of the switch and tuning condenser is shown, but measure your own components and bore the holes accordingly.

It has been stated that a triode valve serves as a detector, but this also applies to pentodes, one being a 220-OT "Cossor" valve. A five-pin valve holder will not be required, since the extra electrodes are not brought into use. However, if a four-pin type cannot be obtained, the five-pin type serves as a substitute.

The components are mounted as shown by the top plan and then wired as indicated in the theoretical circuit diagram (see Fig. 2). Note that the upper pair of terminals are for the headphones. The circuit indicated, of course, shows a diode valve in its layout. In the case of triodes or pentodes, the 'phone terminal wire is connected to the grid and not the plate.

Testing the Circuit

Having connected a good aerial and earth to the set,

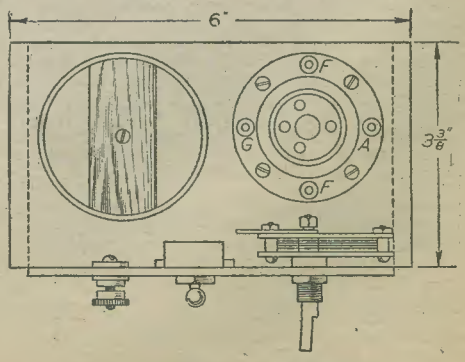


Fig. 3.—Top plan of components.

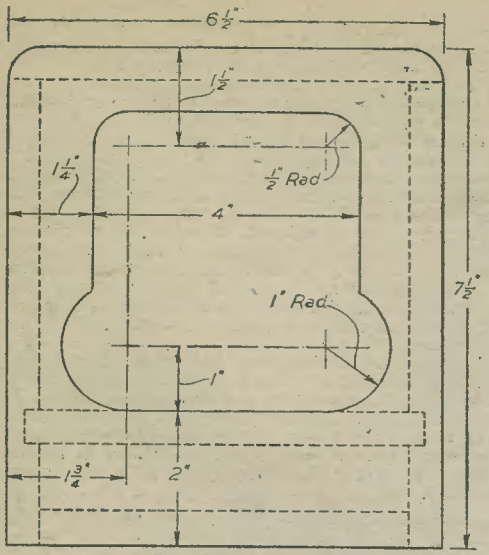


Fig. 4.—The front panel.

plus a pair of headphones, switch on the L.T. supply to the valve and tune in the local station. It must not be forgotten, by the way, that the long-wave winding needs to be short-circuited by connecting the free ends together and earthing them.

Try, if possible, to tune in a distant station, then note the effect obtained by transferring the aerial wire to the various tappings. Make a permanent connection to the loop bringing in the best results.

Incidentally, if nothing is heard at all, change the positive and negative positions on the L.T. battery. You will know that these have been in reverse as soon as one wire is removed, or you should do so. In any case, have both leads reversed and try tuning up the set again.

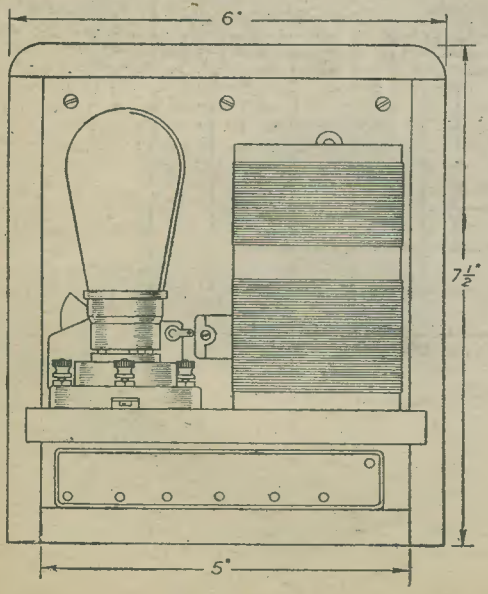


Fig. 6.—Back view.

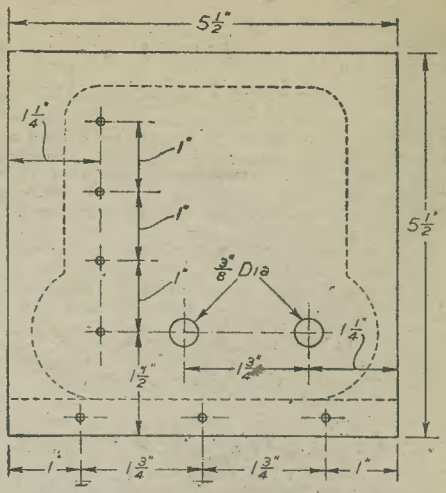


Fig. 5.—The chassis, showing position of holes.

Long-wave Reception

If long-wave listening is wanted, connect together the lower end of the medium-wave winding and the upper end of the long-wave winding and repeat the procedure already described. All that then remains is to fit a two-pole C/O W/C switch. When the later is in one position, the L/W winding is short-circuited and the aerial transferred to the M/W tapping; when in the other position, both windings are in series, with the aerial connected to its tapping on the L/W winding.

The best position for the wave-change switch is directly above the tuning condenser.

The Case Construction

The case is built from ¼in. thick deal or any other wood available which is the same thickness. The

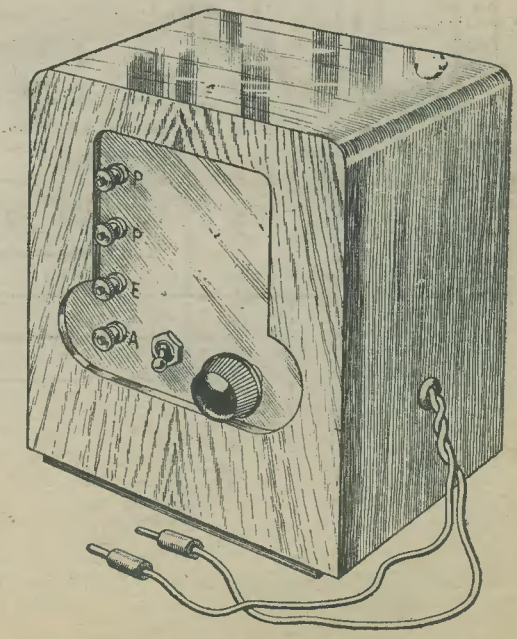


Fig. 7.—The completed receiver.

sides measure 7ins. long by 3¾ins. wide. These are trenched, at one side, for the ends of the chassis base piece, the channels being ¼in. wide by ¼in. deep. The trenching is done 1½ins. from the bottom end, doing so with a tenon saw and a wood chisel.

A bottom piece (5ins. by 3¼ins. by ¼in.) is nailed between the sides, flush at the bottom ends, then a top (6ins. by 3¾ins. by ¼in.) fixed upon the upper ends. Use oval nails 1½ins. long and punch the heads slightly below the wood surface and, if desired, have the corners rounded over at the top with a plane, following which the case is glasspapered. The joins, naturally, will have to be trimmed neatly with a finely set block plane prior to smoothing the work with glasspaper, and it is being assumed that the front shape at Fig. 4 has been cut out from ¼in. wood and attached with glue and panel pins.

It is better to have the front fitted on before cleaning up the joins, etc., with a plane and glasspaper. It helps to keep the work steady and square. When glasspapered, the best finish is either two thin alternate coats of high-gloss paint or shellac polish.

The chassis slips in position and its panel secured to the case front with suitable screws. If an accumulator is to be employed for L.T. supply, a length of twin flex is connected to the filament terminals on the valve holder and brought through a ¼in. hole bored in one of the case sides, as shown at Fig. 7. Spade ends, of course, are fitted to the ends. A grid bias battery requires plugs.

However, to save having to change from one thing to another, fit plugs, for the stems of these can be fixed between the terminals on the accumulator. The latter is the best thing to use, since it can always be recharged at small cost, whereas grid bias batteries, apart from becoming exhausted quickly, are pretty expensive items, which the writer, as an experimenter, knows from bitter experience.

As previously mentioned, therefore, keep the grid bias unused for cases of emergency when, for example, the accumulator fails during an important broadcast. It will probably be considered that a valve detector set is, in view of the fact that a good crystal detector set gives just the same results, a rather foolish thing to devise.

It should not be forgotten that crystal detectors are apt to fail one at the last moment and it is not every time that one can hit on a good sensitive spot. The semi-permanent, double-crystal type does not last for ever, nor can one always go out and buy a new detector. The valve, on the other hand, never fails to function (except when the L.T. supply fails) and is always sensitive.

Designing Your Own Portable—I

Some Fundamentals Explained.

By C. BEGG, M.Sc., A.M.I.E.E.

THE "quality" enthusiast, it is true, has a basic tendency to take a somewhat up-stage attitude towards the portable. His precious decibels avalanche away from both ends of the frequency response and he feels well within the rights of his faith in describing the resultant tone uncompromisingly as poor.

Of course one sees his point of view. If the aim is to hear the London Symphony Orchestra in its rightful perspective, then undoubtedly one could do better than choose a portable to handle the situation. On the other hand there are many programmes which come through surprisingly well despite a drastically clipped frequency response, and with this response it is surprising, too, how much harmonic distortion can pass unnoticed. And the great point about a portable is that it is *portable*. No aerial, no earth and no external leads—just a little

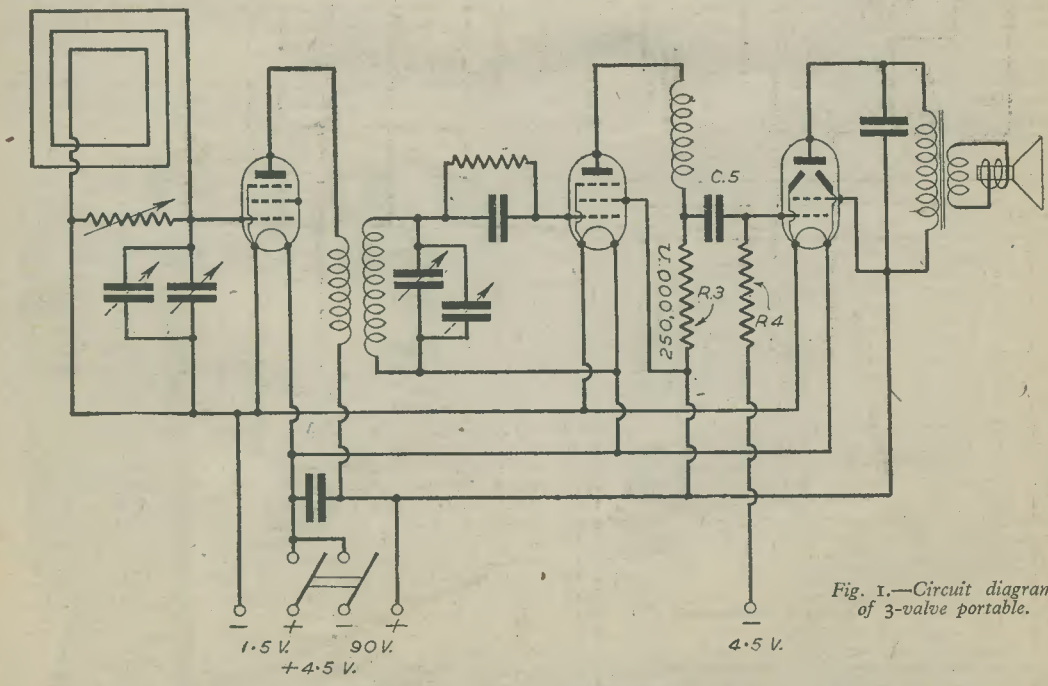


Fig. 1.—Circuit diagram of 3-valve portable.

magic box. At home, on the river, in the park, in the car, or in the sick-room—a touch of a switch and it plays or croons or talks or offers to do you now, sir. Yes, there is a charm about a portable. Make one and see—I did. And if I tell you how I went about it you may perhaps be saved some stumbling. Perhaps, too, the discussion may bring out some points of general use in designing other home receivers.

There is another angle to this. Make one for the girl friend: I am told that the wooing power runs into many watts!

Aim

Competing factors in the design of a portable receiver are:

1. Size and weight.
2. Battery drain.
3. Power output and sensitivity with adequate selectivity.
4. This is a personal receiver so it must be simplicity itself to operate.

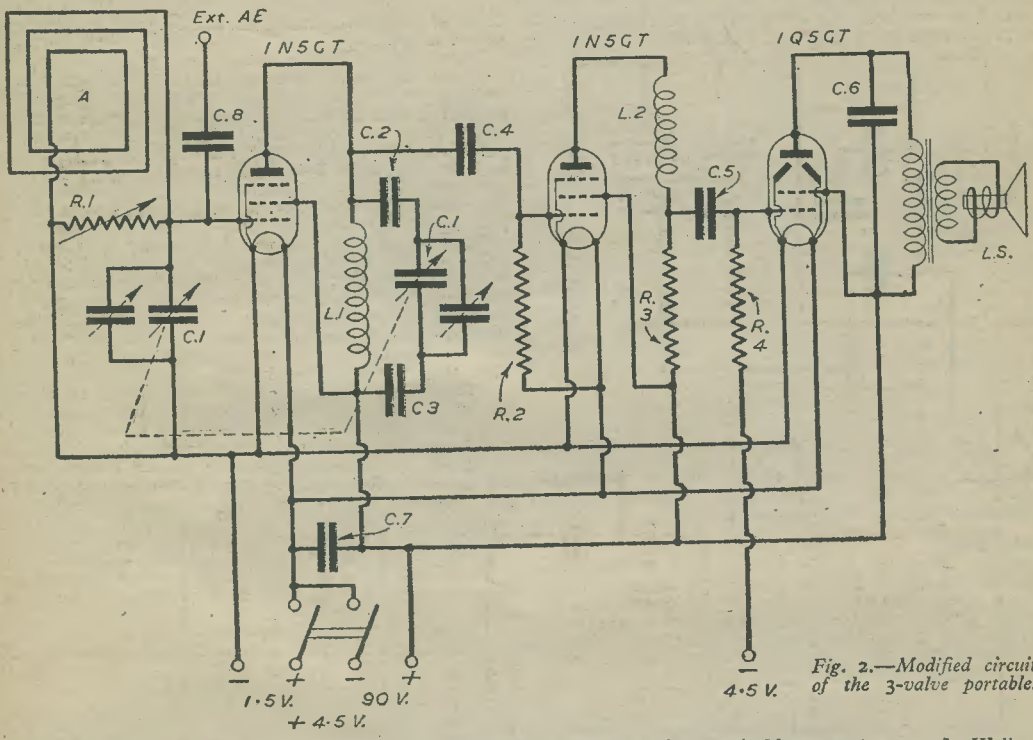


Fig. 2.—Modified circuit of the 3-valve portable.

The other great factor, set by the war, is the size and shape of the container. To buy a case ready-made these days is costly beyond proportion even if a suitable one can be found. It is mostly a matter of using something you have or can make from materials you have available. For this reason I shall give no detailed constructional details as the layout is likely to be determined by individual requirements and amenities.

Now, taking the first point above; it *is* possible to make portables of almost minute dimensions (a friend made one measuring less than 6in. cube) but, apart from the performance of such a set, the batteries carried can only be tiny ones so that life becomes just a stream of battery replacements.

At the other end of the scale there are the great heavy versatile affairs of better performance, but minus the main idea, i.e., true portability. The dominant theme of my design, therefore, was true portability yet with sufficient size to accommodate batteries which would last a long time. I hate replacing batteries and sitting in powerless fury while an interesting programme fades quietly away to silence. All of which brings us naturally to point two. For batteries to last a long time and still be of reasonable weight, the drain on them must be as small as possible. We must, therefore, at once consider the valves and circuit. Portable receivers normally have four valves, usually in a superheterodyne circuit (frequency changer, I.F. amplifier, detector and first audio, output pentode). We remember that pick-up is only by means of a small frame aerial, that we must carry only a moderate H.T. voltage, and that we must use low drain valves which unfortunately have only a moderate mutual conductance. Nevertheless, if we could manage to use only three valves we should have taken a pretty large step towards our ideal in that the battery drain would be reduced, thus giving long life (or smaller batteries), the size of the receiver itself would be substantially reduced and the initial and replacement costs would be smaller. It is well worth trying, but before proceeding we must look at point three, and take heed. What is a suitable output power? Well, a scrutiny of valve specifications shows that there are some small dimensioned valves with low battery drain especially made for portable receivers. They are in the octal base American G.T. series (about 3in. high) with filament voltages of 1.5 and filament currents of 0.05 amp. These seem very suitable, as a single dry cell is a neater and more satisfactory L.T. supply than an accumulator for a portable.

The most efficient output valve in this series is the 1Q5GT output tetrode which has a rated output of 230 mW (a really practical output) with an H.T. voltage of 90 and a control grid bias of —4.5 v. Our problem, therefore, is to supply the control grid of this valve with a peak audio voltage of about 4.5 volts using not more than two valves to do it.

In the interests of straightforwardness and with little or no sacrifice in the sort of performance we are after, let us stick to the medium-wave stations and forget the

long and short waves. If you insist on long-wave performance you simply have to add an extra bit to the tuning coils and have a simple switch to short out these extra bits when using the medium-wave band.

The Circuit

On our earlier decision we have two valves prior to the output. We could use a superhet. circuit with no I.F. amplifier valve but we should probably do just as well with greater simplicity by using a T.R.F. circuit. One H.F. stage feeding into a grid leak detector, both pentodes, seems a good idea. The grid detector is sensitive and the same valve works as a class A audio amplifier (we are not likely to be so burdened with signal strength as to force the operating point down to the bottom bend).

Let's start with the circuit of Fig. 1. The R.F. and detector valves are both 1N5GT R.F. pentodes. L1 is a small unscreened coil costing 2s. 3d. and mounted under the chassis. There are few better ways of learning than by studying and rectifying mistakes, so here goes. What is wrong with the circuit of Fig. 1 for our purpose, and how can we right it?

Well, if we tried this we should find that the programmes were there but just a shadow of what they

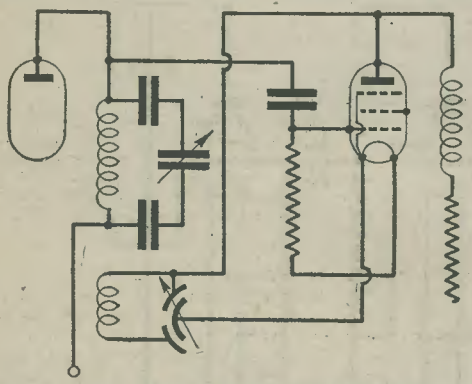


Fig. 3.—The coupling arrangement found to be ideal.

should be. In other words, there would be insufficient gain. To boost this we can attack on two fronts—the audio frequency and the radio frequency.

Audio Gain

Do not think too hastily of removing the resistance capacity coupling and putting in a step-up audio transformer, because the anode impedance of the 1N5GT is 1.5 megohms. This would be in series with the primary of the transformer and it is the currents varying in this circuit which provide the audio output voltage to feed to the next valve. Thus the proportion of the total available output voltage that can appear across the transformer, and so be handed on, depends upon the impedance of the whole series circuit. Now the primary impedance of any available audio transformer of a size suitable for a portable is likely to be so much less than the 1.5 megohms of the valve that the audio voltage across it will be small and the overall gain will be less than that obtained by resistance coupling.

We shall therefore stick to resistance coupling, but Fig. 1 is not the best arrangement. You see, the gain of a resistance coupled amplifier employing a pentode valve may be simply calculated from:

Stage gain = (Mutual Conductance) × (Effective anode load resistance)

The mutual conductance for this formula must be expressed in Mhos.

This will not be true for the lowest frequencies nor for the highest frequencies but it gives us a good idea of what happens for most of the frequencies that our portable is going to be asked to deal with.

The value of the mutual conductance depends upon the valve and we cannot do much about it but the effective anode load resistance is under our control. This (since C is just a blocking condenser to stop the H.T. voltage appearing on the grid of V3 and may be considered a short-circuit at our audio frequencies) is just the value of R3 and R4 in parallel. From the above formula we want this to be large. Well, we can make R4 large, up to 1 megohm even (because there is no current through it), but if we make the value of R3 too high the current through it will cause a large drop in voltage so that the voltage left on the anode becomes too low for the valve to work properly. This fact immediately suggests two lines of action:

First make R4 0.5 megohms, then:

1. Start with a high value of R3 (e.g. 250,000 ohms) and reduce it until the gain reaches a maximum (when there is a reasonable sized resistance and a reasonable voltage on the anode).

2. Keep a high anode resistance (e.g. 250,000 ohms) but reduce the current through it (and so the voltage drop) by lowering the voltage on the screen grid of the valve.

If you do the first of these (using 90v. H.T.) you will find that the gain is a maximum when R3 is approximately 50,000 ohms.

The second procedure will give a slightly greater gain than the first. The best condition here is obtained by making R3 250,000 ohms and putting a resistance of about 2 megohms between H.T. positive and the screen grid. It is necessary too, with this arrangement, to put a condenser of about 0.1 mfd. between the screen grid and earth. This condenser has the effect of connecting the screen to earth at the frequencies which the valve is handling and so making the screen do its proper job in the valve.

Remembering the formula for calculating the stage gain, you will be wondering why I have said that the second arrangement gives only slightly greater gain than the first. The answer is that in the second arrangement, lowering the screen voltage reduces the D.C. anode current through the valve but also has the effect of reducing the effective mutual conductance of the valve. Thus the stage gain is no better.

I found that with this circuit arrangement there was less audio distortion using the first method, and with this method there is no need for the screen dropping resistor nor the screen by-passing condenser—a good point in a portable with little spare space. It is true that the anode current is rather higher and we were out to save battery drain, but this saving, about half a milliamp., is so small compared with the total H.T. drain of the set (about 11 milliamps.) that there is no appreciable loss in the life of the H.T. battery.

We decide therefore on the audio frequency arrangement shown in Fig. 2, which is the final circuit diagram of the receiver.

(To be continued.)

ON YOUR WAVELENGTH

By THERMION

Components Exhibition

AS Leslie McMichael said when he addressed the Radio Industries Club of Wales, throughout the world and particularly in this country there is a feeling of unrest. It is perhaps unpleasant to realise that the transitional period of recovering from war and settling down to peace may take almost as long as the duration of the war. During this time it will be a simple matter to rail against this and that authority, for there cannot be any one of us who does not in some way feel that our requirements are not being met. There is no longer a proper law of supply and demand.

One of the signs, however, that we are gradually returning to normality is the announcement that the Radio Component Manufacturers' Federation proposes to hold, at the Grosvenor House, Park Lane, during the third week in February, 1946, an exhibition of radio and communications components. The exhibition will be open for four days, from Tuesday, February 19th, to Friday, February 22nd, inclusive.

The exhibition will not be open to the public, and admission, as in previous years, will be by ticket only. Security requirements will, however, be less rigid than in former years, and it is hoped to attract a considerable number of visitors from overseas.

On the Beam

WITH reference to the article under the above title, which appeared in our December issue, I wish to make it clear that the full page half-tone which appeared within that article is not related to it. It should be understood that Mandrel, shown in that drawing, did not radiate identity. The aerial used with the "equipment for giving warning of enemy aircraft" is mounted on the tail of the aircraft and is "rearward looking." A "by-product" of H2S is "Fishpond"; the H2S scanner is mounted in a cupola which projects from the belly of the aircraft, but this is not shown in the drawing.

The principal purpose of the trailing aerial is for *transmitting* a long dash on which D/F stations can take a bearing.

Balloon "squeakers" were abolished a long time ago, and many bombers have no provision for receiving them.

Air-to-air communication is seldom used between bombers, and, in any case, was not correctly referred to as intercommunication, this term being used in connection with telephonic communication between crew members in any one aircraft.

Solus Specification

MAY I again assure my readers that this journal will continue its pre-war policy of solus specification. That is to say, we shall specify in receivers which we sponsor, only those components which we have used and found satisfactory. I do not say that other components will not work as well, but our receivers are guaranteed to do what we say they will do, and readers who wish to avail themselves of our guarantee must, therefore, use the parts we specify.

At the present time I cannot hold out a great deal of hope that components will be available in large quantities for some time to come. The new export policy, announced by the Government, means that manufacturers must export a high percentage of what they make, and we must perforce, therefore, continue our national policy of austerity for some years to come. Perhaps some day this country will be liberated too, and we shall enjoy some of the benefits of liberation which we have conferred upon countries which were pro-Hitler.

Correspondent Wanted

ONE of my readers, 3034067/A.C.2/Hook, E. J., S.H.Q., Stores Accounts, R.A.F. Station, Marston Moor, York, wants to correspond with someone in Yorkshire, or the Sydenham district of London, who is interested in U.F.F. communication and radio control of model aircraft. Perhaps interested readers will get into touch with him.

Licences Still On the Increase

IT is interesting to study the latest figures showing the numbers of wireless receiving licences issued during the year ended September 30th, 1945.

London Postal, 1,755,000; Home Counties, 1,276,000; Midland, 1,398,000; North-Eastern, 1,525,000; North-Western, 1,344,000; South-Western, 829,000; Welsh and Border, 584,000. Total, England and Wales, 8,711,000; Scotland, 979,000; Northern Ireland, 151,000. Grand total, 9,841,000.

Our Roll of Merit

Readers on Active Service—Sixty-first List

R. Buckingham (Cpl., R.A.F.).
R. A. Eldridge (L.A.C., R.A.F.).
H. W. A. Ward (A.B., R.N.).
R. Farrow (Cpl., R.A.O.C.).
G. Barney (Sgt., R.A.F.).
D. Graham (Sgt., R.A.).
A. Hawthorn (F./Sgt., R.A.F.).

TELEVISION *VERSUS* TAX

[PRESS ITEM.—If television is to reach the mass-market, as has been confidently predicted, then the abolition of the Purchase Tax is necessary.]

But few of us are supermen—
Just simple muts are we.
How trade can flourish and expand
So taxed, we cannot see.
Our logic may be very weak,
Contemptible indeed,
But would employment not increase
If from such burden freed?

The Fabian theorist ignores
What practice long has taught:
That if you make their cost too high
Less goods will then be bought.
And here's another well-proved fact
Which "Theory" often spurns:
Goods taxed too high will always mean
Diminishing returns!

Such shackle on the nation's trades
Should quickly be removed.
The more we sell, the more we'll earn,
That cannot be disproved.
Financial safety lays in this—
A much increased production.
But Purchase Tax can only end
In widespread trade reduction.

"TORCH."

Is an International Radio Language Practicable?

By REGINALD J. G. DUTTON

HAVING spent a great deal of my spare time over a long period of years in research in connection with the problem of the practicability of an International Auxiliary Language, I naturally read with considerable interest the PRACTICAL WIRELESS Editor's observations in the September issue on this important subject, and I much appreciate his open-minded gesture in placing this space at my disposal in order to present the case on behalf of those who believe that an International Radio Language is practicable now.

It so happens that both my sons were keen "hams" in their 'teens, the junior at one time being the youngest holder in Great Britain of a transmitting licence. Signals exchanged with non-British nationals on the Continent always aroused great excitement, in spite of the fact that such exchanges were somewhat restricted in their scope when the distant radio enthusiast's knowledge of English was limited.

I learned, however, that 73's and 88's were recognised by hams of any nationality as the respective international radio symbols for "Best Wishes" and "Love and Kisses," though I imagine that the latter was not frequently tapped out as between any two members of what is possibly mis-called the sterner sex.

These and other accepted *truly* international radio signals set me pondering. Numerals are, of course, universal where Morse is concerned. Theoretically, therefore, every object and idea could be allotted an international number, and messages on all subjects thereby exchanged between hams whose native tongues were not identical. But from the practical point of view the brain of the average ham would begin to whirl after endeavouring to memorise, say, the first 500. Yet, as our Editor rightly observed, a vocabulary of tens of thousands of words must be provided.

To a limited extent, however, it has been demonstrated that such a numeral code, as well as the many published international telegraphic codes, have overcome language barriers, even though, for the most part, they are limited to rigid phrases of the most frequent use. May we not, therefore, assume that if the structure of an international communications code could be made quite flexible—one radio symbol for each idea—and more readily "rememberable," we should be well on the way to setting up an International Radio Language?

Firstly I would suggest that as figures take much longer to transmit in Morse that we signal ideas by means of the Roman alphabet, reserving the numerals for their accepted use. Secondary school pupils of every nationality are now familiar with the Roman alphabet, which, incidentally, is being employed on an ever-increasing scale in both Russia and China. Indeed, in the past hundred years, most technological terms—generally formed from Greek roots—have become automatically international, and have soon found a place in the lexicons of all civilised (!) nations. Examples which spring to the mind are *electricity*, *photography*, *telegraph*, *telephone*, etc., while such universal terms as *theatre*, *university*, *engineer*, *mechanic*, *metal*, *cigar*, have practically the same sound in every Indo-European language.

If we reduce fundamental terms to pronounceable abbreviations, such as *el* for electricity, *fot*-photography, *met*-metal, and lay down logical rules for expressing all other ideas and objects in short international word-forms, then all plain language messages could be transmitted in less than half the time they take at present, with immense benefit to private, official, service, and commercial Morse code users all over the world, whatever the native tongue of the transmitter and receiver. (The fact that these abbreviations were all pronounceable would make them also available for both the long-distance telephone and the radio microphone, but for immediate consideration we will confine ourselves to Morse signals.)

Although we shall ultimately need a vocabulary of tens of thousands of words (though for all practical purposes we could begin with one of 4,000 or so), it does not necessarily follow that the student must learn tens of thousands of different word-roots. For example, *write*, *writer*, *writing*, *written*, *wrote*, are different words, but only one root is used. Indeed, Dr. C. K. Ogden and Prof. L. Hogben, the respective inventors of *Basic English* and *Interglossa*, have both demonstrated that fewer than 1,000 different words can suffice to cover the whole range of human expression. May I also be forgiven for mentioning that still further economy is effected in Dutton World Speedwords, which employs fewer than 500 parent-words, all other ideas being expressed by the application of simple rules for forming idea-compounds, or alternatively by adding a special single-letter suffix to the parent-word (examples follow later)? This principle of economy in word-roots is, in effect, supported by the fact that P. M. Roget, in his classic Thesaurus, divided all ideas and objects into approximately 600 categories, excluding opposites.

When a complete stranger to London arrives in that city and emerges from Charing Cross Station into the Strand, the name of the latter thoroughfare does not of itself give any clue as to the whereabouts of Fleet Street, but if the original London planners had followed the model of New York and named the Strand Forty-eighth Street and Fleet Street Forty-ninth Street all strangers would have realised that the two thoroughfares adjoin each other.

The eight English words *bead*, *beak*, *beam*, *bean*, *bear* (several meanings), *beast*, *beat* and *beauty* all begin with the same three letters, but the ideas and objects they express have nothing in common. How much simpler our own or any other national language would be to learn if all liquids began with "l," all motions with "m," all creatures which breathe with "b," all emotions with "e," etc.? Then every word would provide at first sight a useful clue to its identity.

It is in matters of this kind that the constructor of an auxiliary language has a great advantage: he can follow New York's street-naming lead and work out a logical and orderly plan in selecting his symbols, and in laying down the rules of sentence formation. In World Speedwords, for instance, the first syllable—apart from single letters standing alone which represent the very common particles and pronouns—is always one of 466 parent-words, and thus at once provides an important clue to the identity of the Speedword.

For example, an opposite idea is automatically produced by adding *-o* or *-x* to any one of the 466 parent-words, e.g. *ax*—ask, *axo*—answer; *ad*—addition, *ado*—subtraction; *am*—love, *amo*—hate; *ov*—over, *ovo*—under; *bi*—life, *bix*—death; *de*—day, *dex*—night; etc.

The complement of any Speedword is expressed by adding *-s* to the original, e.g. *of*—offer, *ofs*—accept; *ze*—send, *zes*—bring; etc.

Again, the function of the single-letter suffix *u* is to express a new idea which has a specially favourable relation to the parent-word, as *ib*—possible, *ibu*—probable; *ik*—quality, *iku*—satisfactory; *oz*—occasion, *ozu*—opportunity; etc.

The addition of *-e* intensifies, as *gu*—good, *gue*—very good; *mu*—much, *mue*—very much; *et*—little, *ete*—very little; *en*—attention, *ene*—careful; etc.

Idea-compounds are logically formed by joining two short parent-words together, thereby eliminating the necessity of learning new radicals. Idea-compounds are very easy to remember, and it will be seen that they announce their identity at sight:

(*Continued on page* 86)

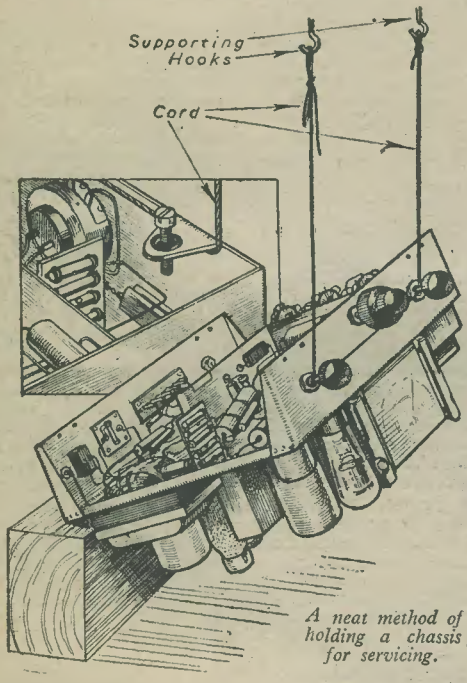
Practical Hints

Holding Chassis for Servicing

IN my service department I find the following a very safe and easy way of holding a receiver chassis in the upside-down position. It is merely a length of strong cord or aerial wire, attached at each end to hooks in the ceiling, so forming a loop.

This loop, which can easily be adjusted for length by twisting one end round its hook, carries the chassis in sling fashion by means of volume control spindles, reaction spindles, etc. Either one or two old H.T. batteries (or a block of wood) support the back end of chassis on the bench, as shown in the sketch.

Alternately, the fixing lugs on chassis can be used for slinging, the cord or wire being either threaded through the fixing screw holes, or looped behind bolts loosely screwed or dropped *into* these lugs.



A neat method of holding a chassis for servicing.

I also find it much easier to work on a chassis held in this slightly sloping position than if it is stood upright on its one end on the bench. An electric light bulb can easily be arranged to hang low over the work. The bulb should preferably have a deep opaque reflector, thus obviating dazzle.—G. J. BARRATT (Friskney).

Resistance-controlled Reaction

IN a midget TRF battery receiver I have constructed, economy of space necessitated using resistance-controlled reaction. After some experimenting, it was arranged that the H.F. signal component at the detector anode was fed back through a 0.0003 mfd. condenser on to the centre-tap of a 10,000 ohm. potentiometer fixed across the reaction coil. This gave a perfectly smooth control, entirely free from back-lash. The set can be worked with any desired degree of oscillation, and a super-regenerative effect can be obtained easily, increasing still more the stage gain. The reaction coil had one-third as many turns as the tuning coil, actually used as a frame aerial. The detector anode was decoupled through a 10,000 ohm resistor, and resistance-coupled to the next valve.

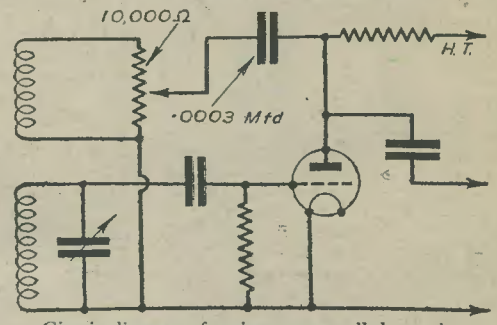
An idea of the efficiency of the arrangement is given by the fact that, using midget valves, having first the detector followed by two stages of L.F. amplification, sufficient output to comfortably fill a medium-sized room was obtained on the Home and Forces programmes, with 39 volts H.T. and an extremely small frame aerial.—G. W. KING (Golders Green).

THAT DODGE OF YOURS!

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

SPECIAL NOTICE

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



Circuit diagram of resistance-controlled reaction.

Extension Speaker Volume Control

REQUIRING a volume control for an extension speaker recently, I constructed one as follows:—

A two-pole six-way switch was used to switch shunt and series resistances in circuit with the speaker, so designed that the total resistance of the circuit remained constant, thereby leaving unaffected any other speakers in the circuit due to change of load. The values given in the diagram are for a 3-ohm type speaker, but others may be used by increasing or decreasing the resistances in direct proportion.

A convenient form of resistance wire to use is an electric fire spiral, as its total resistance may be calculated from the voltage and wattage by Ohms Law, and then the resistances can be made by measurement of lengths of wire.—A. HALL (Sheffield).

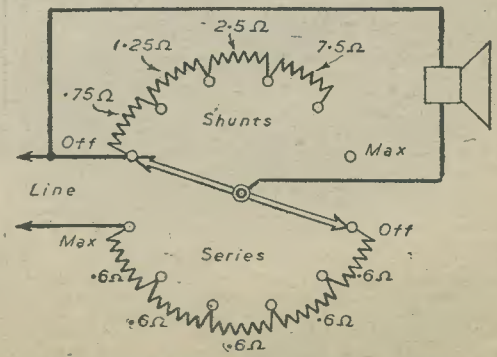


Diagram showing how volume control was applied to an extension speaker.

A Simple Valve Buzzer Set

A "Straight" Oscillator which can be Used Effectively for Morse Practice.

By "EXPERIMENTALIST"

A VALVE buzzer is nothing more than a "straight" oscillator. It is, in other words, an oscillator stripped of all redundant components. Despite this, results are excellent, and in the absence of proper Morse practice facilities the valve buzzer set will be hard to beat for its simplicity in construction and operation, apart from its cheapness and upkeep.

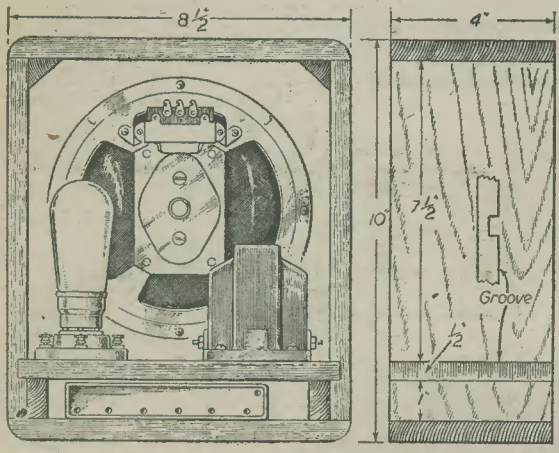


Fig. 1.—Back view with interior view of end piece.

A 9-volt grid bias battery serves for the H.T. supply, with a 2-volt wireless accumulator for L.T. supply. The pitch of the buzzing note is increased and decreased by altering the voltage of the H.T. When plugged in at the maximum voltage (9 volts), a deep bass note is heard. The minimum voltage (1½ volts) produces a rather squeaky note which, however, is ten times better than the sound produced by electrical buzzers for the simple reason that it is more realistic.

The set is designed for headphone or loudspeaker listening. It has its own speaker and operates independent of the house radio. Thus, if "silent" listening with headphones is not necessary, one can merely connect the L.S. leads to the 'phone terminals, plug in to 7½ volts or 9 volts and obtain a lovely deep note which gives every satisfaction. One grows tired of headphones at times, especially if tightly clamped on the ears for long periods. The 'phones "sweat" inside, one's ears become sore and strained, and this discomfort, on top of the monotonous practising, more than suffices to make one irritable.

Loudspeaker listening provides a welcome change. In this connection, the writer has designed a case to suit a 6½in. diameter "Rola" permanent magnet moving-coil speaker. Smaller speakers can be used, but the case size should not be reduced—unless in the height—in view of the battery length and space needed by the batten-type valveholder and L.F. transformer.

Making the Case

Assuming you wish to incorporate a 6½in. diameter moving-coil speaker, prepare the case sides to the dimensions shown in Fig. 1, using ⅜in. wood. Grooves, for the sliding shelf are cut ½in. wide by ¼in. deep, using a tenon saw and a ½in. or ⅝in. wood chisel—or a router, the latter clearing away the waste wood neatly.

A top and bottom (measuring 8½in. by 4in. by ½in.) is prepared and affixed with glue and 1in. panel pins on top of the side pieces, keeping the ends flush. Angular corner blocks (3¾in. long) are glued to the inside top corners to be flush at the face side of the case, this also applying to the bottom corner blocks (see Fig. 2).

A front panel is cut to the size and shape at Fig. 2, doing so from ⅜in. fretwood or plywood. Having attached the front with glue and panel pins, the corners of the case are rounded by planing and glasspapering. The nail heads will need to be punched below the wood surface beforehand, of course. After rounding the corners, the nail holes are filled with a black wax stopping, such as beaumontage or heelball.

The Sliding Shelf

The sliding shelf piece (Fig. 2) is made to fit neatly but freely into the grooves. The shelf forms the base on which the valveholder and transformer are mounted. When all the wiring has been completed, the shelf sides into place.

At the moment, however, the case is fitted with a ¼in. back measuring 9in. by 7½in., following which all parts are spirit stained and the *outside* of the case french polished. Ebony black is an ideal finish, more particularly if you have used various kinds of wood.

When polished—or even enamelled—to satisfaction, feet could be screwed to the case, then the front panel frets covered with gauze material on the interior side. The speaker is fitted centrally in its aperture; it is best secured with ⅝in. long by ⅛in. thick round-headed bolts and single nuts.

Push the shelf in place and set the compononts upon it, as shown by the back view, to find the best position. Having done so, withdraw the shelf and screw the holder and transformer to same. Note, by the way, that the matching transformer—supplied with the speaker—is kept to the top of the case; this gives more space between the holder and transformer.

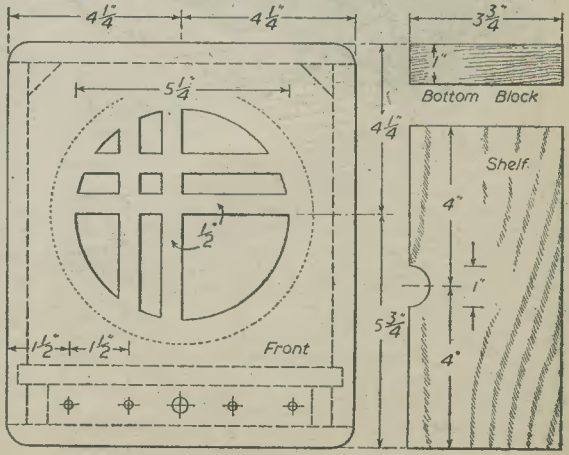


Fig. 2.—Size and shape of front panel and shelf.

Valve and Transformer Used

Whilst almost any triode valve can be used, the writer got best results from an old L.P.2 "Osram" valve. Results from similar types were not so powerful, although quite satisfactory. A smaller triode—an H.L.2—put up a fair performance.

In respect to the transformer, the writer used an old audio Telsen make having a ratio of 5-1. However, a 3-1 step-up type can be utilized. If your transformer has an earthing terminal, ignore it in the wiring up.

The circuit, as shown at Fig. 4, is a very simple one. The dotted line divides the theoretical circuit from the simplified version. You will doubtless find it more convenient to use short pieces of twin-flex wire.

Connect suitable lengths to the 'phone and key terminals first, then proceed to wire the valveholder and transformer terminals. Connect wires to two of the tabs on the speaker transformer and bring the ends through the

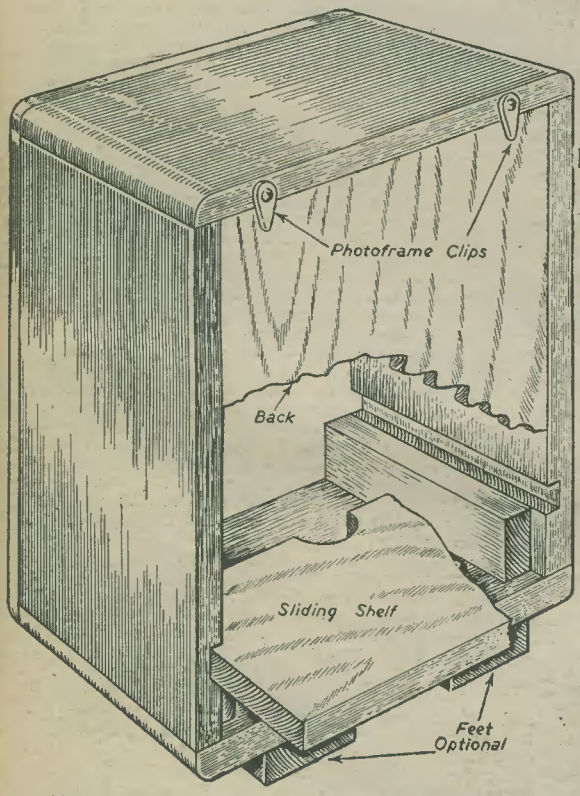


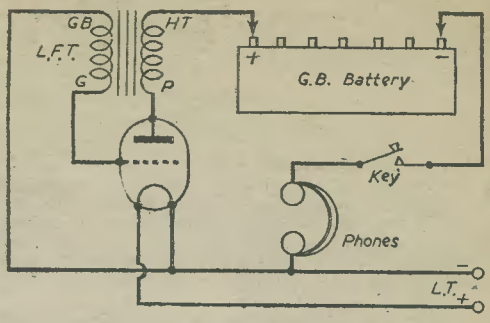
Fig. 3.—General view of case, broken to show construction.

hole in the front panel and fit them with spade ends.

The accumulator leads are brought through a ¼in. hole bored in the left side of the case and fitted with spade ends. The H.T. leads are brought under the shelf via the semi-circular notch and the shelf pushed into place. Fit plugs to these leads for connection in the battery sockets.

Making a Morse Key

You should, obviously, buy a proper Morse transmitting key. Learning Morse is not unlike learning to play a piano. People imagine that any old thing will do to practise on. It is a very foolish idea. It is apt to spoil the "touch" of the beginner, so that we have very heavy-handed pianists and would-be wireless operators, and the trouble—if not checked—is difficult to eradicate later on.



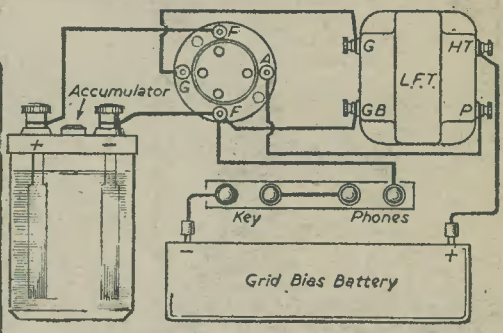


Fig. 4.—Theoretical and simplified wiring diagrams.

Now the writer is not going to say that the transmitting key detailed at Fig. 5 is a proper one. It is merely a temporary affair so that the reader can make it and thus use it for testing his valve buzzer right away. At the same time, it is not likely to spoil one's touch. Unlike most home-made models, it can be adjusted to provide a maximum or minimum "gap" between the key base and its contact.

The key arm is made to provide a spring tension. It is cut and drilled from 1/16in. sheet

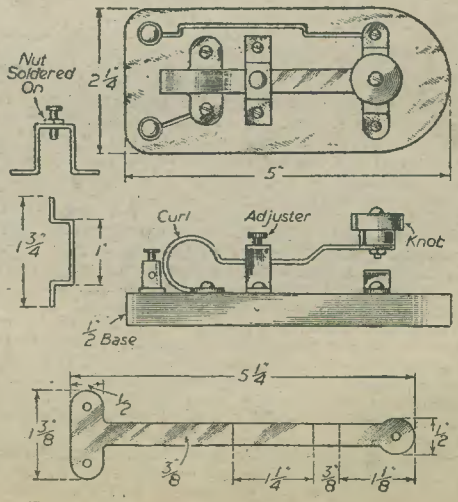


Fig. 5.—Various details of a small morse key.

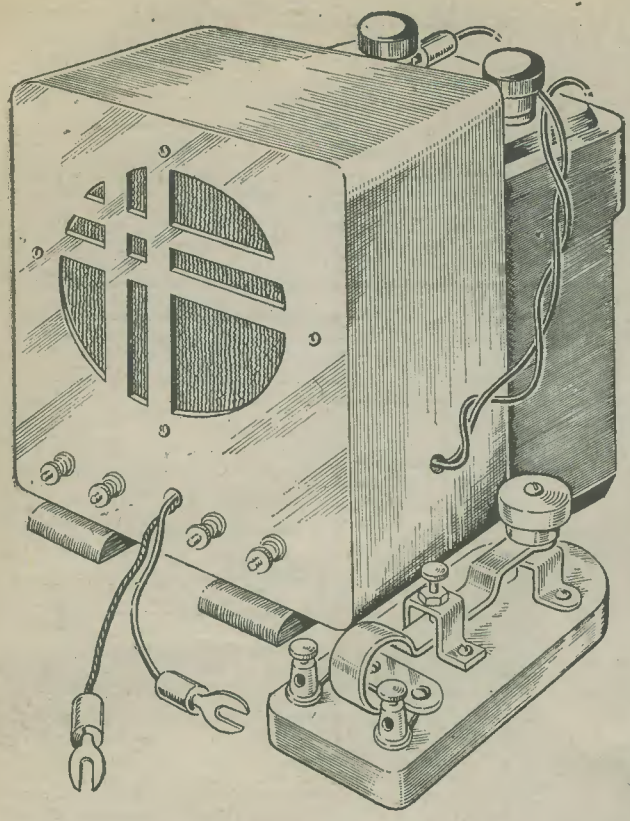


Fig. 6.—The completed morse buzzer set.

brass or copper. This also applies to the contact maker and adjustment parts.

Regarding the knob, this consists of two discs of ¼in. thick ebonite (or similar stuff) ⅜in. and ¼in. in diameter. Drill the centres for a suitable bolt and connect to the arm end with a nut, as shown by the side elevation.

The parts, including a couple of wireless terminals, are fixed upon a wooden base 5in. by 2¼in. by ½in. The terminals are either connected to the key and contact by having cotton-covered wires running along the surface (see top plan) or else sunk flush on the underside of the base. You should, by the way, cover the underside with a piece of green baize; this is to prevent undue slipping and inevitable damage to a polished surface, such as a table top.

Using the Valve Buzzer Set

When testing the valve buzzer, connect the accumulator (this can be borrowed from an existing battery set) first, then, for headphone listening, insert the H.T. plugs to the grid bias battery to give 1½ volts. Having connected the 'phones and key to their proper terminals, it is only necessary to press the key to close the circuit.

To switch off, it is only necessary to remove one of the L.T. leads from the accumulator terminals. One could, if desired, fit a switch between one of the L.T. wires, but it is really not an essential item. If speaker listening is wanted, the 'phone leads are disconnected from their terminals and the speaker leads connected. The H.T. voltage will need to be increased.

Another feature about this valve buzzer is the fact that, being fitted with a super-sensitive speaker, the latter can be used for extension listening to wireless programmes. Thus assuming a member of your family is ill, but is anxious to hear radio features, rather than carry the radio set up and down stairs each time, leads—from the extension speaker sockets on the set—can be taken up to the leads of the speaker in your valve buzzer set. As you can see at Fig. 6, the valve buzzer looks exactly like an extension speaker.

Oscillator Tracking in Superhet Receivers

Instructions on Correct Procedure

IN a conventional superhet the oscillator frequency is arranged to be higher than the signal frequency, ideally by an amount equal to the intermediate frequency. Thus, when a receiver is tuned over a given band, the change of capacity on the oscillator side is required to be less than that on the signal side, the reduction being achieved by means of a capacitor Cp in series with the oscillator tuning capacitor C. An adjustment is also necessary of the minimum capacity of C, Cs being added for the purpose. Generally, C on the signal side will have a shunt trimmer Ct. The final arrangement is shown in Fig. 1.

Practically, Ct and Cs will be combined in one trimmer, and are here shown separately to emphasise the point that the following work assumes that, if at any particular setting of the plates of C the total capacity shunting capacity L is Cx, then the capacity between points A and B is Cx+Cs.

The Error Curve, and Choice of Zero Error Points

The utility of any given set of values for L, Lo, Cp and Cs may be checked by drawing an error curve, as follows: let a certain signal frequency Fs be received and find the corresponding value of (C+Ct). Transfey this value to the oscillator side and find the corresponding oscillator frequency Fo. Then, if Fo-Fs is greater than the required I.F., plot the error as positive, and vice versa. The resultant curve may be similar to one of those shown in Fig. 2. If in our particular set of values Lo were too small, then over the major part of the band the oscillator frequency would be too high, giving a considerable positive error. We should find also that, no matter how many different sets of values were taken for L, Lo, Cp and Cs, it would be impossible to make the relation Fo-Fs=I.F. hold true for more than three points in the band. Let F1 and F5 be the extreme frequencies of the band (F5 greater than F1), and the zero error points be at frequencies F2, F3 and F4. Curve 3 of Fig. 2 shows a rapid fall at the start, so it would seem advisable to place F2 nearer to F1 than F4 is to F5. Also, if F5 is rather less than the mid-frequency, the curve tends to balance better about the zero line. From the (laborious) drawing of many zero error curves, it seems that the fractions of (F5-F1) represent the best choice of zero error points (Fig. 3).

(*Continued on page 79*)

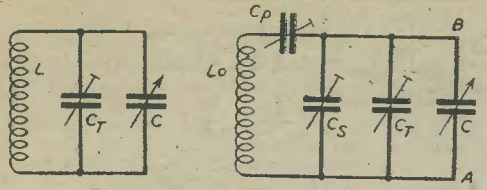


Fig. 1.—Arrangement of trimmers.

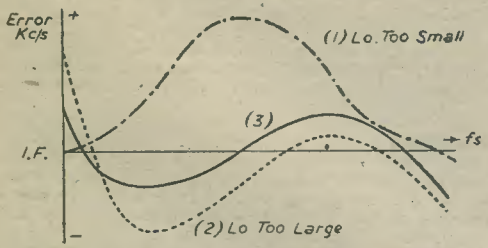


Fig. 2.—Curves indicating fall in frequencies.

At the frequencies F1, F2, etc. (C+Ct) will be assumed to have the values of C1, C2, etc.

$$\text{Then } F_4+I.F.=\frac{1}{2\pi\sqrt{\frac{Lo\ Cp\ (C_4+Cs)}{C_4+Cp+Cs}}} \quad \ldots\ldots\ldots (1)$$

$$\text{and } F_2+I.F.=\frac{1}{2\pi\sqrt{\frac{Lo\ Cp\ (C_2+Cs)}{C_2+Cp+Cs}}} \quad \ldots\ldots\ldots (2)$$

$$\text{If } A=\frac{F_4+I.F.}{F_2+I.F.} \quad A=\sqrt{\frac{(C_2+Cs)\ (C_4+Cp+Cs)}{(C_4+Cs)\ (C_2+Cp+Cs)}} \quad \ldots (3)$$

$$\text{giving } Cp=\frac{(C_2+Cs)\ (C_4+Cs)\ (A^2-1)}{C_2+Cs-A^2\ (C_4+Cs)} \quad \ldots\ldots\ldots\ldots (4)$$

$$\text{Similarly, if } B=\frac{F_4+I.F.}{F_3+I.F.}$$

$$Cp=\frac{(C_3+Cs)\ (C_4+Cs)\ (B^2-1)}{C_3+Cs-B^2\ (C_4+Cs)} \quad \ldots\ldots\ldots (5)$$

(4) and (5) give

$$Cs=\frac{A^2C_3(C_2-C_4)-B^2C_2(C_3-C_4)-A^2B^2C_4(C_2-C_3)}{B^2(C_3-C_4)-A^2(C_2-C_4)+A^2B^2(C_2-C_3)} \quad (6)$$

Cp may then be evaluated from (4) or (5).

$$\text{From (2) } Lo=\frac{C_2+Cp+Cs}{4\pi^2Cp(C_2+Cs)\ (F_2+I.F.)^2}$$

Ct and the Ratio F5/F1

Ct will include the self-capacity of L, the input capacity of the frequency-changer, and various strays due to wiring. It is advisable to make a generous estimate of these strays, since extra capacity can always be added. However, if the estimate is grossly over-generous, the ratio F5/F1 is unnecessarily reduced.

If the maximum and minimum capacities of C alone are Cmax and Cmin,

$$\text{then } F_5=\frac{1}{2\pi\sqrt{L(Cmin+Ct)}}$$

$$F_1=\frac{1}{2\pi\sqrt{L(Cmax+Ct)}}$$

$$\text{If } A_1=\frac{F_5}{F_1} \quad A_1=\sqrt{\frac{Cmax+Ct}{Cmin+Ct}}$$

$$\text{or } Ct=\frac{Cmax-A_1^2\ Cmin}{A_1^2-1}$$

Thus, evaluate Ct from the ratio of the desired "end frequencies" and the maximum and minimum capacities of the tuning condenser. If the value then found for Ct seems rather low, say, less than 15 pf. for the MW band, or about 40 pf. for the LW band, then a smaller frequency range will have to be accepted, and Ct re-evaluated. When a satisfactory value has been found, the values of F1 and F5 can be "frozen," and the positions of F2, 3 and 4 decided upon.

Example

The required frequency range is from 545 kc/s to 1,500 kc/s. The tuning condenser has a maximum capacity of 500 pf., and a minimum of 40 pf. The I.F. is 465 kc/s.

Then $A_1=1{,}500/545=2.752$

$$Ct=\frac{500-2.752^2\times 40}{6.575}=30 \text{ pf.}$$

It is unlikely that the capacities making up Ct will be more than about half of this figure, so in this case we can easily attain the required frequency range.

Then F1=545 kc/s C1=530 pf.
F5=1,500 kc/s C5=70 pf.

L may be found from either, and is 160.8 μH.
Let F2=500 kc/s, F3=1,000 kc/s, F4=1,400 kc/s.

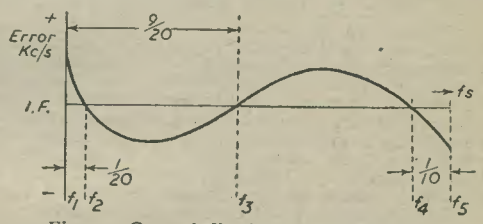


Fig. 3.—Curve indicating zero error points.

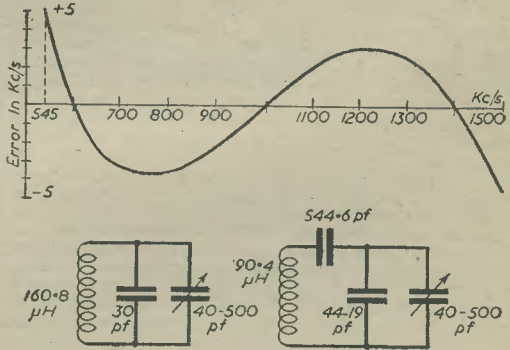


Fig. 4.—Error curve of condenser values.

$$\text{Then } C_2=\frac{1}{\omega^2L}=\frac{10^8}{4\pi^2\times 36\times 160.8}=437.2 \text{ pf.}$$

Similarly, C3=157.4 pf., C4=80.34 pf.
Cs will be found to be 14.19 pf; Cp 544.6 pf, and Lo 90.4 μH
Fig. 4 shows the error curve for these values.

Programme Pointers

By MAURICE REEVE

IN place of the weekly symphony concert, which used to be broadcast from the Queen's Hall, the B.B.C. are holding fortnightly ones at the Royal Albert Hall on Wednesdays, alternating with a series every other Sunday from their newly-acquired home at the People's Palace, Mile End Road. Both series will, of course, be in the radio programmes.

There is also going to be opera from the studios at six-weekly intervals. The first was Weinberger's "Schwanda the Bagpiper," on November 21st. One number from this work, first produced at Covent Garden just before the war, is already quite an established favourite with Promenade Concert audiences. The second will be on January 2nd, 1946.

Music of Our Time

I also draw your attention to three other excellent series. The first is styled "Music of Our Time," every sixth Wednesday; there is also a one-composer programme on Mondays at 9.30, and a piano recital on Tuesdays at 10.15—both p.m.

The first of these makes a useful segregation of modern from classical; or, to put it in a different and perhaps more correct form, the unaccepted from the accepted.

After all, the definition of the term "classical" in "Chambers's Dictionary" is "a standard work," which is only another way of saying that a given work, or composer, has been "accepted." Of contemporary masters we cannot yet say which will gain the approbation of posterity, but, although there are a few who may not be partial to even Beethoven himself, fewer still will dispute that he has been "accepted."

Works of outstanding genius, such as those of Debussy, Strauss or Elgar, need little time in which to claim their places in the classical repertory. Their originality of thought and their depth of meaning give them their right to the titles of classical masterpieces almost without dispute.

Others, on the contrary, need a more careful adjudication, after which some go forward and others pass behind. Until such time as this criticism and pondering has been done, a very desirable purpose is served by keeping them apart until "accepted by the hanging committee."

I would like to say a few words on "turning on the wireless"; a vicious habit, comparable to "going to the movies," or "calling in at the local."

If you want the best that the B.B.C. can give you—as I'm sure you do—never cease to be discriminating. This applies to good music more than anything one can think of—classical drama perhaps alone excepted.

To those of you who may not yet have developed this selective and critical attitude to your wireless sets, my strongest advice is: (a) don't listen to good music unless you are thoroughly in the mood for it, and you feel you have at least a reasonable chance of being allowed to get through the programme more or less undisturbed; and (b) know what it is you are going to listen to before you switch on.

The "Movies"

Whatever we do, don't let us get indiscriminate in our musical tastes and choices, and like so many of us are with the films. This lack of individuality and personal insistence in our film-going has been a most potent cause of much of the rubbish that is foisted on to us.

Our intention to go to a "flick" is usually expressed somehow like this: "Shall we go to a movie to-night?" "Yes, lets; I get awfully fed up stuck here day after day." "Yes, it's enough to drive one crackers. I wonder what's on." "I don't know, but I'm told its awfully good." "Well, it doesn't matter, anyway. It'll be an outing, won't it." And so on and so forth.

The very labels "flicks," "movies," etc., are synonymous with a complete absence of all critical faculty and power of selection. Going to the films has become less, far less, of an adventure or an event than "going into the country" or "going for a ride," either of which events frequently call forth a brief critical consultation if not a glance at a map.

There are crowds of most excellent "light music" programmes, at almost all hours of the day and far into the night, which are admirably suited either for breaking into, or listening to in the spirit of "lets turn the wireless on."

Salon Music

But I can't stress the point too much that, with the "salon" type of music, it won't make a scrap of difference to our enjoyment of it. It will be the higher branches of the art which we should all try and "appreciate" as well as enjoy.

One might almost define the two classes of music by saying that, whereas, the former gives us room to do little other than "enjoy" something pretty, tuneful, wistful, bright, gay, or what you will, the latter is as great as drama, painting, mountains, the very universe itself, which, without a measure of thought and contemplation, cannot give us all of which it is capable. To do this it needs our contemplation, our selection, and our criticism.

Further, the B.B.C. has made itself the ideal medium through which to become acquainted with new music. Much excellent material gets neglected for years because, very naturally, we are reluctant either to spend money or travelling time on the practically unknown. But all this is avoided by means of our sets, and the journey to town need not be embarked upon until we have satisfied ourselves, at home, that our efforts will be repaid.

Heaven forbid that the concert world should ever be referred to as "the tunies," or that we shall ever ask a friend to come with us to the "palais de musique," which is far from unlikely if we let ourselves descend into the completely uncritical and unexacting frame of mind of the average cinema audience.

Contemporary Composers

Of contemporary composers whose work will be heard in the course of the winter season, the following are, perhaps, the most notable: Walton, Brittain, Rawsthorne, Rubbra, amongst natives, and Stravinsky, Shostokowitsch, Bartok (who died last month), and Prokoview, from the continent. Sir Arnold Bax is easily the most distinguished living British composer. But his style and idiom are thoroughly mature and formed, whereas the above named are the young bloods of to-day's music, who are still going through the formative processes and of whom it cannot yet be said how they are likely to finish up. Stravinsky is by no means a young man, but he is in the list of such as he still seems to be experimenting with new ideas. Of course, there are many others.

Sibelius is, with Richard Strauss, the greatest living composer, but both are only mentioned as a footnote, as they are eighty years of age and are not affecting the present course of the musical stream at present. They did in their heyday, very profoundly.

These men are all striking out on new paths, some of which have no roots in the past. They are mostly very original thinkers, intolerant of well-worn convention and shibboleths, and, as such, may give you many shocks and surprises.

But music would lose much of its fascination if it ceased to be original. And, if out of these experiments comes another Wagner or Debussy, their labours will not have been in vain.

Impressions on the Wax

Review of the Latest Gramophone Records

H.M.V.

H.M.V. releases for this month contain so many brilliant recordings that it is rather difficult to know which to place at the top of the list, but I feel that I am quite safe in selecting for my first review, *H.M.V.* *DB*6237. This is an exceptionally fine recording by the London Philharmonic Orchestra, conducted by Sir Thomas Beecham, Bart., of Borodin's Overture "Prince Igor," and as one would expect, the performance is superb. The overture is one which imposes heavy demands on the orchestra, and calls for a perfect technique and brilliant playing, and these requirements are satisfied in every degree by the London Philharmonic Orchestra and the very able hands of Sir Thomas Beecham. It is not perhaps well known that Borodin wrote his opera during what he termed his odd moments, and it received its finishing touches by Glazounov.

The next two records, *H.M.V.* *DB*6239 and *DB*6240, have been recorded by Serge Koussevitzky and the Boston Symphony Orchestra, and they have recorded that delightful music by Ravel, "Suite Number Two, Daphnis et Chloe." As many will well remember, the romance of Daphnis and Chloe is one of the most delightful, and if one has the opportunity of reading George Moore's translation of Longus' book, they are well advised to do so as it does enable them to increase the pleasure which they will obtain from the delightful music of Ravel.

In the 12in. C series, I strongly recommend *H.M.V.* 3466-70, as these are an outstanding recording by Moiseiwitsch (pianoforte) with the Philharmonic Orchestra conducted by George Weldon. The material Moiseiwitsch has selected is Tchaikovsky's Concerto Number One in B Flat Minor (Op. 23), which is in nine parts, and on the remaining side of the fifth record the same artist has recorded for us "Chanson Triste (Op. 40, No. 2)." The solo pianoforte part is played in brilliant fashion by Moiseiwitsch, who appears to revel in overcoming difficulties of technique, and the concerto gives ample scope for this great artist, who reveals his marvellous gift.

Anne Ziegler and Webster Booth have made two more delightful recordings this month on *H.M.V.* *C*3460. They render in their truly delightful fashion the ever popular Liebestraum, and Nocturne.

The Glasgow Orpheus Choir, conducted by Sir Hugh Robertson, have on *H.M.V.* *C*3462 recorded "Belmont" and "All in The April Evening." This famous orchestra is too well known for any comment of mine to be needed, but one must remark about the amazing tone, precision and technique which are so evident in this brilliant recording.

Columbia

THE City of Birmingham Orchestra, conducted by George Weldon, have made a fine recording of Sibelius' "King Christian Second Suite (Op. 27)" *Columbia* *DX*1220. On *Columbia* *DX*1217 we can hear Eric Coates and the London Symphony Orchestra in their latest recording of the "Three Bears Suite," a fantasy which can be thoroughly recommended to record enthusiasts of all ages. Incidentally, this record would form a very delightful Christmas gift.

Harry Davidson and His Orchestra has another record this month in *Columbia* *DX*1218, and it is Nos. 18 and 19 of the Old Time Dance Series. The tunes are the Tango Waltz and the Royal Empress Tango, and they are well up to the standard of the previous recordings in this series. Those followers of Frank Sinatra will welcome *Columbia* *DX*1216 on which he has recorded "Stormy Weather" and "Ol' Man River."

To open the 10in. Columbia series, I do not think one could do better than select the latest recording by Rawicz and Landauer on *Columbia* *DB*2193. These two brilliant pianists have recorded "Radetzky March," and "Perpetuum Mobile," and as usual their performance is simply astonishing. Kathleen Ferrier, contralto, has selected two delightful pieces by Mendelssohn for *Columbia* *DB*2194. The pieces are "Greetings," and "I Would that My Love," and these two well-known artists, with Gerald Moore at the piano, give us a delightful performance of these two rather charming pieces. John McHugh (tenor) recorded "Dearest of All," and "I'll Turn to You," on *Columbia* *DB*2195.

On the lighter side I recommend Paula Green and her Orchestra on *Columbia* *SB*5318, playing "I'm In Love With Two Sweethearts" and "Symphony," and this can be followed by *Columbia* *SB*3149 which is by Jimmy Leach and His New Organolians playing "Always" and "Moonlight and Roses."

Parlophone

AS usual I am opening up these releases with the latest recording by Richard Tauber, who gives a fine performance in English of "Dearest of All," and "I Could Never Tell," on *Parlophone* *RO*20542.

For the dance enthusiasts, I suggest Geraldo and his Orchestra on *Parlophone* *F*2096 playing "You Came Along" and "Summer Time," two very good numbers for slow fox-trot, the latter, by the way, being out of the recent film "Rhapsody in Blue."

Dorothy Squires on *Parlophone* *F*2101 made a good recording of "Under the Willow Tree," and "Goodnight 'Till Tomorrow." On *Parlophone* *R*2987, Woody Herman and his Orchestra offer "Happiness is a Thing, Joe" and "Laura," two fox-trots which should have wide appeal to dancing enthusiasts.

Regal

MY one and only Regal selection this month is by that ever popular Yodelling Cowboy, Gene Autrey, and on *Regal* *MR* 3758 one can listen to him singing "I'll Wait for You" and "Lonely River."

EARTHING

AT a recent meeting of the Society of Engineers (Inc.), a paper on Earthing was read by H. G. Taylor, D.Sc., A.M.I.E.E. After outlining the early history of the subject of earthing with particular reference to the use of the earth for telegraph circuits and protection of buildings from lightning, the author enumerated the present-day uses of earthing and earth electrodes. The principal uses are the provision of neutral points for electrical systems, the earthing of metal-work associated with electrical equipment for protective purposes, and the provision of protection against lightning discharges.

The three most important characteristics of earth electrodes are that they should have a low resistance to the general mass of the earth, that they should have an adequate current-carrying capacity so that they do not deteriorate with use, and finally that they should not in course of operation set up such a voltage gradient on the surface of the earth around them as to be a danger to cattle or human beings.

The author examined these three requirements in turn in relationship to the different types of electrodes which are commonly employed at the present time.

The resistance of an electrode depends primarily on the resistivity of the soil and on the shape of the buried metalwork, and the influence of these factors was examined in detail with the aid of numerous illustrations.

Experiments on current loading capacity have revealed interesting results which have not previously been taken into account, although it was quite evident that considerably more research is required on this aspect.

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).

Condenser as Voltage Dropper

SIR,—In reply to Mr. A. G. Hudson, and in defence of the statements in my letter in the October issue of PRACTICAL WIRELESS, I should like to say that I still think I am right.

Mr. Hudson agrees with me when I say that the voltage across the condenser is zero. Obviously, it cannot be anything else since the condenser is in an uncharged condition.

Now I say that the current which commences to flow at the moment of switching on is $\frac{V}{R}$. In the particular case to which this refers, I said it was $\frac{325}{50}$ or 6.5 amps.

I have looked through all my books for some proof of this, but I have to admit that I couldn't find any.

The only thing I did find was a short paragraph on Time Constants, which appears to have some bearing on the problem.

This is paragraph 174 of Vol. 1 of the "Admiralty Handbook of Wireless Telegraphy." This says: "In the charging case, suppose the switch just made and a steady voltage V applied to the circuit. The charging current is given by $\frac{V}{R}$ at the beginning of the action, because the condenser has no charge and hence exerts no back E.M.F."

Substitute a sinusoidal voltage with its peak value applied, in place of the steady voltage mentioned, and the same conditions must hold for the first few fractions of a second.

Perhaps I may not be so well qualified as Mr. Hudson, as I have only passed the Tech. Elec. and Radio examinations of the City and Guilds Institute; but I am so convinced that I am right that I am willing to submit the problem to an independent authority, whose qualifications shall be not less than A.M.I.E.E., and I will offer my most humble apologies to readers if I am wrong.—R. C. L. BAKER (Mitcham).

SIR,—I have followed with some interest the controversy which has arisen in the PRACTICAL WIRELESS over the use of a condenser as a mains voltage dropper.

Despite the fact that this idea was first suggested in May, and has been debated in your columns ever since, it is still a matter of opinion whether the use of a condenser is detrimental to the valve heaters or not. One fact is apparent: this method is not used commercially. There must be a reason for this as the idea is far from new.

Unfortunately the rather complicated subject of transients must enter into the question, and those who have written on the subject in PRACTICAL WIRELESS do not seem to be capable of producing conclusive mathematical proof of their argument. I personally would like to read an expert's opinion on the matter and I think this would show why the method is not used commercially.

The simplest method suggested for finding the condenser value was that of T. E. Millward in the June issue. The current through the condenser, $I_c = \omega CE = 2\pi fCE$ Therefore the condenser $C = \frac{I_c 10^6}{2\pi fE}$ microfarads.

Mr. Millward made, to my mind, one very bad suggestion. That of switching off the set by shorting out the heaters and so leaving the condenser and pilot lamp across the mains. Firstly, a small amount of power would be consumed, that in the condenser (very small amount), plus that in the pilot lamp. This is not very important as the loss would be compensated for by the economy in power consumption when the set is in use as compared with the resistance method. Secondly, the current through the pilot lamp would increase when the set is switched off owing to the reduction in impedance caused by shunting the valve heaters. This might well be sufficient to blow the pilot lamp, which is exactly what Mr. Millward's idea claims to prevent. Thirdly, Mr. Millward stated that "the power suppliers would be pleased as this improves the power factor of their system." I am afraid they would be far from pleased. Whenever there is an inductive load in power transmission there is reactive kVA and reactive current. This is compensated for by a condenser in parallel (introduced by the power suppliers), and if the value be correct will improve the power factor to unity, i.e., I in phase with E.

If many subscribers leave condensers in circuit across the mains, the load becomes capacitative, causing I to lead E by an angle ϕ, less than 90 degs. This is undesirable.—R. T. DOBSON (Earlsfield).

SIR,—In response to Mr. D. Homa's request for help, in your December issue, in connection with the "condenser in lieu of resistance" question, I would like to forward a brief explanation.

He states that "the power taken from the mains can be found by multiplying the mains voltage by the current."

This, of course, is not so, as the power factor of the whole circuit would not be unity.

The reason for this is that the presence of capacitive reactance in the circuit will cause the current to lead the applied voltage by an angle less than 90 degs., whose cosine is called the "power factor," and is the ratio of resistance to total impedance.

If the product of current and applied voltage is multiplied by the power factor, the result will be the true power consumption of the whole circuit, which, as stated by Mr. Hedley, is much less than that of a similar circuit employing a dropping resistance.

The power consumption of the heaters themselves will only be slightly less than the total power consumption; the difference being expended as heat in the small equivalent series resistance of the condenser's high parallel leakage resistance.

Power in A.C. circuits can seldom be found by taking the product of current and voltage, as reactance is nearly always present.—P. J. DARBY (Northampton).

SIR,—I see in the December issue of PRACTICAL WIRELESS a letter from Mr. David Homa concerning the power taken from the mains in a set where a condenser is used in place of line cord.

It is obviously not correct to state that the power consumed by the set can be obtained by multiplying the mains voltage by the current taken.

In a circuit of this type the power is given by voltage × current × power factor. Applying this to the case of the condenser, the following result is obtained. The current leads the voltage by 90 degs., i.e., power factor = cosine 90 degs. = 0. Thus there is no power used in the condenser.

In the remainder of the set, assumed to be a pure resistance, the current and voltage are in phase. Hence power factor = 1. Thus the power consumed by the whole circuit is equal to that used in the heaters and for the H.T. supply, no power being lost in the condenser.—M. D. H. WHITEHEAD (Sheffield).

(*Continued on page* 84)

SIR,—Mr. R. C. L. Baker, writing regarding the use of a condenser in place of a dropper resistance, writes: "The voltage on the condenser = $\frac{I}{\omega C}$ but it is as yet uncharged; if it is uncharged it has no current," and then goes on to prove that 6.5 amps passes through it in that same instant, being a series circuit the current must pass through the condenser and the heaters. What actually happens is that at the instant of switching on, the voltage, at whatever its value at that instant, appears at the condenser teminals, because as there is no (or very little) current passing, the voltage drop across the heaters is negligible. Also when dealing with transients it must not be overlooked that the condenser current is almost 90 deg. leading the voltage, i.e., when the current is at max. the voltage is at minimum.

The idea of using a condenser is quite workable, the reason it is not adopted commercially is the risk of short-circuit. If the condenser breaks down all the heaters will be ruined, which is very expensive.

If a condenser with mica insulation is built, which would be necessary if we must be reasonably sure of it not breaking down, it would cost several times the price of a dropper reistance (to say nothing of its bulk) whose failure only opens the circuit and no damage is done to the valves.

In conclusion, may I appeal to all your letter writers to refrain from slanging one another, decrying other people's qualifications and boosting their own; after all, no one knows it all and the best of people make what appear in writing to be stupid mistakes. The tendency to make mistakes is increased if the pen is red-hot and the ink and the brain are boiling. If people would adopt the attitude that, "If *anyone* can teach me *anything* I am willing to learn," and really mean it, the letters would give more instruction and pleasure to the other readers who should be regarded as the judges and jury to whom they are presenting their case.—S. COOPER (Newcastle).

Midget Portable

SIR,—I made the little Midget Portable described in your October issue—a truly amazing little set—deserving universal attention.

Since then I have experimented with it exhaustively, and there were a few points that I was able to improve upon.

Unfortunately I am too far from a B.B.C. station to get satisfactory results on the frame aerial *alone*, but with the modifications mentioned in my last letter—converting this to the tuning coil with special tappings, and a few feet of throw out aerial, stations come *pouring* in all the way round the tuning condenser—most of them too loud for headphones.

Unfortunately gauge of wire was omitted from your instructions. I used 30 enamelled, which allows for the long wave winding; which I worked out satisfactorily. With finer gauges, there is a drop in signal strength, with a tendency to instability.

The L.T. supply recommended only gives about 24 hours useful life—hardly satisfactory. The method I explained to you before, can still be employed in the 5½ x 4in. box without crowding, and gives 80 to 100 hours' service before a slight drop in power.

Sensitivity and *unusual* selectivity—with the improved tuning coil I worked out—are almost incredible in such a tiny set with only one valve.

As a universal headphone set of the ultra-midget type, with high all round efficiency—nothing is left to be desired. May I send you a photo of special cabinet I made; also of the improved internal arrangements?—J. SWEENEY (Gloucester).

SIR,—Having just completed the "Midget Portable," of your October issue, I thought other readers might be interested in my experience with same. I used 22 s.w.g. enamelled for both windings, and with a .0005 tuning condenser, 7 turns for reaction, 30 for grid. Reaction was a bit sharp so I tried a .0003 differential reaction condenser and this improved matters—smoothed reaction and thus helped tuning. I get very good strength, and the L.T. lasts quite a while. When the L.T. fails I find that moving each of the L.T. tappings each up one point sets matters right.

I have been an enthusiastic reader of PRACTICAL WIRELESS for about 15 months and it has been invaluable to me. Wishing PRACTICAL WIRELESS the best of luck.—P. J. TOWGOOD (Bournemouth).

SIR,—I have constructed the midget portable as published in October's issue of PRACTICAL WIRELESS, and have made one or two modifications which may interest other readers.

All the parts fitted easily into the small space above the two G.B. batteries; the turntable on the bottom of the set is a definite advantage, the aerial/coil being rather directional. I found that a small throw-out aerial about 6ft. long connected to the grid condenser and coming out through a hole in the back of the set greatly improved volume and general stability. Also, the H.F.C. was omitted in the finished receiver, as this component had little effect on the results.

The reaction coil was increased to 13 turns to enable the set to oscillate on the longer wavelengths. The tuning condenser was a .0005 of component, which gave a longer tuning range.

It is just the set for camping and hiking, as Mr. Caspers says.

In conclusion I would like to add a word of praise for PRACTICAL WIRELESS and the present high standard of the articles—I hope this standard will be maintained in future issues, the same handy pocket-size, of course.—D. R. BATE (Bristol).

Romford Radio Society

SIR,—An emergency general meeting was held on October 16th, 1945 to elect officers now that we have decided to commence weekly meetings, the result being as follows: Chairman, A. J. Hallett, G3CQ; Vice-Chairman, H. Holt, 2DXI; Hon. Sec., R. C. E. Beardow, G3FT; Treasurer, W. F. Holdaway, 2CWF; Working Committee: Mr. Janes, Mr. Williams, and Mr. George King, 2DXL. Ex P.O. Telegraphist R. N. Janes has been appointed Morse Instructor. Town representative for Romford, Mr. Dennis Witt, 2FXM.

A vote of thanks was passed to all those who had assisted the business of the Society during the war.

Club finance, £6 16s. 9d.

The first Morse instruction was a great success and we hope the enthusiasm will continue. It is hoped the Essex societies will get together in the near future to formulate plans for 1946.—ROWLAND C. E. BEARDOW (Chadwell Heath).

Television Progress

SIR,—Under the heading "Television Broadcasting Practice in America," appearing in a recent number, it was stated that "since British standards are eight years older than the most recent revision of the American standards, the British standards might profitably be reviewed to take account of recent practice."

I would like to point out that television has not been neglected in this country, although the closing down of the television station came with the outbreak of war. We all know that this branch of radio has been kept well to the fore by John L. Baird, and that experiments have been undertaken to further improve reception and screening. What remains to be seen is just how far British brains have traversed in relation to American.

According to what I have been informed the British public will receive a pleasant surprise when the full facts of television progress have been released—colour screening and televised news-reels for cinemas being a mere side issue. It will probably take another "Radiolympia" (or similar show place) to reveal the true facts to the man-in-the-street.—E. R. ADLEM (M.E.F.).

Station Identification Required

SIR,—I have a long list here of stations I have received and their corresponding dial readings. I am anxious to discover their respective frequencies for set calibration purposes. Can any of my fellow readers help me? Here they are: CZG7, CGX2, CGW8, CNR3, CNR4, CUD2, CNR2, CWD2, CUS, CUL, EPA, EPB, EAW, EAK, FZK3, FYM2, Fyy3, FYV2, FZI, FZT, FZM, FYJ2, FYJ, GNO, GFZ/3, GYC5, GYE12, GSP, GFH3, GFA3 (Air Ministry, Whitehall), GyG22, GFN9, GYZ69, GYA18, HBH, HVJ, HPQ, HBJ, HBO, HBQ2, HBW, HBE, HBU, HBI, HBV, HBS, HDL4, ICD, ICF, ICB, ICC, IRX, ICA, JKZA, JCYN, JEKF, MAS7, MSA3, MQE, MQE3, MSA39, ODE, ODD, ODK, RVW, RCB, RIF2, SUP3, SUC, SDM6, SDL7, SDE3, SDA3, SDC8, THD/2, THA, TFJ, TFM, VER, VPU. Then follow 58 Americans, which I will omit, XOH, YVR and lastly, ZRB. There are some unidentified ones, too, such as "Magnetism is a quality which we attribute to the atom," a test transmission from an American telephone co-station. I have logged all the above transmissions since September last year.

Will G8RF please write? Can any reader confirm rumours that amateur transmissions are going to start again, 73's to G8JC?—GEOFFREY C. BAGLEY (Ironbridge).

Station "Jeet"

SIR,—In your August edition of PRACTICAL WIRELESS, No. 470, I noticed that you had made a request for some information regarding station Jeet.

Unless someone has already informed you, you may be interested to know that that is the call-sign of the Press Section at 12th Army Group. Four letter call-signs beginning with "J" are allocated to Service fixed communication terminals, both teleprinter and wireless.—W. H. T. WARREN (B.A.O.R.)

Jazz

SIR,—In reply to "Ordinary Listener," M. K. Huggard writing in your November issue under the heading of "Jazz." We should like to ask him on behalf of British jazz enthusiasts whether he can differentiate between jazz and so-called popular music.

We should like to point out that jazz is a musical form with intricate musical and rhythmic patterns which naturally offers the same difficulties to the listener as does the symphony. The word jazz appears to have fallen into misuse since Paul Whiteman christened himself the "King of Jazz," and (especially in England), when so many third-rate ragtime bands added a few "tin cans" to their drum kits and called themselves a jazz band, inspired more by the novelty of the original Dixieland jazz band than by the good jazz they played.

The B.B.C. caters for jazz enthusiasts with never more than two hours' programme time a week and rarely at peak listening periods; this is totally inadequate for the demand for good jazz. The majority of B.B.C. programmes consist of anæmic light music, the incessant song plugging of tuneless uninspired musical combinations, the death moans of the imitators of Sinatra and the repeated reciting of songs by reputed comedians.

Hoping to have dispelled the fallacies in the mind of M. K. Huggard, and that we may be allowed to listen to our modest two hours a week of real jazz without offending the listeners who probably do not understand our musical tastes.—D. S. SAUNDERS (Rochester).

"Applications of the 0-1 Milliammeter"

SIR,—Our attention has been drawn to the article in your October issue under the above title, and particularly to the statement appearing at the foot of column 2 on page 469.

We shall be grateful if you will arrange for a note to appear in your next issue to the effect that we can and shall be pleased to supply any of your readers with our instrument-type rectifiers.—WESTINGHOUSE BRAKE & SIGNAL CO., LTD. (Pew Hill House, Chippenham, Wilts).

Midget Three

SIR,—There is a point concerning the Midget 3 which calls for modification. The reaction winding on the frame aerial has full H.T.+ potential with only a thin layer of enamel between that and the grid winding. This has already "broken down" at the corner of the frame on the set my friend has built, with the result that the L.F. transformer primary has burned out.

Undoubtedly this trouble would have been avoided had the author specified a couple of turns of thread between the windings, and many a young amateur will be spared this trouble and consequent expense if this fault can be amended in your columns.

There is just one more grouse. There is no information given as regards the dimensions, make and voltage of the H.T. battery. From the article in your paper it might be anything from 18 to 60.

I think mention should be made of the above fault for those readers not familiar with Midget H.T.s.—C. D. GANTZER (Essex).

Amplifier Acting as Detector

SIR,—Regarding the case instanced of an A.F. amplifier picking up a radio transmission I have little doubt that the first valve is working on a part of the anode current/grid volts curve, which is not absolutely straight; it is rectifying slightly, that is, detecting. There is no tuned grid circuit, but a strong transmission can build up a voltage on whatever impedance, such as a grid leak, exists between the grid and cathode of the first valve.—A. O. GRIFFITHS (Wrexham).

A Super Without the Het

SIR,—With reference to the article in your December issue, I have obtained improved stability by connecting a fixed feed-back condenser (say .0001 to .0003 mfd.) between the octode anode and the oscillator grid coil. This increases the strength of the local oscillation, but this can be reduced to its correct value by the oscillation control.—D'ARCY FORD (Exeter).

Measuring A.V.C. Voltages

SIR,—Having noticed a reader's letter in which the correspondent regrets the necessity of having a valve-voltmeter for measuring A.V.C. voltages, I thought a description of a method of doing this with ordinary instruments would be of interest. It takes a little longer, of course, than the direct measurement, but is nevertheless useful.

The method is as follows. Connect a meter in the anode circuit of one of the controlled valves (say, an I.F. stage), by-passing for H.F. by means of a capacitor if necessary. Now tune in a signal, or inject a signal from a generator, of the strength of which it is desired to determine the A.V.C. voltage generated. Now note the anode current of the valve checked, which will fall. Now de-tune or remove the signal generator. A high-resistance voltmeter is now connected between the A.V.C. line and earth and bias applied from a battery and 1,000-ohm potentiometer as in ordinary V.M. bias. When the potentiometer has been adjusted so that the anode current is the same as in the initial test, the bias applied to the controlled valves will be the same as that obtained by the A.V.C. action, and will be shown by the voltmeter.

In actual practice the operation does not take much longer than to read of it.—F. G. RAYER (Longdon).

Mill Hill Wireless Club

SIR,—I am writing this letter to tell you that the Mill Hill School Wireless Club has been restarted, as I know no other method of informing old boys who may be interested.—J. R. GABRIEL, Secretary, Collinson House, Mill Hill, N.W.7.

Ultra-midget Battery Receiver

SIR,—I wish to point out a mistake which I made in the diagram of my set Ultra Midget Battery L.S. Receiver, December, 1945, Fig. 7.

The 3 ohm resistor should be in the L.T.+ lead, and not as shown in the pentode leg, as this would have disastrous results to other valves.

The H.T. battery used was 67½ volts "Mini-Max" Ever-Ready, No. 467.—MORGAN MACKAY.

Radio Vatican

SIR,—I am taking this opportunity of writing to you to say that I have just been appointed British representative of Radio Vatican HVJ, and all reports of reception and comments if sent to me will be sent to Radio Vatican. Perhaps you would be so good as to publish this information in PRACTICAL WIRELESS for the benefit of readers.—B. HAYES, 8, Althorpe Crescent, New Bradwell, Bletchley, Bucks.

D.C. Multi-range Test Instrument

SIR,—In the November issue I find a criticism by R. S. Wood (R.A.F.) of two articles in the May issue—one on a "D.C. Multi-range Test Instrument" and the other, written by myself, on "Meter Switching."

His criticism of the former warrants little comment as the original error is obviously a "slip of the pencil" and should be obvious.

In the latter case, however, his comments display an ignorance of Ohm's Law and, in addition, he seems to have lost sight of the very object of the article.

If he will re-read the article in question, he will see that, in order to avoid switch contact resistance, the shunt is permanently connected across the meter thus giving a F.S.D. of 50 m/A. This unit, used as a voltmeter, has an ohms/volt rating of 20—and NO MORE.—R. A. BOTTOMLEY (Troon).

Results from Our Economy S.W.3

SIR,—I am a keen short-wave DX fan, and the set I am using up to the present is "The Economy DX Three," published in the May, 1944 PRACTICAL WIRELESS, the only difference being is that I have built the set on a metal chassis and am using the Osram KT2 as the power valve.

Here is my log from the beginning of this year up to the present time:

19-*metre Band.*—WOOC, 19.75 m. (15,190 kc/s); WCBX, 19.65 m. (15,270 kc/s); SBT, Motala, 19.79 m. (15,155 kc/s); CHTA, Sackville, 19.71 m. (15,220 kc/s); WGEO, 19.57 m. (15,330 kc/s); WRUA, 19.54 m. (15,350 kc/s); RRRD, Moscow, 19.05 m. (15,750 kc/s); Allied Force H.Q., JJKM.

25-*metre Band.*—VLG5, Melbourne, 25.25 m. (11,880 kc/s); PRL8, Rio de Janeiro, 25.61 m. (11,715 kc/s); Algiers, Voice of America (25 m.b.); FZI, Brazzaville, 25.06 m. (11,970 kc/s); WRUL, 25.58 m. (11,725 kc/s); WOOW, 25.27 m. (11,870 kc/s); DJF, Berlin, 25.47 m. (11,780 kc/s); Paris, 25.62 m. (11,710 kc/s); WLWL1, 25.40 m. (11,810 kc/s); WCRC, 25.36 m. (11,830 kc/s); WGEA, 25.32 m. (11,847 kc/s); OIE, Lahti (Finland), 25.47 m. (11,780 kc/s); WRUS, 25.44 m. (11,790 kc/s); CHOL, 25.6 m. (11,720 kc/s).

27-*metre Band.*—Stockholm (Norman McDonald calling B.B.C.), 27.94 m. (10,780 kc/s).

29-*metre Band.*—HEO4, Berne, 29.02 m. (10,338 kc/s).

30-*metre Band.*—OPM, Leopoldville, 30.66 m. (9,784 kc/s); VLC2, Shepperton (Australia), 30.99 m. (9,680 kc/s).

31-*metre Band.*—YU, Belgrade, 31.66 m. (9,483 kc/s); EAQ, Madrid, 31.43 m. (9,870 kc/s); TAP, Ankara, 31.70 m. (9,465 kc/s); JZI, Tokio, 31.47 m. (9,535 kc/s); HVJ, Vatican City, 31.06 m. (9,660 kc/s); Prague, 30.41 m. (9,550 kc/s); VLG, Melbourne, 31.32 m. (9,580 kc/s); Singapore (Richard Sharp calling B.B.C.); LRI, Buenos Aires, 31.12 m. (9,640 kc/s); VUM2, Madras (All-India Radio), 31.35 m. (9,570 kc/s).

Wavelengths not known.—Cairo, SUV, calling GDB2 London; Cesena, Italy (Army Station), with messages in code; ICDS, Rome, calling WQV, New York (Press Station); SBT2, Stockholm, calling HEO4, Berne (Press Station), 10,780 kc/s.—M. PAVELY (Catford, S.E.6).

A SMALL A.C./D.C. AMPLIFIER

(*Continued from page* 48)

except to state that all wiring should be as short and rigid as possible, and that a really heavy gauge bus-bar should be employed for the H.T.— line.

LIST OF COMPONENTS

Mains Dropping Resistor, R8 (Norman Rose); Chassis (Waveband Radio); Valveholders (Raymart); Smoothing Choke 30 H 100 mA (Partridge); Capacitors (T,C.C.); Resistors, variable (Centralab); Resistors, fixed (Waveband Radio); Valves—V1, HL13C, V2, Pen 36C, V3, CY1 (Mullard).

CAPACITORS.—C1, input isolating capacitor, 0.1 mfd.; C2, input isolating capacitor, 0.1 mfd.; C3, V1 bias shunt, 25.0 mfd.; C4, V1 anode decoupling, 2.0 mfd.; C5, V2 coupling, 0.1 mfd.; C6, V2 bias shunt, 25.0 mfd.; C7, V2 tone correction, 0.005 mfd.; C8, tone control, 0.02 mfd.; C9, H.T. smoothing, 8.0 mfd.; C10, H.T. smoothing, 8.0 mfd.; C11, mains filter, 0.1 mfd.; C12, chassis isolating, 0.1 mfd.

RESISTORS.—R1, gain control, 100,000 ohms; R2, V1 cathode bias, 1,000 ohms; R3, V1 anode decoupling, 20,000 ohms; R4, V1 anode coupling, 50,000 ohms; R5, V2 grid leak, 500,000 ohms; R6, V2 cathode bias, 150 ohms; R7, tone control, 10,000 ohms; R8, mains dropper (NR/2), 650-750-850 ohms for A.C. volts 200-220-240.

IS AN INTERNATIONAL RADIO LANGUAGE PRACTICABLE?

(*Continued from page* 72)

First Parent-word	Second Parent-word	Compound	Meaning
de—day	*be*—before	*debe* (day-before)	yesterday
de—day	*po*—after	*depo* (day-after)	to-morrow
be—before	*mi*—midday	*bemi* (before-midday)	morning
po—after	*mi*—midday	*pomi* (after-midday)	afternoon
li—liquid	*bi*—life	*libi* (liquid-life)	blood
li—liquid	*ri*—write	*liri* (liquid-write)	ink

I was glad to read the PRACTICAL WIRELESS Editor's declaration that a common language "would add enormously to the interests of radio," but he quite pertinently asks: "How can an international language overcome the differences between, say, English and French and German?" I would courteously submit that, although these three languages differ so greatly, no one suggests that it is impossible for an Englishman to learn French or German, or vice-versa. Is it not logical then to assume that all three nationals could learn the much simpler grammatical rules of a constructed International Radio Language which is free from the tortuous case-endings, genders for inanimate objects, irregular verbs and irregular spelling which have troubled hundreds of thousands of foreign language students for hundreds of years?

"Nothing, indeed," concludes Roget in the introduction to his Thesaurus "would conduce more directly to bring about a golden age of union and harmony among the several nations and races of mankind than the removal of that barrier to the interchange of thought and mutual good understanding between man and man, which is now interposed by the diversity of their respective languages."

Will not wireless enthusiasts, therefore, combine to test whether an International Radio Language, constructed on lines similar to those I have illustrated, is a practicable proposition?

CLASSIFIED ADVERTISEMENTS

LITERATURE, MAPS, etc.

BRITISH SHORT-WAVE LEAGUE.—S.A.E. for membership details and sample monthly "Review." The S.W. Listener's Handbook, 2/9 post free. Write NOW to H.Q., 53, Madeley Rd., Ealing, London, W.5.

RADIO SOCIETY OF GREAT BRITAIN invites all keen experimenters to apply for membership. Current issue "R.S.G.B. Bulletin" and details, 1/- below.

AMATEUR RADIO HANDBOOK (300 pages), paper cover, 4/-; cloth, 6/6. Radio Handbook Supplement (140 pages), paper cover, 2/9; cloth, 5/-.—R.S.G.B., 28-30, Little Russell Street, London, W.C.1.

WEBB'S Radio Map of the World. Locates any station heard. Size 40in. by 30in. 4/6, post 6d. On linen, 10/6, post 6d.—Webb's Radio, 14, Soho Street, London, W.1. GERrard 2089.

MORSE & S.W. EQUIPMENT

MORSE Practice equipment for class-room or individual tuition. Keys, audio oscillators for both battery or main operation.—Webb's Radio, 14, Soho Street, London, W.1. Phone: GERrard 2089.

"H.A.C." Short-wave Receivers. Famous for over ten years. Improved one-valve model now available. Complete kit of components, accessories, with full instructions, now 19/3, postage 9d. Easily assembled in one hour. S.A.E. for free catalogue.—A. L. Bacchus, 109, Hartington Road, London, S.W.8.

RECEIVERS & COMPONENTS

B.A. thread screws, one gross useful sizes, 2/6; ditto, nuts, 2/6 gross; assorted gross screws and nuts, 2/6; ditto, brass washers, 1/6 gross; fibre washers, 1/6 gross; assorted soldering tags, 2/- gross; assorted small eyelets and rivets, 1/3 gross. Large stock of screws, etc. State requirements. S.A.E. Rubber-covered stranded copper wire, 1d. yard; heavier quality, 1½d. yd.; very heavy quality, 2½d. yd.; ideal for aerials, earths, etc. Single cotton-covered tinned copper wire, 25g., 12 yds. 9d.; 50 yds., 3/-; tinned copper connecting wire, 20 ft. coil, 6d.; ditto, rubber-covered, 10 ft., 6d.; finest quality push-back wire, 12 yds., 2/3; twin bell wire, 12 yds., 1/9; ditto, heavier quality, 12 yds., 2/3; ditto, flat rubber-covered, 3d. yard; twin flat braided electric cable, 6d. yd.; Wood's metal stick, 2½in. by ½in., 1/-. Cotton-covered copper instrument wire, ½lb. reels, 18, 20, 22, 24g., 1/6; 26, 28g., 1/9; 30, 32g., 2/-; 34, 36g., 2/3; silk-covered ditto, 2 ozs. reels, 24, 26, 28g., 1/6; 30, 32, 34, 36g., 1/9; 42g., 2/-; 16g., double silk-covered, 1 lb., 5/-; 18g., enamelled, 1 lb., 3/6. Sensitive permanent crystal detectors. Tellurium-Zincite combination, complete on base, guaranteed efficient, 2/6; Glass tube crystal detectors, complete, 2/-; reliable crystal and cats-whisker, 6d. Reconditioned headphones, complete, 4,000 ohms, 12/6. All postage extra.—Post Radio Supplies, 33, Bourne Gardens, London, E.4.

REWINDS and Radio Spares. Armatures, Field Transformers, Pick-ups, Fractional H.P. Motors, Speakers, New Cones and Speech Coils fitted. All work guaranteed and promptly executed. C.O.D. Postal Service. Send S.A.E. for list Valves and Radio Bargains.—A.D.S. Co., 261-5, Lichfield Road, Aston, Birmingham, 6.

CLEARANCE SALE.—Universal Avo-Minor, Avo No. 7 Universal Meter, Electrolytic Condensers, Valves, Speakers, etc. List, S.A.E.—Young, 134, Old Shoreham Road, Southwick, Sussex.

MALLORY 6-volt, 4-pin. UX Vibrators, New and Guaranteed, 10/- each.—H. English, The Maltings, Rayleigh Road, Hutton, Essex.

REWINDS.—Repairs to moving-coil speakers. Cones, Coils fitted. Fields wound or altered. Mains Transformers, Eliminators and Clock Coils rewound. Competitive prices. Speaker-Transformers and Pick-ups repaired, 4/6 each Post Free. Guaranteed satisfaction. Prompt Service. **—L.S. Repair Service, 49, Trinity Road, Upper Tooting, London, S.W.17.**

MAINS Transformers, primaries 200/250v. 100 m.a. 350-0-350, 4v. or 6v. heaters, shrouded with fixing feet, an A1 job, 24/6. Cards of asst'd resistors, popular sizes, 18 ohm to 2 mv., 40 on card, 16/6. P.M. speakers, with pen., transf., 8in. 26/-. 6in. 25/6, new goods only cash with order, post paid by us —P.T. and P.D. Banks, 60, Hall Lane, Chingford, London, E.4.

PRATTS RADIO

1070 Harrow Road, College Pk.
HARLESDEN, N.W.10
(Nr. SCRUBS LANE)

SPEAKERS. P.M. less transfr. 2½in. 25/-, 3½in. 28/6, 5in. 21/-, 6½in. 21/6, 8in. 22/-. With Pen transfr., 6½in. 25/-, 8in. 27/-, 10in. 37/6. Mains En., 2,000 ohm field, 6½in. 27/6, 8in. 30/- (inc. transfr.). Speaker transformers, Pentode 5/9, midget 5/9, Heavy Duty 7/6, Multi-ratio 7/6, Power Pentode 6/-.
LINECORD, .3 amp. 60 ohms per ft., 2-way 8d. per ft., 3-way 9d. per ft.
VOLUME CONTROLS (most values), less switch 3/6 each, with switch 5/- each.
SMOOTHING CHOKES. Midget 360 ohms 5/9 ea., 60 ma. 500 ohms 6/6 each.
VARIABLE CONDENSERS. Small .0005 mfd. 2-gang with trimmers, 11/- each.
MAINS TRANSFORMERS. Input 200/ 30/50v. Output 350-0-350v. 4v. 2½a., 4v. 5a. or 5v. 2a., 6.3v. 2½a. 25/- each.
ELECTROLYTIC CONDENSERS (all 450v. wkg.), 8 x 8 mfd. 5/6 each, 16 x 8 mfd. 6/3 ea., 8 mfd. 4/- each, 25 mfd. 25v. 1/9 each.
PAPER CONDENSERS. Most values in stock.
COILS. M.W., H.F. and Detector, very selective, 5/6 per pair. Superhet Coils, L.M.S. wave. Aerial and Oscillator complete with circuit diagram 13/- per set.
I.F. TRANSFORMERS. 465kcs., 15/- pair.
INTERVALVE TRANSFORMERS, Midget Parafeed 4/9 each. Driver Class B or Standard 3/1 7/- each.
VOLTAGE DROPPERS. .3 amp. 800 ohm 5/- each, .2 amp. 950 ohm 4/9 each.
MISCELLANEOUS GOODS. Valve Bases 7d. each. Control or pointer knobs 7d. each. Toggle switches 2/3 each. Dielectric Condensers, .0003 and .0005 mfd. variable, 4/3 each.
VALVES. We have a large selection. Your enquiry invited. Prompt delivery.
S.A.E. for list or enquiries. Orders over 10/- post free. C.O.D. or C.W.O. Buses 662, 664 and 18B pass door.
NEW GOODS ONLY.

ALL RAYMART PRODUCTS NOW IN STOCK

A wide range of Brand New Quality Components of reliability, always in stock.

Ceramic Valve-bases.
4.5.6.7. and Octals.

Ceramic Stand-offs.
½in., 1in. and 1½in.

Precision Dials and Knobs.
2¾in., 3/11. 4in., 5/9.

Black Bakelite Knobs.
From 1in. to 3in., with and without skirts.

Plug-in Coils.
4- and 6-pin. 11/25, 20/45, 44/100, 80/180, 100/250 metres.

Send stamped, addressed envelope for "LATEST LIST "P."

BERRY'S (SHORT WAVE) LTD
25 HIGH HOLBORN, LONDON, W.C.1 (Opposite Chancery Lane)
'Phone: HOLborn 6231

I WISH to learn practical radio repairing up to the standard of radio mechanic, in spare time. Anywhere.—A. Armstrong, c/o High Street P.O., Southampton.

807's (3), 6SK7's (2), 6N7, 6B8, 12SK7. All unused. To best cash offers.—Box No. 123, "Practical Wireless," Tower House, Southampton Street, W.C.2.

DISPOSAL, stock and equipment of radio and electrical service (domestic), including mains and battery sets, meters, chargers, torches, elements, bulbs, dozens of components, Taylor 47 valve-tester, 8 h.p. car with radio, taxed, etc. Genuine, £200.—Particulars: Griffin, Theddingworth, Rugby.

AVO Meters, Oscillators, Valve Testers, etc., a few in stock, no priority. Wanted: Test Equipment, Single Range Meters. S.A.E. with inquiries.—Massey, 58, Wakefield Avenue, Hull, E. Yorks.

EXIDE Power Unit, trickle charger, 200/250 volts, mains A.C., perfect, 108/-. —121, Nottingham Street, Sheffield.

35 mm. Sound Films from well-known features, musicals, &c. Suitable for experimenters, test film, etc. 250ft., 9/6; 500ft., 15/6. W. Jones, 51, Cranford Drive, Hayes, Middx.

ELIMINATOR, power unit, voltage 200/250 mains A.C., 45/-, perfect.—121, Nottingham Street, Sheffield.

ALL makes and kinds of Electrical and Radio Instruments repaired by skilled technicians A.I.D. approved. Over 60,000 instruments repaired for R.A.F. All work quoted by return without charge.—C. Gertler, Dept. B, 71-79, Waterside, Chesham, Bucks.

SPARKS' DATA SHEETS

Full constructional details, circuit, and full-size prints of assembly and wiring plans of Tested and Guaranteed Designs.
LATEST RELEASES.—One-valve All-dry Midget Portable, med. and long waves, 9 v. H.T., 'phone sigs., 2/6; Midget All-dry Portable, three valves, med.-wave, L.S. sigs., 2/6; Midget All-dry Battery Two-valver, powerful 'phone sigs., 9 v. H.T., size 5½ x 5¼ x 3¼, med.-wave, 2/6; Radio Unit H.F. Plus Infinite Impedance Detector, for use with mains-operated quality amplifier, med. wave, 2/6; A.C. Radiogram, for quality radio and P.U. reproduction, P.P. output, 8 watts, med.-wave, 3/6; A.C. 8-watt Amplifier, P.P. output, tone and vol. controls, ideal for quality P.U. reproduction, 2/6; Three-Valve Amplifier (Battery) P.P. output, 2/6.
OTHER DATA SHEETS.—Electric Guitar Units, 5/-; Electronic One-String Fiddle, 3/6; Trans-current Mike, 2/6; A.C. Charger, 2/6; D.C. Charger, 2/-; Shocking Coil, 2/6.
AMPLIFIERS.—6-8-watt A.C./D.C. Amplifier, portable, neg. feed-back, P.P. output, 3/6; 3½-watt A.C. Amplifier, 2/6; Two-Valve Amplifier (Batt.), 2/6.
SETS.—With full coil details.—A.C. Two-Valver, 2/6; Three-Valve "Straight" Set (Batt.), 2/-; Crystal Set, 1/6 (All med.-wave only). S.W. Super Two-Valver (Batt.), Eddystone or Premier Coils, 2/6. Please include stamp with order, inquiries or for detailed list. **L. ORMOND SPARKS (P),** The Constructor's Consultant, 9, Phoebeth Road, Brockley, S.E.4.

SOUTHERN RADIO'S WIRELESS BARGAINS

LATEST RADIO PUBLICATIONS: "Radio Valve Manual." Equivalent and Alternative American and British Types, with all data, 3/6. **"Radio Circuits."** Fully Illustrated. Receivers, Power Packs, etc., 2/-. **"Amplifiers."** Fully descriptive Circuits, 2/-. **"Radio Coil and Transformer Manual,"** 2/-. **"Short-Wave Handbook,"** 2/-. **"Manual of Direct Disc Home Recording,"** 2/-. **"Test Gear Construction Manual,"** 1/6. **"Radio Pocket Book."** Formulas, Tables, Colour-Code, etc., 1/-. **"10 Hows for Radio Constructor,"** 1/-. Just Published, **"Radio Reference Handbook."** Comprehensive and up-to-date, covering all branches of Radio, 10/6.
PAPER CONDENSERS, Post Office Type, Upright, 2 mfd., high working (used, but guaranteed perfect), 2/6 each. Brand new, 2 m.d. Mainsbridge, 3/6. 1mfd., 3/-. .1—.1—.1 2/6, T.C.C. electrolytic, reversible, 4-4mfd., 70 volts, 3/6. **MULTICON MICA CONDENSERS.** 28 capacities in one, 4/-.
ALUMINIUM PANELS (undrilled). 18in. x 7in., 16 gauge thickness, 3/6; 28in. x 18in., 12/6 each.

(Continued first column overleaf)

ACE "P.O." Microphones, complete with transformer, usable with any receiver, 7/6. Permanent Crystal Detectors, 2/6. Crystals, 6d., with cats-whisker, 1/-. Insulated Push-back Wire, 25yds., 5/-. Insulated Sleeving, assorted sizes and colours, 3/6 per doz. yd. lengths. Single screened Wire, 10/- per doz. yds. Twin Screened Wire, 17/- per doz. yds. **POWER RHEOSTATS, CUTLER HARMER,** 30 ohms and 10 ohms, 4/6 each. **PRESS BUTTON SWITCHES,** 3-way, 4/- ; 8-way, 6/- (all complete with knobs). Escutcheons for 8-way switches, 1/6. Yaxley Type Rotary Switches, 11-way, single bank, 6/6. **KNOBS** : Instrument Type Pointer, black or brown, 1/- each. All types of Round Knobs, black or brown, 1/- each. All ¼in. holes. Postage Stamp Size Trimmers, Paxoline and Ceramic, 30 pf., 1/-. International Octal Base Valve Holders, moulded or Paxoline, 1/- each.. 10/6 doz. Mazda Type Octal, 1/- each. Variable Condensers, twin-gang, 0.00015, Midget size, 12/6. 0.0005 twin-gang, 12/6. **RESISTANCES,** brand new wire ended, ½, ½, and 1 watt, assorted values, 30/- per 100. ¼ watt only, assorted sizes, 20/- 100. ¼ watt only, assorted sizes, 22/6 100. Assorted screws, 5/- per lb. Assorted Soldering Tags, including Spade Ends, 6/- per gross. Hundreds more bargains lines.
SOUTHERN RADIO SUPPLY CO., 46, Lisle Street, London, W.C.
Gerrard 6653

CHARLES BRITAIN RADIO invite you to their new premises. This month's offers include:—**PHILCO** Mains energised speakers, 2,000 fields with new cones 7in. with pentode trans., 21/- ea. Two-gang Condensers with trims, 7/6 ea. Bakelite dialectic condensers, .0005 or .0003, 3/- ea. Moving-coil mikes, 6/-. **ELECTROLYTIC** condensers, 4 mfd. Micropac 200 v. wkg., 2/6 ea. ; 6 mfd. small cans, 175 v. wkg., reversible, 4/6 ea., 8 mfd. tubular 450 v. 4/- ea., block 4/3 ea., 25 mfd. 25 v. 2/6 ea., 12 mfd. 50 v. 2/- ea., 50 mfd. 12 v. 2/- ea. **COILS.** All-wave aerial and oscillator coils, 465 k/c with circuit, 14/- per set. Midget A and H.F. m.w. Litz wound 5/- pr. ; P type coils, A and H.F., 2/- ea. I.F. transformers (465 k/c) Litz wound in all cans with trims, 12/- pair. Tuning condensers, 2-gang midget 12/6 ea., 3-gang 10/- ea. Volume controls, with switch, ¼, ½, 1 and 2 meg. Morganite and Centralab, 5/6 ea. All values less switch Dubilier, 3/- ea. Knobs: best quality with brass inserts, 1¼in. dia. 8/- doz., 1¾in. 7/- doz. ; black pointer knobs, 8/- doz. Solid brass spindle extenders, ¼ bore, 6/- doz. Dials: Marconi glass vertical type only, 2/- ea. ; paper dials for midgets L. and M.W., 8/- doz. **SPECIAL** offers. Epicyclic slow-motion condenser drives, ex-Elkco, 1/6 ea. Morganite volume controls 50,000 ohms, short spindle, less switch, 1/3 ea. Socket strips, engraved A.E. or P.U., 4/6 doz. Resistance stripped from Ecko, 3/6 doz. Tubular conds. ditto, incl. bias types, 4/6 doz. Micas, 3/- doz. Band-pass aerial coils ex Ecko with diagram, 2/6 ea. I.f. trans. 110 k/c in cans with trims, 3/6 pair. Three-gang condensers, tracked for 110 k/c, 3/6 ea. Small moving coil mikes (damaged), 1/6 ea. Send for new list "W." Terms: cash or c.o.d. over £1. Note our new address: **Charles Britain Radio, Radio House, 2, Wilson Street, London, E.C.2.** Tel. BIS. 5935, ext. 7.

FRED'S RADIO CABIN
MED. WAVE T.R.F. Coils, 2/6 pair
MED. WAVE Litz wound T.R.F. coils, 4/6 pair.
PAX COIL FORMERS, 1in. x 4in., 3d. each.
2 PIN COIL HOLDERS, 6d. each.
DUAL RANGE COILS in large square can. No reaction, 2/- each.
BRASS Coupling Links, 9d. each.
BRACKET and Clip Pilot Lampholders, 8d. each.
LAMP ADAPTORS, 8d. each.
2in. BLACK KNOBS, 1in. bore, 10d. each ; small black pointer knobs, 9d. each ; large black pointer knobs, 1/- each.
PAXOLIN Resistor Panels—3in. x 2¼in., 3d. ; 5¼in. x 2¼in. 5d. ; 9in. x 2¼in., 6d.
PAX STRIPS, Blank, 4in. x 1¼in., 3d.
LATEST CRYSTAL DETECTOR on ebonite base, 2/6 each.
CRYSTAL and Catswhisker, 6d.
TAPPED TONE CONTROLS, 2/- each.
CENTRALAB V/C's. with sw., 3/6 each.
VOLUME CONTROLS. Less sw., 3/- each. Most Values ; volume controls with sw., 4/6 each most Values.
ODD SECONDHAND. V/C's. with and without sw., 7/6 doz.
STANDARD SPEAKER FIELDS. 1,500 ohms and 2,000 ohms, 7/6 each.
MAINS DROPPERS. .2 and .3 amp., 6/- each.
OCTAL BASE V/hs., 7 pin English, 5, 6 and 7 pin U.X., 8d. each, 7/6 doz.
7 and 8 WAY P.B. units, 2/- each, no knobs.
RESIN-CORED SOLDER, 3/9lb. reel ; multi-core solder, 5/-lb. reel.
465 K/c. I.F. TRANS., 12/6 pair.
3 WAVEBAND COILS with Circuit, 11/- pair.
MIDGET H.F. CHOKES. 2/- each.
SQUARE I.F. COIL CANS. 3¼in. x 1¼in., 6d. each ; round coil cans, 3in. x 2in. dia., 6d. each.
COVERED CONNECTING WIRE. 6d. per coil ; 18 and 20 gauge tinned copper wire, 2/- ½lb. reel.
HEAVY DUTY Twin Screened Cable, 9d. yd.
SINGLE BELL WIRE. 9d. doz. yards.
MIDGET FIELD COILS. 5,000 ohms, 1/- each.
SYSTOFLEX SLEEVING. 2 mm., 3/- doz. yds.
SOLON SOLDERING IRON. Straight bit, 13/6 ; pencil bit, 14/6.
METAL CHASSIS drilled for 3 valves, 7in. x 7in. 2¼in., 2 valves, 7in. x 5¼in. x 2¼in., 2/- each.
NEW. ¼ and ½ watt Resistors, 4.7 m. ohms 150 k., 100 k., 50 k., 22 k., 10 k., 5 k., 1 k., 200 ohms, 150 ohms, 3d. each or 3/6 doz.
L.F. SMOOTHING CHOKES. 240 ohms, 10 Hy., 90 ma., 5/6 each.
MULTI-RATIO O.P. Trans., 6/- each.
MIDGET .0005 mfd. variable bakelite Tuning Condensers, 2/6 each.
2 GANG .0005 mfd. Condenser with Trimmers, 2in. x 2¼in. x 1¼in., 12/6 each.
L.F. CHOKE BOBBINS. 180 ohms, 3 Hys., 2/- each.
Postage must be included. No C.O.D.
FRED'S RADIO CABIN FOR BARGAINS, 75, Newington Butts, S.E.11.
Rodney 2180.

WIRELESS and Loudspeaker Cabinets manufactured to special design of each customer.—Birney Smallwood Products, Ltd., "Swan Works," Fishers Lane, W.4.

CAR Radio Transformer, 6v., 16s. 6d. ; Mains Transformers rewound to specification.—Body, 22, Fabian Cres., Shirley, Birmingham.

WANTED.—P. W. Copies June and Aug., 43. Dec., 44. June, 45. Will change Sept., Oct., 43. July, 44. Jan., Aug., Sept., July, 45 P. W. for above copies. Box 124, Practical Wireless, Tower House, Southampton St., W.C.2.

SITUATIONS VACANT

OVERSEAS EMPLOYMENT : RADIO TELEGRAPH INSPECTORS required for the Nigerian Government Posts and Telegraphs Department for one tour of 12 to 24 months in the first instance. Salary £600 a year plus local allowance £24 a year. Separation allowance for married men between £72 and £192 a year, according to number of children. Outfit allowance £60. Free quarters and passages. The duties of the post are those of a construction foreman engaged on the installation of radio diffusion or relay systems including fitting central receiving stations with diversity reception receivers, aerial arrays, etc., and subscribers lines and apparatus. Candidates should preferably have had experience with a company operating radio relay services in England or elsewhere. A sound practical knowledge of radio reception apparatus is of more importance than experience in underground and overhead distribution.
Written applications (no interviews) giving the following essential details (1) Full name, (2) Date of Birth, (3) Industrial training and experience, (4) Name and adddress of present employers, (5) Details of present work should be sent to The Secretary, Overseas Manpower Committee (Ref. 1436), Ministry of Labour and National Service, York House, Kingsway, London, W.C.2. Applications cannot be acknowledged.

"ENGINEERING OPPORTUNITIES."—Free 112-page guide to training for A.M.I.Mech.E., A.M.I.E.E., and all branches of Engineering and Building. Full of advice for expert or novice. Write for free copy and make your peacetime future secure.—B.I.E.T. (Dept. 242B), 17, Stratford Place, London, W.1.

TUITION

LEARN MORSE CODE the Candler Way. See advertisement on this page.

RADAR.—Be prepared for the boom in post-war developments. We train students of both sexes for appointments in all branches of radio. Low inclusive fees. Boarders accepted. 2d. stamp for Prospectus.—Wireless College, Colwyn Bay.

THE Tuitionary Board of the Institute of Practical Radio Engineers have available Home Study Courses covering elementary, theoretical, mathematical, practical and laboratory tuition in radio and television engineering ; the text is suitable coaching matter for I.P.R.E. Service entry and progressive exams. ; tuitionary fees at pre-war rates—are moderate. The Syllabus of Instructional Text may be obtained, post free, from the Secretary, 20, Fairfield Road, Crouch End, N.8.

INSTRUMENT WIRES Etc.

Lewcos enam. copper wires, 14-16-18-20-22-24-26-30-34-38-40-43 swg. 2/9, 3/-, 3/3, 3/6, 3/9, 4/-, 4/3, 4/9, 5/3, 5/9, 6/-, 7/- per lb. Less than 1-lb. reels 2d. extra, over 1 to 2-lb. reels 4d. extra, over 2 to 8-lb. reels 2/6 extra. All reels returnable. Also D.C.C., D.S.C. enam./S.S.C. coverings. Resistance wires, etc. Many other interesting Radio and Electronic items. Lists 1d. S.A.E. Orders over 30/- post Free.
MIDLAND INSTRUMENT CO., 18, Harborne Park Rd., Birmingham, 17.

Practical Wireless

BLUEPRINT SERVICE

PRACTICAL WIRELESS — *No. of Blueprint.*

CRYSTAL SETS

Blueprints, 6d. each.

1927 Crystal Receiver .. .. — PW71*
The "Junior" Crystal Set .. — PW94*

STRAIGHT SETS. Battery Operated.

One-Valve : Blueprints, 1s. each.

All-Wave Unipen (Pentode) .. — PW31A*
Beginners' One-valver .. .. — PW85*
The "Pyramid" One-valver (HF Pen) .. .. — PW93*

Two-valve : Blueprint, 1s.

The Signet Two (D & LF) .. — PW76*

Three-valve : Blueprints, 1s. each.

Selectone Battery Three (D, 2LF (Trans)) .. .. — PW10
Summit Three (HF Pen, D, Pen) — PW37*
All Pentode Three (HF Pen, D (Pen), Pen) .. .. — PW39*
Hall-Mark Cadet (D,LF,Pen (RC)) — PW48*
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. .. — PW49*
Cameo Midget Three (D, 2 LF (Trans)) .. .. — PW51*
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) — PW53*
Battery All-Wave Three (D, 2 LF (RC)) .. .. — PW55*
The Monitor (HF Pen, D, Pen) .. — PW61*
The Tutor Three (HF Pen, D, Pen) — PW62
The Centaur Three (SG, D, P) .. — PW64*
The "Coil" All-Wave Three (D, 2 LF (RC & Trans)) .. .. — PW72*
The "Rapide" Straight 3 (D, 2 LF (RC & Trans)) .. .. — PW82*
F. J. Camm's Oracle All-Wave Three (HF, Det. Pen) .. .. — PW78*
1938 "Triband" All-Wave Three (HF, Pen, D, Pen) .. .. — PW84*
F. J. Camm's "Sprite" Three (HF Pen, D, Tet) .. .. .. — PW87*
The "Hurricane" All-Wave Three (SG(D), (Pen), Pen) .. .. — PW89*
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet) .. — PW92*

Four-valve : Blueprints, 1s. each.

Beta Universal Four (SG, D, LF, Cl. B) .. .. — PW17*
Nucleon Class B Four (SG, D SG), LF, Cl. B) .. .. .. — PW34B*
Fury Four Super (SG, SG, D, Pen) — PW34C*
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull) .. .. .. — PW46*
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B) .. .. — PW83*
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)) .. .. — PW90*
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) .. — PW67*

Mains Operated

Two-valve : Blueprints, 1s. each.

A.C. Twin (D (Pen), Pen) .. — PW18*
Selectone A.C. Radiogram Two D, Pen) .. .. — PW19*

Three-valve : Blueprints, 1s. each.

Double-Diode-Triode Three (HF Pen, DDT, Pen) .. .. — PW23*
D.C. Ace (SG, D, Pen) .. .. — PW25*
A.C. Three (SG, D, Pen) .. .. — PW29*
A.C. Leader (HF Pen, D, Pow) .. — PW35C*
D.C. Premier (HF Pen, D, Pen) .. — PW35B*
Unique (HF Pen, D, Pen), Pen) .. — PW36A*
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) — PW50*
"All-Wave" A.C. Three (D, 2 LF (RC)) .. .. — PW54*
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) .. .. — PW66*
Mains Record All-Wave 3 (HF Pen, D, Pen) .. .. — PW70*

Four-valve : Blueprints, 1s. each.

A.C. Fury Four (SG, SG, D, Pen) — PW20*
A.C. Fury Four Super (SG, SG, D, Pen) .. .. — PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull) .. .. — PW45*
Universal Hall-Mark (HF Pen, D, Push-Pull) .. .. .. — PW47*

SUPERHETS

Battery Sets : Blueprints, 1s. each.

F.5 Superhet (three-valve) .. — PW40*
F. J. Camm's 2-valve Superhet. .. — PW52*

Mains Sets : Blueprints, 1s. each.

A.C. £5 Superhet (Three-valve) .. — PW43*
D.C. £5 Superhet (Three-valve) .. — PW42*
F. J. Camm's A.C. Superhet 4 .. — PW59*
F. J. Camm's Universal £4 Superhet 4 .. .. — PW60
"Qualtone" Universal Four .. — PW73*

SHORT-WAVE SETS. Battery Operated

One-valve : Blueprint, 1s.

Simple S.W. One-valver .. — PW88*

Two-valve : Blueprints, 1s. each.

Midget Short-wave Two (D, Pen) — PW38A*
The "Fleet" Short-wave Two (D (HF Pen), Pen) .. .. — PW91*

Three-valve : Blueprints, 1s. each.

Experimenter's Short-wave Three (SG, D, Pow) .. .. .. — PW30A*
The Prefect 3 (D, 2 LF (RC and Trans)) .. .. — PW63*
The Band-spread S.W. Three (HF Pen, D (Pen), Pen) .. — PW68*

PORTABLES

Three-valve : Blueprints, 1s. each.

F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) .. — PW65*
Parvo Flyweight Midget Portable (SG, D, Pen) .. .. — PW77*

Four-valve : Blueprint, 1s.

"Imp" Portable 4 (D, LF, LF (Pen)) .. .. .. — PW86*

MISCELLANEOUS

Blueprint, 1s.

S.W. Converter-Adapter (1 valve) — PW48A*

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS

Blueprints, 6d. each.

Four-station Crystal Set .. .. — AW427*
Lucerne Tuning Coil for A.W.427*, 6d.
1934 Crystal Set. .. .. .. — AW444
150-mile Crystal Set .. .. — AW450*

STRAIGHT SETS. Battery Operated.

One-valve : Blueprint, 1s.

B.B.C. Special One-valver .. — AW387*

Two-valve : Blueprints, 1s. each.

Melody Ranger Two (D. Trans) . — AW388*
Full-volume Two (SG det. Pen).. — AW392*
A modern Two-valver .. .. — WM409*

Three-valve : Blueprints, 1s. each.

£5 5s. S.G. 3 (SG, D, Trans) .. — AW412*
Lucerne Ranger (SG, D, Trans) . — AW422*
£5 5s. Three De Luxe Version (SG, D, Trans) .. .. .. — AW453*
Transportable Three (SG, D, Pen). — WM271
Simple-Tune Three (SG, D, Pen).. — WM327*
Economy Pentode Three (SG, D, Pen) .. .. — WM337
"W.M." (1934 Standard Three (SG, D, Pen) .. .. .. — WM351*
£3 3s. Three (SG, D, Trans) .. — WM354
1935 £6 6s. Battery Three (SG, D, Pen) .. .. — WM371
PTP Three (Pen, D, Pen) .. — WM389*
Certainty Three (SG, D, Pen) .. — WM393
Minitube Three (SG, D, Trans) .. — WM396*
All-wave Winning Three (SG, D, Pen) .. .. — WM400

Four-valve : Blueprints, 1s. 6d. each.

65s. Four (SG, D, RC, Trans) .. — AW370
Self-contained Four (SG, D, LF, Cl. B) .. .. — WM331
Lucerne Straight Four (SG, D, LF, Trans) .. .. .. — WM350
£5 5s. Battery Four (HF, D, 2LF). — WM381*
The H.K. Four (SG, SG, D, Pen).. — WM384
The Auto Straight Four (HF, Pen, HF, Pen, DDT, Pen) .. — WM404*

Five-valve : Blueprints, 1s. 6d. each.

Super-quality Five (2 HF, D, RC, Trans) .. .. — WM320
Class B Quadradyne (2 SG, D, LF, Class B) .. .. — WM344
New Class B Five (2 SG, D, LF, Class B) .. .. — WM340

Mains Operated

Two-valve : Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C. . — AW403*
Economy A.C. Two (D, Trans) A.C. — WM286

Three-valve : Blueprints, 1s. each.

Home Lover's New All-Electric Three (SG, D, Trans, A.C.) .. — AW383*
Mantovani A.C. Three (HF, Pen, D, Pen) .. .. — WM374*
£15 15s. 1936 A.C. Radiogram (HF, D, Pen) .. .. .. — WM401*

Four-valve : Blueprints, 1s. 6d. each.

All-Metal Four (2 SG, D, Pen) .. — WM329
Harris' Jubilee Radiogram (HF, Pen, D, LF, P).. .. .. — WM386*

SUPERHETS

Battery Sets : Blueprints, 1s. 6d. each.

'Varsity Four .. .. .. — WM395*
The Request All-Waver .. .. — WM407

Main Sets : Blueprints, 1s. each.

Heptode Super Three A.C. .. — WM359*

PORTABLES

Four-valve : Blueprints, 1s. 6d. each.

Holiday Portable (SG, D, LF, Class B) .. .. — AW393*
Family Portable (HF, D, RC, Trans) .. .. — AW447*
Tyers Portable (SG, D, 2 Trans.) — WM367*

SHORT-WAVE SETS. Battery Operated

One-valve : Blueprints, 1s. each.

S.W. One-valver for America .. — AW429*
Roma Short-Waver .. .. — AW452*

Two-valve : Blueprints, 1s. each.

Ultra-short Battery Two (SG, det Pen) .. .. — WM402*
Home-made Coil Two (D, Pen) .. — AW440

Three-valve : Blueprints, 1s. each.

Experimenter's 5-metre Set (D, Trans, Super-regen) .. .. — AW438
The Carrier Short-waver (SG, D, P) .. .. — WM390*

Four-valve : Blueprints, 1s. 6d. each.

A.W. Short-wave World-beater (HF, Pen, D, RC, Trans) .. — AW436*
Standard Four-valver Short-waver (SG, D, LF, P) .. .. .. — WM383*

Superhet : Blueprint, 1s. 6d.

Simplified Short-wave Super .. — WM397*

Mains Operated

Two-valve : Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen), A.C. .. .. .. — AW453*

Three-valve : Blueprints, 1s.

Emigrator (SG, D, Pen) A.C. .. — WM352*

Four-valve : Blueprints, 1s. 6d.

Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) .. — WM391*

MISCELLANEOUS

S.W. One-valve Converter (Price 6d.) .. .. — AW329
Enthusiast's Power Amplifier (1/6) — WM387*
Listener's 5-watt A.C. Amplifier (1/6) .. .. — WM392*
Radio Unit (2-r.) for WM392 (1/-) — WM398*
Harris Electrogram battery amplifier (1/-) .. .. .. — WM399*
De Luxe Concert A.C. Electrogram (1/-) .. .. — WM403*
New Style Short-wave Adapter (1/-) .. .. — WM388
Short-wave Adaptor (1/-) .. — AW456*
B.L.D.L.C. Short-wave Converter (1/-) .. .. — WM405*
Wilson Tone Master (1/-).. .. — WM406
The W.M. A.C. Short-wave Converter (1/-) .. .. .. — WM408*

SPECIAL NOTICE

THESE blueprints are drawn full size. The issues containing descriptions of these sets are now out of print, but an asterisk beside the blueprint number denotes that constructional details are available, free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: Thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

HINTS COUPON

This coupon is available until January 14th, 1946, and must accompany all Practical Hints.

PRACTICAL WIRELESS, January, 1946

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by THE NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rates including postage: Inland 10s. 6d. per annum; Abroad 10s. per annum. Registered at the General Post Office for the Canadian Magazine Post.